The Use of WebQuests for Helping Students Develop Their Information Skills

by

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摘　要

資訊素養一般被定義為一種具備確認所需資訊及有效地檢索、評估及運用所需資訊的能力。在資訊不斷澎漲的電腦網絡上，資訊素養尤其重要。「網絡探究」源於九十年代末，是一種通過真實任務及強調探究、合作學習以促進高階思維的網絡學習模式。「網絡探究」亦著重分析、綜合及評估資訊。「網絡探究」與資訊素養之間存在一定關係，也有相關的討論建議以「網絡探究」活動作為提高資訊素養的工具。

基於該等建議，本研究探討「網絡探究」活動能否有效地提高學生的資訊素養，以此作為一項實證研究，確認該等建立於理論層面的建議。具體而言，本研究調查通過進行一套「網絡探究」活動，是否能顯著地發展學生的資訊技能，從而協助初中學生達致某些列在「香港學生資訊素養架構」內的學習成果。

是次研究在一所香港的中學進行，為期約三個月，共有一百四十名初中學生參與。本研究利用四個經過精心設計及調整的「網絡探究」活動，作為培養學生資訊素養的工具。該工具旨在協助學生實踐相關的資訊技能，從以達致七項具體的學習成果。活動經由學校的電腦科課堂進行，共有五班（每班廿人）混合能力的初中學生參與。

本研究採用前後測的方法衡量該等「網絡探究」活動給學生帶來的學習成效。前、後測皆針對評估學生在七項目標學習成果方面的績效。此外，本研究亦審查了學生在「網絡探究」活動中所完成的作品，從以分析部分學習成效。在活動實施期間，本研究更為五組學生（每班一組）進行錄影，記錄他們的具體活動及電腦畫面，活動後再安排他們接受訪問，以了解他們的學習過程及從活動中所學的東西。

研究結果顯示，整體而言，對於達致該等目標學習成果，學生有顯著的進步。針對個別學習成果而言，學生在其中五項展現顯著的進步，餘下兩項則未見。通過查核質化數據，發現在活動期間，學生並沒有如期般實踐與該兩項有關的資訊技能，而導致學生缺乏實踐的主要原因來自某些提供給學生的學習支架、一些超越學生閱讀程度的網上資源及在個別「網絡探究」裡的內隱學習機會。

是次研究結果給未來在相關領域的研究及實踐，帶來一定的意涵。對正處於發展階段的「網絡探究」研究，本論文能充實該領域之文獻，為其增添具體的實證數據。另一方面，對於實踐「香港學生資訊素養架構」的內容，尤其是初中部分，是次研究能為學校提供有用的參考資料。

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Information literacy is generally defined as a set of abilities enabling individuals to recognize when information is needed and have the capacity to locate, evaluate, and use effectively the needed information. As a consequence of the ongoing proliferation of information resources on the Web, information literacy is required and gains a high profile as central to education. Since the late 1990s, the concept of WebQuest has been developed to promote higher-order thinking through authentic assignments that emphasize inquiry-based and cooperative learning. The WebQuest model stresses the evaluation, analysis, and transformation of information. In linking the two concepts, there are discussions and theoretical assertions suggesting WebQuest as a useful tool for helping improve information literacy.

Owing to the suggested use of WebQuest for information literacy training, the study investigated if WebQuest activities supported the improvement of information literacy. Specifically, the research was intended to act as an empirical study for verifying the theoretical assertions. It was like a treatment study investigating whether using a set of

well-designed WebQuests, as treatment, could yield significant improvement in developing students' information skills, in order to help junior secondary students achieve a set of specific learning outcomes defined in the Information Literacy Framework for Hong Kong Students.

The study took place in a co-educational secondary school in Hong Kong lasting for about three months. One hundred and forty junior students constituted the sample of the research. Four self-designed and adapted WebQuests were involved in the study as instruments aiming to help students practice their information skills in order to achieve seven learning outcomes for information literacy. The WebQuests were delivered to five groups of S.2 students through the Computer lessons. Each group consisted of 20 mixed ability students representing half of a S.2 class in the school.

For assessment, a pre-test/post-test approach was used to measure the learning effects of the use of WebQuests. The tests assessed students' overall achievement of the target learning outcomes. Besides, the work completed by students throughout the WebQuest activities was evaluated by using four specially designed rubrics. During the implementation of the WebQuests, the physical activities and the computer screens of five working groups were video recorded. After the implementation, the five working groups were also interviewed to gather information regarding their learning processes and what they had learned throughout the WebQuests.

The results indicated significant treatment effect on the overall achievement of the target learning outcomes for information literacy. Individually, the test results indicated significant treatment effect on five out of the seven learning outcomes. Among the five, large effect size was found for one, and medium effect size was found for the other four. For

another two learning outcomes, findings from the qualitative data showed that the primary reason for the failure was about the absence of practice for the information skills concerned owing to some sort of supports given to students, the Web materials given in the WebQuests, and the implicit learning opportunities provided in the WebQuest.

The findings of the study have implications for future research and practice in the area of employing the WebQuest model for information literacy instruction. Concerning the growing body of WebQuest research, the findings of this dissertation work contribute to the inadequate literature by enriching the empirical data. For practical concern, information gained from this study may have significant implications and provide useful reference for implementing the Information Literacy Framework for Hong Kong Students at Junior Secondary level.

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CHAPTER 1

INTRODUCTION

1.1 Application of Information Technology in School Curriculum

Over the past decade, information technology (IT) has become increasingly prevalent in the schools (Shamoail, 2005). The application of information technology in the school curriculum involves the infusion of technology as a tool to enhance the learning in a content area or multidisciplinary setting (ISTE, 2000). Information technology involves the tools with which teachers deliver content and implement practices in better ways (Earle, 2002). It enables students to learn in ways, which were not previously possible. Its focus should be on curriculum and learning (Ching, 2009). Thus, discussions on the application of IT in the curriculum should not only be bounded by the amount or type of technology used, but also emphasize how and why it is used (Earle, 2002).

A number of authors have attempted to clarify the understanding of the application of IT in the school curriculum by stating a variety of ways in which computers are used. Bialobrzeska and Cohen (2005) point out that such application operates on three levels, namely, 1) functional practice, 2) integrative practice, and 3) transformational practice. Learners engage in functional practice when they use the computer in basic and functional ways to do the things that the computer can do well, such as word processing, document presentation, spreadsheets, graphics production and searching for information on the Internet. Progressively, when learners begin integrating the purpose of the learning activities with the use of computer programs, new ways of teaching and learning emerge. This constitutes integrative practice. Drafting and revising a piece of writing using a word processor is one of

the examples. The third level of application, transformational practice, is characterized by learning which occurs as a result of activities and opportunities that do not exist in computer-less environments, such as collaborative online projects and synchronous discussion rooms.

Yuen, Law and Wong (2003) propose another three levels of information technology adoption in schools, which are termed 1) technological adoption model, 2) catalytic integration model, and 3) cultural innovation model. The first model is likely to be found in the initial stages of innovation where the immediate concern of school leaders is whether teachers are able to master the necessary skills or technologies. Information technology is used to enhance the effectiveness of information presentation and to stimulate student interest using attractive multimedia, especially graphics and animation. The second model reveals deliberate integration of information technology into the teaching and learning process as an integral part of the curriculum. The pedagogical practices found in this model are mostly task-based, problem-based and social-constructivist approaches. When information technology is introduced, attempts are made to integrate it in different curricula so as to further school's curriculum innovation goals. In the third model, information technology is well integrated into at least some aspects of the total school curriculum. The kinds of pedagogical practices occurring in particular classrooms depend on the beliefs of teachers. In addition, teachers are further challenged to rethink their personal attitudes, beliefs and values about their roles as educators.

Other scholars express their views on the issue of application in similar ways. McCormick and Scrimshaw (2001) present a detailed description and discussion of three levels of change in pedagogic practice with information technology, and how these affect professional knowledge. The levels of change are described as 1) to improve efficiency of conventional teaching, 2) to extend the reach of teaching and learning, and 3) to transform teachers' and learners' conceptions of the subject itself. Coupal (2004) also describes three

waves of IT professional development for teachers, which she names 1) literacy uses (a technology-centered pedagogy), 2) adaptive uses (a teacher-centered, direct instruction pedagogy), and 3) transforming uses (a student-centered, constructivist pedagogy). Bottino (2004) singles out three models, namely, 1) the transmission model, 2) the learner centered model, and 3) the participative model, as a starting point for eliciting ideas about the use of information technology in classroom activities.

In dealing with what is understood by the application of information technology in the curriculum, Hokanson and Hooper (2000) offer a simple and clear distinction. They differentiate between two approaches to the use of information technology to enhance cognition, which are termed representational use and generative use. The former aims at transmission of information. It is used to describe how information technology is used to re-present or reproduce information in another medium. The focus of the latter is on knowledge construction. It is conceptualized as the capability of using information technology to generate thought.

Referring to the three levels of application stated by Bialobrzeska and Cohen (2005), representational use accords mostly with functional practice (Hodgkinson-Williams, 2006). That is, even information technology is incorporated within a task, its purpose is to re-present information but not to generate or construct new information or knowledge. Such use of information technology is also named by Suthers (2000) as representational tools, by which users construct, examine, and manipulate external representations of their knowledge.

Hodgkinson-Williams (2006) further elaborates the concept of generative use mainly as cognitive tools. In her proposed conceptual framework, she refers integrative practice described by Bialobrzeska and Cohen (2005) to cognitive tools. Teachers, who understand the application of information technology as cognitive tools, assume the roles of listener, questioner, facilitator, and promoter of cognitive conflict. The main focus of the use of information technology as cognitive tools is on the active character of individual learner and

his/her relationship with information technology. Salomon, Perkins and Globerson (1991) refer such relationship to an intellectual partnership. They elaborate that the cognitive effects with computer tools greatly depend on the mindful engagement of the learner in the tasks afforded by these tools. Jonassen (1996) also develops similar idea and defines cognitive tools as computer-based tools and learning environments that have been adapted or developed to function as intellectual partners with the learner in order to engage in and facilitate critical thinking and higher order learning. Concerning the generative use of information technology, Loveless, DeVooged and Bohlin (2001) note that constructing knowledge from information requires more than the ability to use a variety of information technology techniques. It relates more to an ability to question, access, interpret, amend, analyze, construct and communicate meaning from information.

1.2 The Need for Information Literacy

Effective application of information technology is achieved when students are able to use it appropriately for 1) obtaining information in a timely manner, 2) analyzing and synthesizing the information, and 3) presenting the information in a professional way (Richardson, 2002). Such desired achievement is in conformity with the concept of information literacy (IL), which is generally defined as an understanding and set of abilities enabling individuals to recognize when information is needed and have the capacity to locate, evaluate, and use effectively the needed information (ALA, 1998). Information literacy incorporates, and is broader than, fluency in the use of information technology. It is an intellectual framework for recognizing the need for, understanding, finding, evaluating, and using information. These are activities which may be supported in part by fluency with information technology, in part by sound investigative methods, but most importantly through critical discernment and reasoning (Bundy, 2004).

Among various information technology approaches to teaching and learning, the World

Wide Web is seen as a valuable learning tool for inquiry and research activities (see Berenfeld, 1994; Cohen, 1997; Feldman, Konlold & Coulter, 2000; and Gordin, Gomez, Pea & Fishman, 1996). Over the past decade, the Web has become a huge information resource (Lamb, 2005). It offers teachers and students access to a vast collection of information sources for curricular resources. Capable of providing rich, real language input through interactive hypermedia functions, Web resources promise to bring about positive learning outcomes that traditional classroom materials alone cannot achieve (Chuo, 2004). Kearsley (1996) suggests that the most significant aspect of the Web for education at all levels is that it dissolves the artificial wall between the classroom and the real world. Students can find original materials and collect first-hand information themselves. Similarly, Lamb (2005) points out that, by drawing on the natural relationships among subjects and connecting to authentic resources, students can see how the curriculum connects to the world around them. In addition, the Web provides up-to-date information such as real-time data, current local and global news, access to government information sources, etc, which cannot be provided by textbooks.

The ease of access to vast amounts of information on the Web reveals a key characteristic of the post-industrial 21st century – it is information abundant and intensive. As a consequence of the ongoing proliferation of information resources and the variable methods of access, information literacy is required and gains a high profile as central to education (Moore, 2002). This dynamic concept extends basic reading, writing and calculating skills for application in information and technologically rich environments, ultimately aiming at effective use of information for learning or problem solving (Kuhlthau, 2001).

1.3 WebQuest for Information Literacy Instruction

In accordance with the representational use of information technology, the Web provides rich representations of information including colorful graphics or photographs, images, sounds, and video clips. It even allows teachers and students to experience virtual trips such

as visiting museums, outer space, gardens, etc. With respect to the generative use, Web-based materials can provide prompts for students to examine evidence, compare different viewpoints on issues, analyze and synthesize existing data sets to formulate conclusions, and communicate findings to others across large geographical distances. Besides, the Web also offers rich instructional resources to enhance and enrich student learning that is unavailable in many traditional classrooms (Bodzin & Cates, 2003).

Until the late 1990s, a majority of Web-based learning activities focused on low-level, scavenger hunt types of activities (Lamb, 2005). In other words, representational use was the dominant purpose of using online resources. Frustrated by this poor use, educators began to seek ways to make effective and generative use of the vast information resources available on the Web. Since then, a variety of strategies have been developed to promote higher-order thinking through authentic assignments that emphasize inquiry-based and cooperative learning (Lamb, 2004). The concept of WebQuest (Dodge, 1995) is one of the typical strategies developed to achieve such purpose (Lamb, 2005).

The WebQuest model stresses the evaluation, analysis, and transformation of information (Dodge, 1995; March, 2003). Rather than using the Web to collect facts and opinions, WebQuest is an engaging, inquiry-based approach to teaching and learning that promotes the kind of meaningful and authentic learning experiences for achieving higher-order thinking (Lamb, 2005). The model continues to grow in popularity, with teachers from around the world and many teacher-educators and experts in the field of educational technology espousing its potential to extend content knowledge and promote higher level thinking (Frazee, 2004). Over the past decade, a number of authors have discussions on the application of WebQuests in the school curriculum (see Lipscomb, 2003; MacGregor & Lou, 2004; Peterson, Caverly & McDonald, 2003; Watson, 1999). One of the suggested uses is to help develop information literacy (Blummer, 2007; Lamb, Smith & Johnson, 1997).

While the central processes of information literacy instruction draw on critical thinking, problem solving, and development of extensive understanding of information in the context of the curriculum and beyond (Moore, 2002), WebQuests provide an authentic, technology-rich environment for problem-solving, information processing, and collaboration (Teclehaimanot & Lamb, 2004). In this environment, students are given hands-on opportunities to practice their information skills on real-world problems (Blummer, 2007) using real, rich, relevant Web information (March, 2000), and to participate in a final group process that attempts to transform newly acquired information into a more sophisticated understanding (March, 2003).

1.4 Purpose of the Study

Owing to the suggested use of WebQuest for information literacy instruction (see Blummer, 2007; Lamb, Smith & Johnson, 1997), the study investigated if WebQuest activities supported the improvement of information literacy. The reasons for linking the two concepts are discussed in Chapter 2 (see Section 2.4).

Specifically, the research was intended to act as an empirical study for verifying the theoretical assertions suggesting that, in general, WebQuest appeared useful for helping improve information literacy. It was like a treatment study investigating whether using a set of well-designed WebQuests, as treatment, could yield significant improvement in developing students' information skills, in order to help junior secondary students achieve a set of specific learning outcomes (Level III) defined in the cognitive dimension of the Information Literacy Framework for Hong Kong Students (Tsui & Lee, 2008). Particulars of the Information Literacy Framework for Hong Kong Students (EMB, 2005) are provided in the following chapter (see Section 2.3).

Conceptually, the research comprised the studies of treatment design together with its implementation and evaluation. While the WebQuest model is well received by teachers and

students alike, most evidence of its effectiveness is anecdotal, and there is little in the way of empirical research on the elements that make an effective WebQuest (Abbit & Ophus, 2008; Dodge, 2007; Frazee, 2004; Lamb & Teclehaimanot, 2005; Milson, 2002). Related research work on WebQuests is reported in Section 2.5 of Chapter 2.

For this reason, the study of treatment design focused on the design of the WebQuests. It was 1) to ensure the quality of the WebQuests employed in the study, and 2) to identify the opportunities offered by the WebQuests for helping junior secondary students develop their information skills. Furthermore, rich descriptions of how students interact during a well-developed WebQuest are largely absent from the literature (Frazee, 2004; Lamb & Teclehaimanot, 2005). Accordingly, the study of implementation focused on the process of implementing the WebQuests. By examining students' activities in the lessons for the implementation, it explored students' actual practice and learning process during the WebQuests. Lastly, the evaluation of treatment assessed students' achievement of the target learning outcomes. It sought to look at the learning effects of employing the WebQuests on students' achievement of the learning outcomes for information literacy.

In short, there are discussions and theoretical assertions suggesting WebQuest as a useful tool for the improvement of information literacy. On the contrary, there have been few studies on the elements that make an effective WebQuest, while descriptions of students' learning process during a well-developed WebQuest are also absent from the literature. The WebQuest model suffers from a lack of scholarly research (Abbit & Ophus, 2008; Dodge, 2007; Lamb & Teclehaimanot, 2005; Milson, 2002) which may impede practitioners interested in using this approach to design and deliver effective Web-enhanced instruction (Frazee, 2004).

Based primarily upon the notion connecting WebQuest and information literacy, the purpose of the research was to study if using a set of well-designed WebQuests could yield significant improvement in helping students achieve a set of learning outcomes for information literacy. Through examining the design and implementation of the treatment (i.e.

the set of WebQuests) and also evaluating it (i.e. the learning effects of the WebQuests), the study was to provide empirical evidence for verifying the theoretical assertions that related WebQuest to information literacy.

1.5 Significance of the Study

The study will yield findings, which have implications for future research and practice in the area of employing the WebQuest model for information literacy instruction. As discussed in the previous section, the WebQuest model suffers from a lack of scholarly research (Abbit & Ophus, 2008; Dodge, 2007; Frazee, 2004; Lamb & Teclehaimanot, 2005; Milson, 2002). Concerning the growing body of WebQuest research, the findings of this dissertation work would contribute to the inadequate literature in particular by 1) enriching the empirical data on the elements that make an effective WebQuest for improving information literacy, 2) enhancing the understanding of students' learning process during a well-developed WebQuest, and 3) initiating the development of a contemporary instrument for measuring the learning outcomes defined in the Information Literacy Framework for Hong Kong Students (EMB, 2005).

For practical concern, information gained from this study may have significant implications and provide useful reference for implementing the Information Literacy Framework for Hong Kong Students (EMB, 2005) at Junior Secondary level. Schools with similar context can use the findings of this study as a baseline in their effort to carry out WebQuest activities or information literacy instruction in their classrooms. Besides, the study would provide noteworthy insights for schools that are interested in integrating WebQuests into classroom teaching or pursuing a similar path in the future.

1.6 Outline of the Dissertation

The rest of the dissertation is divided into five chapters. Following this introduction, Chapter 2 reviews the literature related to WebQuest and information literacy that serves to

provide the theoretical underpinnings of the study. It gives an account of the WebQuest model, including the key attributes and the theoretical foundations underlying WebQuests, and introduces the Information Literacy Framework for Hong Kong Students by providing an overview of the key dimensions, IL standards and learning outcomes defined in the Framework. It also looks at the reasons for linking WebQuest to information literacy. The theoretical assertions suggesting that WebQuest appears suited for information literacy instruction are discussed as well. The chapter ends with reporting the related research work on WebQuest and information literacy.

Chapter 3 presents the design of the study, including the research question, research plan, instruments, and pilot study. At the beginning, it states the research question followed by describing the research plan. Then, it delineates the instruments employed in the study, including the process of selecting and adapting the WebQuests in the treatment and the development of the instruments for measuring the learning effects of the treatment. Lastly, particulars of the pilot study, as well as its results, are reported.

The focus of Chapter 4 is on the procedure of carrying out the main study. The chapter first gives particulars of the implementation of the WebQuests, including the participants. Subsequently, it details the procedure for data collection and preparation.

Following the illustration of the research procedure, Chapter 5 presents the results and findings from the data collected in the main study. The instrument for measuring the learning effects of using the WebQuests primarily comprised a pre-test and a post-test. Besides, the work completed by the participants during the WebQuest activities was analyzed, based on some rubrics. Accordingly, the chapter presents the learning effects by reporting and comparing the results of the two tests. Next, it presents the qualities of students' work according to the rubric scores. Afterwards, based upon the learning effects, the chapter presents some findings from the qualitative part of the main study in order to look at students' practice during the WebQuests.

The last chapter concludes and discusses the whole study. It first reviews the aim, process, and findings of the study in order to conclude in response to the research question. Next, it discusses several issues regarding the findings of the present study. Lastly, the significance and limitations of the study together with recommendations for further research are discussed and suggested.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Introduction

This chapter presents a critical review of the literature related to WebQuest and information literacy. It serves to provide the theoretical underpinnings of the study. The rest of the chapter is structured into four sections. This introductory section is followed by an overview of the WebQuest model, where the key attributes of a WebQuest and the theoretical foundations underlying WebQuests are addressed. Next, the chapter details the Information Literacy Framework for Hong Kong Students (EMB, 2005) by stating the key dimensions, IL standards and learning outcomes defined in the Framework. Subsequently, it sets forth the reasons for connecting WebQuest to information literacy instruction followed by reporting the research work related to WebQuest and information literacy. Lastly, a summary is given at the end of the chapter.

2.2 Overview of the WebQuest Model

The concept of WebQuest was initiated by Bernie Dodge and Tom March at San Diego State University in 1995. According to Dodge (1995), as an inquiry-based activity in which most or all of the information used by learners is drawn from the Web, the WebQuest model is designed to use learners' time well, to focus on using information rather than just looking for it, and to support learners' thinking at the levels of analysis, synthesis and evaluation. March (2003) further describes WebQuest as a scaffolded learning structure that uses links to essential resources on the World Wide Web and an authentic task to motivate students' 1) investigation of a central, open-ended question, 2) development of individual expertise, and 3) participation in a final group process that attempts to transform newly acquired information

into a more sophisticated understanding.

2.2.1 Key Attributes of WebQuests

Bailie and Ricardo (2000) sum up a WebQuest activity in the following way. At the beginning, students are assigned a task or mission that they have to complete according to a set of steps named *process*. The WebQuest contains specific links to sites, called *resources*, that contain relevant information. Such information often exists as primary sources that students need to use to complete the project. The task is usually a group project, requiring students to use higher order thinking skills, such as problem solving, to create a product which may be a multimedia presentation, a brochure, or a performance for parents or classmates. The assessment part, titled *evaluation*, of the WebQuest is accomplished by a rubric which describes the characteristics of various levels of achievement.

The critical attributes of a WebQuest include 1) *Introduction*: an introduction that sets the stage of the activity, 2) *Task*: a doable and interesting task, 3) *Process*: a clear process, guidance and organizational frameworks, 4) *Resources*: a set of information resources, 5) *Evaluation*: a rubric used to describe students' performances, and 6) *Conclusion*: a conclusion that provides reflection and closure, while some other non-critical attributes include group activities, motivational elements, and interdisciplinary approaches (Dodge, 1995).

A well-designed WebQuest involves students in using Web-based resources and tools to transform their learning into meaningful understandings and real-world projects (Lamb, 2004). Instead of spending substantial time on using search tools, most or all of the information used by students is found on pre-selected Web sites. Students are not merely surfing on the Web in an unsupervised fashion but rather are visiting sites the teacher has chosen. Such screening of sites not only ensures that the material is valuable but also addresses the concerns that teachers and parents may have about the appropriateness of content (Bailie & Ricardo, 2000). Students can therefore focus on using Web-based materials

to analyze, synthesize, and evaluate information to address high-level questions.

2.2.2 Theoretical Foundations Underlying WebQuests

The concept of WebQuest is rooted in a multifaceted collection of educational theories and popular practices. According to March (2003), well-designed WebQuests 1) promote dependable instructional practices by combining research-supported theories with effective use of essential Internet resources, 2) produce open-ended questions, and 3) offer authentic tasks that motivate students. Moreover, they allow students to develop expertise in a subject from within a situated learning environment and offer opportunities for transformative group work.

In a 10-year retrospective of WebQuests, Lamb and Teclehaimanot (2005) figure out that, as a learner-centered and project-based approach to teaching, WebQuests draw on a variety of areas, including constructivist philosophy (Dutt-Doner, Wilmer, Stevens & Hartmann, 2000; March, 2003), thinking, understanding, and transformational learning (Dudeney, 2003; Kelly, 2000; March, 2003; Tancock, 2002; Vidoni & Maddux, 2002), authenticity and situated learning environments (March, 2000; Marco, 2002; Peterson, Caverly & MacDonald, 2003; Snider & Foster, 2000; Tancock, 2002; Watson, 1999), inquiry-based learning (Dodge, 1995; Jakes, Pennington & Knodle, 2000; Lamb, Smith & Johnson, 1997), scaffolding (Chandler, 2003; Dodge, 2001; March, 2003), differentiation (Kelly, 2000; Milson, 2002), cooperative learning (Brucklacher & Gimbert, 1999; Milson & Downey, 2001; Perkins & McKnight, 2005), and motivation, challenge, and engaged learning (Kelly, 2000; Lipscomb, 2003; Marco, 2002; Perkins & McKnight, 2005; Tancock, 2002).

2.2.3 Present Condition of WebQuests

Since 1995, the WebQuest model has been incorporated into hundreds of education courses and staff development efforts around the globe (Dodge, 2001). It has evolved into a classroom phenomenon, used in both primary and secondary schools (Yoder, 2006). At the

same time, a number of efforts have been made to study this model by the research community (see Atchade, 2002; Chuo, 2004; Dobson, 2003; Frazee, 2004; Keengwe, 2006; Lewis, 2006; Lim, 2001; Reinhart, 1999; Roberts, 2005; Rozema, 2004; Solis, 2006; Swindell, 2006; Talamantes, 2006; Tsai, 2006; Wagman, 2005). However, as noted by Dodge (2007), the number of data-based studies in refereed journals is still small. Based upon their reviews and findings, Abbit and Ophus (2008), and Lamb and Teclehaimanot (2005) also note that few experimental research studies have been published demonstrating the impact of WebQuest on learning. Related research work on WebQuests is reported in Section 2.5 of this chapter.

WebQuest consists of a challenge, often to solve a real life problem or create an original project, using carefully selected Internet resources and specific parameters. Yoder (2004) points out that it is a kind of inquiry-based and constructivist activities, which can invigorate teaching and motivate students to take charge of their own learning, understand multiple perspectives, and develop high-level reasoning skills. Dodge, Molebash, Bell and Mason (2002) assert that the WebQuest model will continue to be an important component of inquiry-oriented learning and serve as an important component of Web learning.

2.3 Information Literacy for Hong Kong Students

According to the U.S. National Forum for Information Literacy, information literacy (IL) is defined as the ability to know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.

In the *IFLA/UNESCO School Library Guidelines 2002* (IFLA, 2002), information literate students are described as competent, independent learners. They know their information needs and actively engage in the world of ideas. They display confidence in their ability to solve problems and know what is relevant information. They manage technology tools to access information and communicate. They operate comfortably in situation where

there are multiple answers as well as those with no answers. They hold high standards for their work and create quality products. Information literate students are flexible, can adapt to change and are able to function independently and in groups (Doyle, 1992).

2.3.1 Information Literacy Framework

In 2005, an Information Literacy Framework for Hong Kong students (hereinafter referred to as the Framework) was formulated and proposed by the Education and Manpower Bureau of the Hong Kong Special Administrative Region. The following characteristics concerning information literacy are further described and summarized in the publication entitled *Information Literacy Framework for Hong Kong: Building the capacity of learning to learn in the information age* (EMB, 2005).

Information literacy is more than just information retrieval skills or IT skills. It is an ability, which is demonstrated in the process of turning information into meaning, understanding, and new ideas. This process would require learners to understand the rationale behind using information as well as actually knowing the exact procedures of conducting the information search. Emerging with the advent of information and communication technologies, the notion of information literacy has been shaping the way of how people perceive, process, use and create information. It is deemed to be pivotal to the pursuit of personal empowerment and recognized as a kind of lifelong learning skills essential for people to cope with the rapidly evolving changes in the era of information age, as well as an essential element of the emerging digital culture (EMB, 2005).

2.3.2 Key Dimensions of Learning

In the proposed framework for Hong Kong students, the information literacy standards, derived from a scrutiny of a set of representative information literacy frameworks developed in different regions, are classified into four key dimensions of learning accordingly: cognitive, meta-cognitive, affective and socio-cultural dimensions (EMB, 2005).

The cognitive dimension addresses the need to enable students to master the necessary skills to comprehend, locate, analyze, critically evaluate and synthesize information, and apply their knowledge to inform decisions and problem solving. The meta-cognitive dimension puts emphasis on developing students as reflective learners. The affective and socio-cultural dimensions address the need to enable students to appreciate and enjoy the process of inquiry, and to empower them with greater autonomy and social responsibility over the use of information in their individual as well as collaborative learning.

2.3.3 Standards and Learning Outcomes

In the Framework, a number of IL standards are defined in each dimension. Each standard is followed by several indicators that detail the descriptions of the standard and provide a guideline for the formulation of the expected learning outcomes of information literacy. Each indicator entails a set of learning outcomes that detail four levels of proficiency in a particular performance area in information literacy. Levels I, II, III and IV indicate respectively the expected IL learning outcomes for students at Junior Primary, Senior Primary, Junior Secondary and Senior Secondary.

A complete set of the IL standards defined in the Framework, together with their indicators and the corresponding learning outcomes (Level III) under each indicator, is presented in Appendix 1. For the ease of making reference to the standards and their learning outcomes in the rest of this dissertation, each of them is assigned a unique code to facilitate representation. A part of the appendix is extracted and shown in *Table 2.1* to help the illustration. For example, the codes for the four IL standards defined in the cognitive dimension are [ILC I], [ILC II], [ILC III], and [ILC IV] respectively. For [ILC I], the codes for the four learning outcomes (Level III) under the first indicator are [C1.1], [C1.2], [C1.3], and [C1.4] respectively, while the three learning outcomes (Level III) under the second indicator are labeled as [C2.1], [C2.2], and [C2.3] respectively.

Information Literacy Standard I (in the Cognitive Dimension): an information literate person is able to determine the extent of and locate the information needed. [ILC I]	
Indicators	Learning Outcomes (Level III)
An information literate person is able to frame appropriate questions based on information needs.	• formulate questions for research inquiry [C1.1]
	• describe and assess the strategies they use for reading, viewing, and listening for various purposes [C1.2]
	• use questioning, summarizing, skimming or scanning, and graphic organizers to accomplish specific purposes for reading, viewing, and listening [C1.3]
	• evaluate the purposes and ask the appropriate questions [C1.4]
An information literate person is able to determine the nature and scope of the information needed.	• construct mind-maps to frame research questions [C2.1]
	• scan to locate and understand self-selected information [C2.2]
	• skim to identify key concepts and arguments [C2.3]
… … …	• … … …
	• … … …

Table 2.1: Part of an IL Standard with its Indicators and Learning Outcomes

Dimension	Code of IL Standard	Codes of Learning Outcomes (Level III)
Cognitive	[ILC I]	[C1.1], [C1.2], [C1.3], [C1.4], [C2.1], [C2.2], [C2.3], [C3.1], [C3.2], [C3.3], [C3.4], [C3.5], [C3.6], [C3.7], [C4.1], [C4.2], [C4.3], [C5.1]
	[ILC II]	[C6.1], [C7.1]
	[ILC III]	[C8.1], [C8.2], [C8.3], [C9.1], [C9.2], [C10.1], [C11.1], [C12.1], [C12.2], [C12.3]
	[ILC IV]	[C13.1], [C13.2], [C13.3], [C13.4], [C14.1]
Meta-cognitive	[ILM I]	[M1.1], [M2.1], [M2.2]
	[ILM II]	[M3.1], [M3.2], [M4.1], [M4.2]
	[ILM III]	[M5.1], [M6.1], [M7.1], [M7.2]
Affective	[ILA I]	[A1.1], [A2.1], [A2.2]
	[ILA II]	[A3.1], [A4.1], [A4.2], [A5.1]
	[ILA III]	[A6.1], [A6.2], [A7.1], [A7.2], [A7.3]
Socio-cultural	[ILS]	[S1.1], [S2.1], [S3.1], [S4.1], [S4.2], [S4.3]

Table 2.2: Overview of the Codes of IL Standards and Learning Outcomes (Level III)

Altogether, there are eleven IL standards stated in the Framework, where four of them ([ILC I], [ILC II], [ILC III], and [ILC IV]) are grouped in the cognitive dimension, three ([ILM

I], [ILM II], and [ILM III]) are grouped in the meta-cognitive dimension, another three ([ILA I], [ILA II], and [ILA III]) are grouped in the affective dimension, and one IL standard ([ILS]) is defined in the socio-cultural dimension. There are a total of sixty four learning outcomes stated under the corresponding IL standards to describe Level III of proficiency (for Junior Secondary) in information literacy. *Table 2.2* presents an overview of the Framework by indicating the codes of the IL standards according to the four key dimensions of learning and summarizing the distribution of the sixty four learning outcomes (Level III) according to the eleven IL standards.

2.4 Linking WebQuest to Information Literacy

The WebQuest model is becoming a favored approach, moving resource-based learning into the electronic learning environment. According to Dodge (2000), the best WebQuests are those that take adult activities and scale them down to something that kids can do. In respect of information literacy, the best WebQuests would scaffold or structure students' learning to ensure they access, evaluate, and use appropriate information on the Web.

2.4.1 Exemplar for Practical Implementation

Together with the proposed Framework, a few exemplars for practical implementation of the information literacy elements in classroom teaching are also suggested (EMB, 2005). One of the suggested exemplars is a WebQuest, which targets for students at junior secondary level and serves as an exemplar of using information technology to train information skills. The WebQuest is centered on a real issue regarding drug abuse and youth. By utilizing inquiry-based learning and providing scaffolding, it offers students opportunities to search for, select, organize, and synthesize information through the completion of the task.

2.4.2 Hands-on Approach for Practice

In linking WebQuest with information literacy instruction, Blummer (2007) shares

similar view with the above exemplar by pointing out that WebQuests offer students a hands-on approach to practice their information skills on seemingly real-world problems. In general, WebQuests follow search strategies of gathering information, arranging information (selecting, interpreting, and organizing), and presenting findings (Peterson, Caverly & MacDonald, 2003), which parallels the theme of the Big6 for information literacy: define the task, create information seeking strategies, use information, and synthesize information (Darrow & MacDonald, 2004). Both tactics have students find and evaluate information for a topic, synthesize possible meanings of the information, and present their findings to other people.

2.4.3 Complement of Problem-solving

In addition to the use of Web information for inquiry, problem-solving is at the center of a good WebQuest, requiring students to assume roles in real-world examples of real-world problems (Gervasio & Nagler, 2004; March, 2003). Other authors also relate problem-solving to information literacy (Rodriguez, 2003). In a good WebQuest, students work collaboratively on problem-solving activities to identify the problem, generate possible solutions, analyze the solutions, and present the plan (DeVincentis & King, 2000). All these would increase the hands-on opportunities for students to practice their information skills. With the emphasis of information literacy in mind, Blummer (2007) discusses that problem-solving refers to the ability to identify a problem, analyze possible solutions, implement a plan, and present the solution. She argues that information literacy complements problem-solving and both concepts enhance the growth of skills that support lifelong learning. In this manner, WebQuest appears suited for information literacy instruction since its structured format complements the loosely organized steps associated with problem-solving (Blummer, 2007).

2.4.4 Empirical Example at Elementary Secondary Level

Because WebQuests are such versatile learning tools, they could probably be used in

virtually many curriculum areas. The information literacy instruction is thus no exception, and is perhaps more intuitively allied with WebQuest because of its inquiry-based and information-seeking nature. In a retrospective review of WebQuest, Lamb and Teclehaimanot (2005) state that, over the past decade, educators noticed how the WebQuest model could be applied to a variety of subject areas and theoretical approaches. In respect of information literacy, it is reported in their review that an early WebQuest titled "Nonprofit Prophets", by Tom March, was employed by Lamb, Smith, and Johnson (1997) as an example to reveal how this inquiry approach promoted information literacy at elementary secondary level through meaningful, engaging, and authentic project-based learning.

2.4.5 Correlations between WebQuests and IL Standards

In a discussion of incorporating WebQuests into library curriculum, Gervasio and Nagler (2004) compare Dodge's (1995) comment on WebQuests with three information literacy standards listed in the *Information Literacy Standards for Student Learning* (AASL, 1998), and identify several correlations. The three IL standards are listed below:

- Standard 1 – An information literate accesses information efficiently and effectively.
- Standard 2 – An information literate evaluates information critically and competently.
- Standard 3 – An information literate uses information accurately and creatively.

According to Dodge (1995), "WebQuests are designed to use learners' time well, to focus on using information rather than looking for it, and to support learners' thinking at the levels of analysis, synthesis, and evaluation".

With reference to the above comment, Gervasio and Nagler (2004) first consider that using time well equates to Standard 1, accessing information "efficiently and effectively". Next, they believe that focusing on the use of information relates to Standard 3, using information "accurately and creatively". Lastly, they point out that support for learners to use higher-order thinking skills such as analysis, synthesis and evaluation fits into all of the three

standards. In their conclusion, Gervasio and Nagler (2004) note that WebQuests could be the wave of the future for more involved information literacy instruction, providing students with more time to become acquainted with technology and use of information.

2.5 Related Work

Subsequent to the discussion of reasons supporting WebQuest for information literacy instruction, this section reviews the related work done by the research community. The first three parts of the section report notable research studies related to WebQuest, while the last two parts look at the instrument for assessing information literacy.

2.5.1 Thesis and Dissertation Work Related to WebQuest

As discussed in Chapter 1, the WebQuest model suffers from a lack of scholarly research which may impede practitioners interested in using this approach to design and deliver effective Web-enhanced instruction (Frazee, 2004). Likewise, Dodge (2007) notes that there are a number of graduate students world wide conducting research on the effectiveness of WebQuests but the number of data-based studies in refereed journals is still small.

To serve as a starting point for locating scholarly research related to WebQuests, Dodge (2007) establishes and maintains a page entitled "Research about WebQuests" at the portal Website, *WebQuest.Org*. The page gathers twelve doctoral theses and dissertations concerning WebQuests (see Chuo, 2004; Dobson, 2003; Frazee, 2004; Lim, 2001; Reinhart, 1999; Roberts, 2005; Rozema, 2004; Solis, 2006; Swindell, 2006; Talamantes, 2006; Tsai, 2005; Wagman, 2005). In addition to looking at the page maintained by Dodge (2007), the researcher searched for theses and dissertations at the ProQuest Dissertations & Theses Database as well. Abstract and title searches were conducted for the key words "WebQuest" and "Web Quest". As a result, fifteen doctoral theses and dissertations were found, where twelve of them were duplicate copies of those gathered by Dodge (2007) and three additional ones were found (see Atchade, 2002; Keengwe, 2006; Lewis, 2006).

Among the fifteen doctoral theses and dissertations, five of them were about the use of the WebQuest model for language teaching and learning (see Chuo, 2004; Dobson, 2003; Rozema, 2004; Talamantes, 2006; Tsai, 2005). Two were about the study of students' motivation and self-efficacy in Web-based instruction or Internet research project, such as WebQuests (see Reinhart, 1999; Wagman, 2005). Two were about the study of undergraduate students' perception of using computer-based projects, such as WebQuest, to improve learning (see Keengwe, 2006) and the study of distance learners' perception of learning computer technology through online instruction, such as WebQuest, (see Atchade, 2002) respectively. Two were about identifying the guidelines for designing online inquiry-based learning environment, such as WebQuest, for teacher development (see Lim, 2001) and the WebQuest design strategies for measuring the effect of the jigsaw method on students' engagement and learning (see Frazee, 2004) respectively. The others were about the study of using WebQuest activities with rural minority at-risk, middle grade students (see Swindell, 2006), the study of pre-service teachers' self-regulated learning upon completion of a WebQuest (see Lewis, 2006), the relationship between pre-service teachers' social learning style preferences and their role choices in a WebQuest activity (see Solis, 2006), and the study of pre-service teachers working individualistically and collaboratively during the creation of a WebQuest (see Roberts, 2005). After all, none of them was about the promotion of information literacy or the use of WebQuest for helping develop information skills.

2.5.2 A 10-Year Retrospective of WebQuests

In 2005, Lamb and Teclehaimanot compiled a chapter entitled "*A Decade of WebQuests: A Retrospective*" that was published in the 30th volume of the Education Media and Technology Yearbook. The chapter provides a retrospective examination of the first decade of the WebQuest model by addressing the theoretical foundations of WebQuests and tracing the evolution of the WebQuest phenomenon. It also explores the growing research base

associated with WebQuests.

In their chapter, Lamb and Teclehaimanot (2005) point out that a number of educators, like Orme and Monroe (2005), and Perkins and McKnight (2005), have identified the need for academic research on the use of WebQuests in teaching and learning. However, though educators have enthusiastically embraced the WebQuest concept based on its practical application of educational theory, few experimental research studies have been published demonstrating its impact on learning (Lamb & Teclehaimanot, 2005). Like what has been discussed in the above section, Dodge (2007) notes, as well, that the number of data-based studies on the effectiveness of WebQuests in refereed journals is still small.

The retrospective review also summarizes the major research work done in the first decade of the WebQuest model and suggests the directions for future research. Concerning the research work on WebQuests, Lamb and Teclehaimanot (2005) summarize that much of the research related to WebQuest applications has been in the forms of case studies and teachers' action research projects, like the work done by Delisio (2001) and Dunne (2000). They also point out that there is an increasing number of studies on the effectiveness of WebQuests as a tool for inquiry-based learning, like the work by Arbaugh, Scholten, and Essex (2001), Brucklacher and Gimbert (1999), Kelly (1999 & 2000), and Perkins and McKnight (2005). After examining studies in a wide range of grade levels and subject areas, Lamb and Teclehaimanot (2005) find that those studies have pointed to the success of WebQuest use in five areas, which are higher education (Peterson, Caverly & MacDonald, 2003; Pohan & Mathison, 1998), social studies (Milson, 2001b), mathematics (Orme & Monroe, 2005), English and language arts (Snider & Foster, 2000; Spanfelner, 2000; Tancock, 2002; Truett, 2001), and English as a second language (Marco, 2002).

Lamb and Teclehaimanot (2005) conclude the review by suggesting and discussing the needs for further research in two main categories. One is about the use of WebQuests for helping students develop three kinds of skills, including information skills, reading skills, and

writing and communication skills. Another one is the study of teachers' classroom management skills during the implementation of WebQuest activities, including management of different groups working at different speeds, management of computer use, difficulty in helping students when everyone has a computer, and balance between computer time and other activities.

2.5.3 A Review of Research on the Impacts of WebQuests

Later, in 2008, Abbit and Ophus published an article, entitled "*What We Know about the Impacts of WebQuests: A Review of Research*" at the AACE (Association for the Advancement of Computing in Education) Journal. They conducted a literature analysis by examining the body of research investigating the impacts of the WebQuest instructional strategy on teaching and learning. Their research process began with searching for published articles, theses, dissertations, and conference proceedings relating to the implementation of the WebQuest strategy at all levels of education. The search included sources in the Educational Resources Information Center (ERIC) database, EBSCO Academic Search Premier and Educational Research Complete databases, the Education and Information Technology (ED/IT) digital library, the Ohio Library and Information Network (OhioLINK), and the Google Scholar Internet search engine. Their initial search produced 114 published sources, where 108 of which were identified as being related to WebQuests. Of the 108 references, 58 were papers presented at conferences and 44 were reviewed or refereed articles. Two reports, two Web pages, and two theses were also included.

Abbit and Ophus (2008) classified all the articles into three categories: 1) an article described a research that was conducted involving WebQuests, 2) an article was primarily descriptive in nature and described the design, development, or implementation of a WebQuest, and 3) an article described the concept of a WebQuest in general or theoretical foundations concerning the use of WebQuests in education. As a result, they found that the

majority of the articles were descriptive in nature and were predominantly articles describing how WebQuests were used in a specific context. These articles were relevant to the secondary research goal of better understanding the context in which WebQuests were being implemented. Though some of these articles suggested practices and methods that would support the use of WebQuests in various learning contexts, they did not meet the selection criteria for identifying research-supported practices as they did not incorporate a research method. Among the 108 retrieved articles, only 41 of them described some type of formal research method and met the criteria for further review. The majority of the 41 articles were either empirical or evaluative studies. The rest were identified as case studies, action research, and qualitative methodologies.

Following the initial classification of each article, Abbit and Ophus (2008) further analyzed the 41 articles for impacts on teaching and learning as well as promising practices and recommendations for the implementation of the WebQuest instructional method that were supported by the research findings. In the second round of classification, Abbit and Ophus (2008) limited the review to those described a specific research process and design. As a result, 26 out of the 41 research articles met this criterion and the specific impacts on teaching and learning were identified. Abbit and Ophus (2008) grouped those impacts of WebQuests on teaching and learning described in the literature into three general categories: 1) attitudes and perceptions of learners, 2) impacts on learning content and skills, and 3) investigations of the cognitive requirements of WebQuests. The authors found that most prevalent among those research studies were investigations of the attitudes and perceptions of learners towards WebQuests.

In their research findings, Abbit and Ophus (2008) report that, for the first category (i.e. learners' perceptions of WebQuests), many of the studies compiled identified attitudes and perceptions that were generally positive towards WebQuests (see Carroll, Legg & Taylor, 2003; Fox, 1999; Gaskill, McNulty & Brooks, 2006; Santavenere, 2003), including impacts

on motivation, clarification of information, benefits of collaboration, and perceptions of technology skills.

In concluding the second category (i.e. impact on learning and achievement) with evidence on the work by Milson (2001a & 2002) and Strickland (2005), Abbit and Ophus (2008) note that the current body of research does not indicate that incorporating a WebQuest into an educational setting will lead directly to improved learning and achievement. There is a lack of research and evaluation efforts with regards to the impacts of the WebQuest instructional strategy specifically on learning and achievement.

For the third category (i.e. cognitive requirements of WebQuests), Abbit and Ophus (2008) report that the investigations of the cognitive requirements of WebQuest have largely focused on whether WebQuests promoted higher-order thinking and inquiry skills. Based primarily on the work by Kanuka, Rourke and Laflamme (2007) and Wentworth and Popham (2003), the two authors summarize their findings for the third category by pointing out that 1) WebQuests are more effective than some other activities at supporting a higher "cognitive presence", and 2) WebQuest activities, which focus more on problem-solving, are also more likely to exhibit characteristics of a critical thinking instructional activity. In following with their findings, the authors suggest that additional work needs to be done with the educators to focus WebQuest development on higher level thinking skills and problem solving.

In the conclusion of their review, Abbit and Ophus (2008) state that one overarching issue with what is known about the WebQuest strategy is the scarcity of research on the effects of this method on teaching and learning. In searching for published research on WebQuests, only 41 resources were found that included a research method. As the majority of resources located in the literature search were descriptive of a WebQuest activity, they once again support Milson's (2002) assertion by 1) concluding that most of our knowledge regarding the benefits of the WebQuest strategy comes from anecdotal accounts of how this strategy is being used, and 2) suggesting the needs for empirical research and studies on the

use of WebQuest in educational settings.

2.5.4 Instruments for Information Literacy Assessment

In addition to looking at the research work on WebQuests, there is another concern of the study. As introduced in Chapter 1, the major purpose of the study was to investigate how a series of WebQuests could help junior secondary students achieve a set of learning outcomes for information literacy. Therefore, assessment of student learning became a major concern of the study.

Prior to developing the Standardized Assessment of Information Literacy Skills (SAILS), O'Connor, Radcliff and Gedeon (2001) reviewed existing instruments for assessing information literacy. They searched the literature since 1980 for an instrument that could be used to assess students' information literacy longitudinally and across institutions. Upon finding no adequate existing instrument, they reviewed the literature for information that might assist them in the process of creating a new instrument.

According to their review, the literature on information literacy assessment falls into three distinct categories: 1) literature review articles that tend to describe the need for assessment and discuss the political and pragmatic barriers to library assessment, 2) theoretical articles that discuss the various types of assessment and describe the strengths of each type for evaluating library instruction, and 3) reports of assessment projects. As discussed by O'Connor, Radcliff, and Gedeon (2001), it is not difficult to find that most existing instruments for assessing information literacy are designed for particular standards defined in different information literacy frameworks or for specific teaching programs or learning activities. Like the project TRAILS (Tools for Real-time Assessment of Information Literacy Skills) funded by the Institute for Library and Information Literacy Education (ILILE), it is a knowledge assessment with multiple-choice questions targeting a variety of information skills based on sixth and ninth grade standards. The assessment items are based

on the information literacy components in the Ohio Academic Content Standards and aligned the Information Literacy Standards for Student Learning included in the publication entitled *Information Power: Building Partnerships for Learning* (AASL, 1998).

In 2008, UNESCO published a report entitled *Towards Information Literacy Indicators* that was prepared by Catts and Lau (2008). The report provides a basic conceptual framework for measuring information literacy and is designed to serve as a reference to facilitate the elaboration of information literacy indicators. A review of instruments for assessing information literacy is included in the report, in which Catts and Lau (2008) highlight three standardized information literacy measurement tools. One is the Standardized Assessment of Information Literacy Skills (SAILS) developed by a consortium of library scientists in the United States (see O'Connor, Radcliff & Gedeon, 2002; Salem & Radcliff, 2006). More recently, in 2008, the Education Testing Service (ETC), partnered with a consortium of institutions of higher education in the United States, has also released a computer-based test termed the iSkills Assessment. The third one is the Information Skills Survey (CAUL ISS) developed by the Council of Australian University Librarians (Catts, 2005).

In their report, Catts and Lau (2008) also compare the three measurement tools by discussing that SAILS, the CAUL ISS, and the iSkills Assessment provide an interesting comparison of how to measure information literacy. SAILS is a test of the knowledge of each respondent about information literacy based on the ACRL (Association of College and Research Libraries) Information Literacy Competency Standards for Higher Education (ALA, 2000). Thus, Catts and Lau (2008) point out that the tool measures only what people know about information literacy at a general level of abstraction, rather than what they actually do in practice. The CAUL ISS is a self-report inventory asking each respondent to describe what they do with information. It measures across Standards 2 to 6 defined in the Australian and New Zealand Information Literacy Framework (Bundy, 2004). The iSkills Assessment provides a simulated computer-based test of performance of IL skills in the digital

environment. Like SAILS, it tests a range of IL skills aligned with the ACRL Information Literacy Competency Standards for Higher Education (ALA, 2000). In their discussion, Catts and Lau (2008) note that, in an environment with ease of access to computers, it is feasible to adopt simulated performance which provides the most direct measure of information skills. In the absence of such environment, the self-report approach is likely to provide the best evidence of practice, as compared to knowledge about information literacy.

In short, lots of efforts by librarians and faculties have been put on devising measurement tools of information literacy, like tests, surveys, or rubrics. In the concluding paragraph of their review, Catts and Lau (2008) summarize that many of these tools 1) are designed for the higher education level (i.e. undergraduates at college or university level), and 2) target the broad standards defined in different information literacy frameworks developed in different regions. They also note that these tools are often of use to evaluate curricula because they are designed to assess the objectives of particular teaching programs or learning activities. This is in line with what O'Connor, Radcliff, and Gedeon (2001) discuss in their review.

2.5.5 Measurement Tools for the Hong Kong Framework

Concerning the local context of the study, since the proposition of the Information Literacy Framework for Hong Kong Students (EMB, 2005), there has been a lack of measurement tools for assessing the learning outcomes defined in the Framework.

Owing to the recent global trend in the development of information literacy, such as those developed by UNESCO in its recent publication entitled *Towards Information Literacy Indicators* (Catts & Lau, 2008), the Education Bureau (formerly known as the Education and Manpower Bureau) of the Hong Kong Special Administrative Region launched a project in 2009, one year before this dissertation was published. The Education Bureau invited local universities and research institutes to 1) develop evaluation tools suitable for use in local

schools for assessing students' information literacy based upon the Information Literacy Framework for Hong Kong Students (EMB, 2005), and 2) develop strategies or pedagogies that could enhance information literacy among students in local primary and secondary schools (see Appendix 2 for the cover page of the invitation). The investigation of the impact on students' information literacy when they were taught with the strategies or pedagogies developed was also required by the project.

In responding to the invitation, the Center for the Advancement of Information Technology in Education (CAITE) of the Chinese University of Hong Kong established a working group to work out a proposal for the project. The working group consisted of academics and practitioners, where the researcher was involved. To contribute the work of this study to the Hong Kong schools, especially for practical use, part of this dissertation work was embraced in the proposal submitted by CAITE, including a data collection tool (the post-test) used in the study and one of the WebQuests in the treatment. Details of the treatment and the data collection tools developed and employed in the study are delineated in the following two chapters.

2.6 Overview of the Literature Review

In this chapter, the related literature and research work are reviewed. A WebQuest includes six critical attributes: *Introduction*, *Task*, *Process*, *Resources*, *Evaluation*, and *Conclusion* (Dodge, 1995), while a well-designed WebQuest involves students in using Web-based resources and tools to transform their learning into meaningful understandings and real-world projects (Lamb, 2004). Lamb and Teclehaimanot (2005) figure out that, as a learner-centered and project-based approach to teaching, the concept of WebQuest is rooted in a multifaceted collection of educational theories and popular practices.

In 2005, an Information Literacy Framework for Hong Kong students was formulated and proposed by the Education and Manpower Bureau of the HKSAR (EMB, 2005). There

are eleven IL standards stated in the Framework and they are classified into four key dimensions of learning. In addition, there are a total of sixty four learning outcomes stated under the corresponding IL standards to describe Level III of proficiency (for Junior Secondary) in information literacy.

Since its proposition, there has been a lack of measurement tools for assessing the learning outcomes defined in the Framework. Accordingly, an instrument for assessing part of the learning outcomes was developed in this study. Concerning its implementation, WebQuest is an exemplar suggested together with the Framework for implementing its elements in classroom teaching (EMB, 2005). Blummer (2007) argues that WebQuests offer students a hands-on approach to practice their information skills. DeVincentis and King (2000), and March (2003) discuss the problem-solving nature of WebQuest, while other authors relate problem-solving to information literacy (Rodriguez, 2003). In a retrospective review (Lamb & Teclehaimanot, 2005), it is reported that an early WebQuest was employed as an example to reveal how such inquiry approach promoted information literacy at elementary secondary level (Lamb, Smith & Johnson, 1997). Blummer (2007) further suggests WebQuest as suited for information literacy instruction due to its structured format, which can complement the loosely organized steps associated with problem-solving.

Together with these reasons, WebQuest is deemed to be a practical, useful means for information literacy instruction. Therefore, in this study, the WebQuest model was employed as a means for helping students improve information literacy. Nevertheless, none of the doctoral theses and dissertations gathered by Dodge (2007) and found at the ProQuest Database was about the use of WebQuest for helping develop information literacy. In a 10-year retrospective of WebQuests and a review of research on WebQuests, Lamb and Teclehaimanot (2005), and Abbit and Ophus (2008) report that few experimental research studies have been published demonstrating the impact of WebQuest on learning. Lamb and Teclehaimanot (2005) suggest the needs for further research on 1) using WebQuests for

helping students develop three kinds of skills, including information skills, and 2) studying teachers' classroom management skills during the implementation of WebQuest activities. Likewise, Abbit and Ophus (2008) suggest the needs for empirical research and studies on the use of WebQuest in educational settings. In responding to their suggestions, this research would be an empirical study investigating whether using well-designed WebQuests could yield significant improvement in developing students' information skills.

Regarding the instruments for assessing information literacy, it is reported by O'Connor, Radcliff and Gedeon (2001) and, Catts and Lau (2008) in their reviews that most existing measurement tools are designed for the higher education level and target the broad standards defined in different information literacy frameworks developed in different regions. Many of them are often used to evaluate curricula because they are designed to assess the objectives of individual teaching programs or learning activities. One year before the publication of this dissertation, the Education Bureau of the HKSAR launched a project by inviting the local research community to develop 1) strategies or pedagogies for promoting information literacy among primary and secondary students and 2) evaluation tools for assessing students' information literacy based on the early proposed Framework (EMB, 2005). Part of this dissertation work was included in the proposal submitted by CAITE in responding to the government's invitation.

CHAPTER 3

DESIGN OF THE STUDY

3.1 Introduction

This chapter presents the design of the study, including the research question, research plan, instruments, and pilot study. At the beginning, the research question is stated. It is followed by describing the research plan. After that, the chapter delineates the instruments employed in the study, including the process of selecting and adapting the WebQuests in the treatment and the development of the instruments for measuring the learning effects of the treatment. Lastly, particulars of the pilot study, as well as its results, are reported.

3.2 Research Question

It has been reported in Chapter 1 that this research was intended to act as an empirical study for verifying the theoretical assertions suggesting that, in general, WebQuest appeared useful for helping improve information literacy (see Section 1.4). In line with the primary purpose of the study, the following research question was formulated and developed to form the basis of the study.

> *Do WebQuests yield significant improvement in developing students' information skills?*

In particular, with respect to the research question stated above, the study sought to investigate whether using a set of WebQuests could yield significant improvement in helping students develop their information skills, so as to help junior secondary students achieve a set of specific learning outcomes (Level III) defined in the cognitive dimension of the Information Literacy Framework for Hong Kong Students (EMB, 2005).

3.3 Research Plan

To carry out the study, the WebQuest model was employed as a means for helping students improve information literacy. In practice, four WebQuests were carefully designed or adapted from those available at online collections to construct an instrument that would help students develop and practice their information skills. Subsequent to the implementation of the instrument, the effects of using the WebQuests on the improvement of students' information literacy, which referred to students' achievement of the target learning outcomes, were measured (Tsui & Lee, 2008), so as to answer the research question.

3.3.1 Intended Participants

The study was designed to be conducted in a secondary school in Hong Kong lasting for about eight 6-day school cycles or three months. The intended participants of the study were the junior students in the school as the research question was to study the learning effects of using the WebQuests on their improvement of information literacy.

3.3.2 Data Collection

The study would employ a variety of data collection methods, including pre-test and post-test, analysis of student work, and interview with students for gathering evidence.

Prior to the implementation of the WebQuests, a pre-test, which was designed to assess the target learning outcomes defined in the Information Literacy Framework for Hong Kong Students (EMB, 2005), would be administered to all participants. Besides, a group of experts on WebQuest were invited to review the design of the WebQuests in order to ensure the quality and appropriateness of the instrument.

During the implementation, video recording and screen recording would be used to record the physical activities and the computer operations respectively of five groups of students. The recording was not a primary part of the data collection. It only served as a kind of supplementary data source for corroborating part of students' interview responses.

Subsequent to the implementation, a post-test, which was similar to the pre-test in nature but different in theme, would be administered to all participants. Besides, the work completed by the participants during the WebQuest activities, such as reports and presentation documents, would be analyzed for a reference to part of the findings from the tests. An interview would also be conducted with the five groups of students for gathering information regarding their actual practice and what they had learned throughout the WebQuests.

The qualitative data gathered in the study would help to supplement the quantitative results of the test scores. In particular, the interview data would be used to explore the possible reasons that led to the results, whatever good or bad learning effects were produced.

The figure below presents an overview of the data collection methods that would be employed in the study.

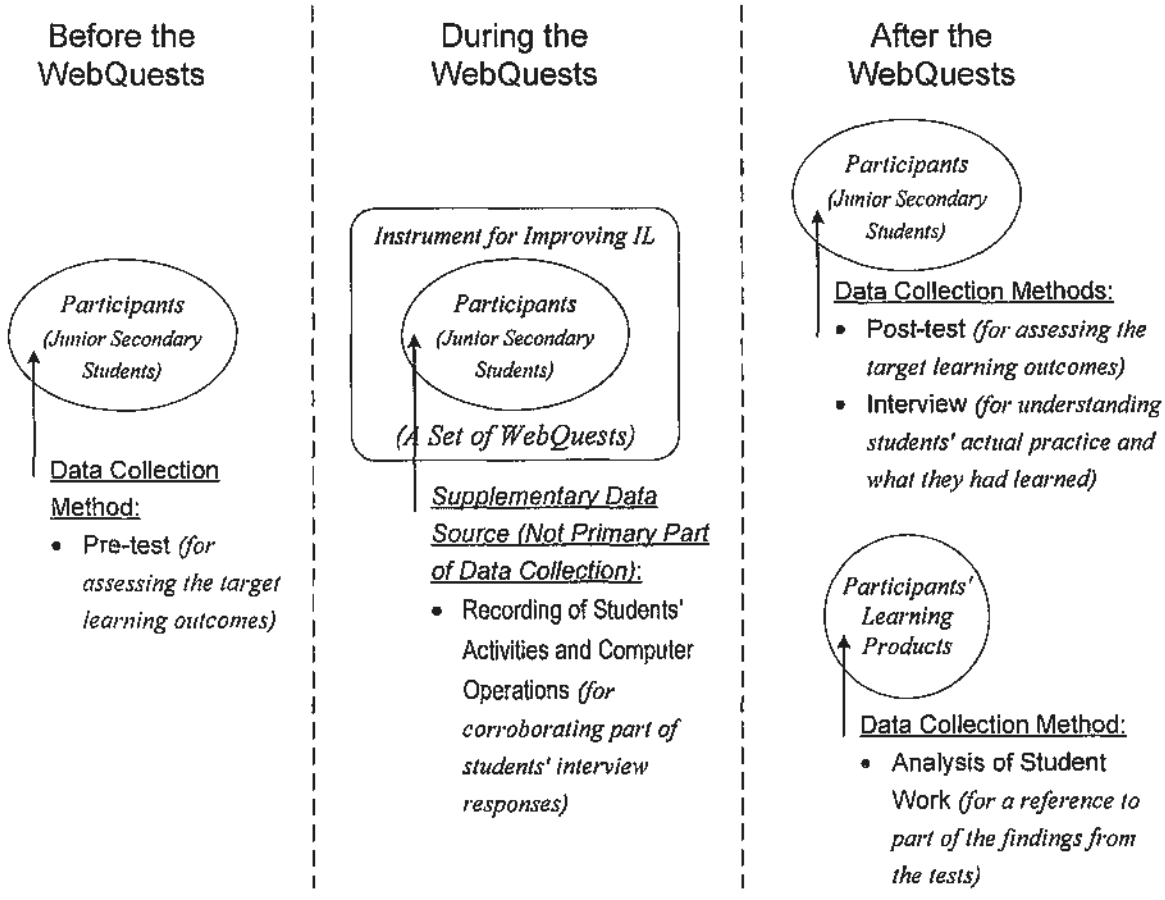


Figure 3.1: Overview of Data Collection Methods

3.4 Instruments

Subsequent to providing an overview of the study, this section delineates the instruments employed in the study. There were two types of instruments developed in the present study. One was the instrument for helping students improve information literacy. In practice, the instrument was in the form of four WebQuests. Another type of instruments was for measuring the learning effects of using the WebQuests, including a pre-test and a post-test, together with four rubrics. Development of the two types of instruments is described below.

3.4.1 Instruments for Improving Information Literacy

First, the instrument for helping students improve information literacy and its quality assurance are concerned. It has been discussed in Chapter 2 that there were discussions and theoretical assertions suggesting WebQuest as a useful tool for the improvement of information literacy (see Section 2.4).

In brief, WebQuest is an exemplar suggested together with the Information Literacy Framework for Hong Kong Students (EMB, 2005) for classroom implementation of the elements defined in the Framework. Concerning theoretical assertions, Blummer (2007) argues that WebQuests offer students a hands-on approach to practice their information skills. DeVincentis and King (2000), and March (2003) discuss the problem-solving nature of WebQuest, while other authors relate problem-solving to information literacy (Rodriguez, 2003). As a concluding remark, Blummer (2007) further suggests WebQuest as suited for information literacy instruction due to its structured format, which can complement the loosely organized steps associated with problem-solving.

Owing to these discussions and suggestions, the WebQuest model was chosen as a tool for the development of an instrument that aimed at practically helping students improve information literacy. The instrument consisted of four short-term WebQuests (denoted by *WQ1*, *WQ2*, *WQ3*, and *WQ4*). Among the four, three of them (*WQ1*, *WQ2*, and *WQ4*) were selected from those available at a variety of online collections. The selected WebQuests were

further adapted in accordance with the level of junior secondary students. The selection and adaptation were the collaborative work of the researcher and a group of experienced teachers. The other WebQuest (*WQ3*) was initiated and designed by the same group of people.

3.4.1.1 Learning Outcomes to be achieved by using the WebQuests

The instrument aimed to help junior secondary students achieve five specific learning outcomes (Level III) stated under two target IL standards ([ILC II] & [ILC III]) in the Information Literacy Framework for Hong Kong Students (EMB, 2005). It has been reported in the previous chapter that there are eleven 11 IL standards defined in the Framework with a total of a total of 64 learning outcomes stated under the corresponding standards to describe Level III of proficiency (for Junior Secondary) in information literacy (see Section 2.3).

The table below presents 1) the two IL standards that the study focused on and 2) the five learning outcomes (Level III) that were expected to be achieved by students through the WebQuests. Details of how each WebQuest could help achieve the target learning outcomes are given in the following sub-sections.

Target IL Standard of the Study	Indicator under Target IL Standard	Expected Learning Outcomes (Level III) to be Achieved by the WebQuests
Information Literacy Standard II in the Cognitive Dimension: • An information literate person is able to apply information to problem-solving and decision making. [ILC II]	• An information literate person is able to apply information to inform decisions.	• make judgments and draw conclusions from research to solve problems [C6.1]
	• An information literate person is able to apply information in critical thinking and problem solving.	• draw conclusion from the information collected and apply the knowledge to solve problems of similar nature [C7.1]
Information Literacy Standard III in the Cognitive Dimension: An information literate person is able to analyze the collected information	• An information literate person is able to record, categorize and manage the information and its sources.	• use multiple keywords or phrases to label information; categorize and connect the concepts derived from information [C8.1] • integrate the agreement and disagreement among sources [C8.2]

and construct new concepts or understandings. [ILC III]	• An information literate person is able to make inferences, connections, and draw conclusions.	• make inferences and simple generalizations from the evidence collected [C11.1]

Table 3.1: Summary of IL Standards and Learning Outcomes to be achieved through the WebQuests

3.4.1.2 Selection and Adaptation of the WebQuests

As mentioned previously, the instrument for helping improve information literacy consisted of four short-term WebQuests. Each of them was expected to be completed in no more than three 70-minute class periods.

Dodge (2002a) discusses the difficulty of creating a WebQuest from scratch. It might seem like a daunting task and takes a certain level of technical skill, familiarity with the subject matter, and time to round up appropriate links. Thus, he suggests that educators could take advantage of thousands of the existing WebQuests that others have done already.

Among the four WebQuests used in the study, *WQ3* (see Appendix 7) was initiated and designed by the researcher together with three experienced teachers, while the other three (*WQ1*, *WQ2*, and *WQ4*) were found and selected from the online WebQuest resources, including:

- the WebQuest database hosted by San Diego State University at "http://www.webquest.org/search/index.php",
- the WebQuest database hosted by Tom March's Website, entitled *BestWebQuests.com*, at "http://www.bestwebquests.com/",
- the WebQuest matrix hosted by the Web portal, entitled *Zunal.Com*, at "http://www.zunal.com/matrix.php",
- the WebQuest matrix hosted by Alice Christie's Website, entitled *AliceChristie.org*, at "http://www.alicechristie.org/edtech/wq/matrix/index.html", and
- the collection of WebQuests hosted by the University of Richmond at "http://oncampus.richmond.edu/academics/education/projects/".

A) Background of the WebQuest Designers

The selection of the WebQuests was the collaborative work of three experienced teachers, namely *Teacher T*, *Teacher W*, and *Teacher L*, together with the researcher. The three teachers were all master's degree holders in the Education field and each of them had more than fifteen years teaching experience in secondary schools.

Teacher T held a Master of Education degree from a Hong Kong university. He was the vice-principal, the chairman of the Academic Board, a mathematics teacher and a computer teacher of a secondary school.

Teacher W held a Master of Education degree from a Hong Kong university. He was the chairman of the Moral Education Board, the chairman of the (Junior) Integrated Humanities (I.H.) Panel, the coordinator of Project Learning, an I.H. teacher, and a design and technology teacher of the same secondary school.

Teacher L held a Master of Arts degree in I.T. in Education from a Hong Kong university. He was the chairman of the Information Technology Board, the chairman of the (Senior) Integrated Humanities Panel, an I.H. teacher, and a history teacher of the same secondary school.

The researcher held a Master of Philosophy (M.Phil.) degree in Computer Science from a Hong Kong university. His M.Phil. research was about the design and implementation of a Web-based cooperative school information system (Tsui, 1999). He had ten years teaching experience in the same school as the three experienced teachers. He was the I.T. Coordinator, the Network Manager, the Systems Administrator and a computer teacher of the school. He taught the Computer subject for three S.1 classes, three S.2 classes, three S.3 classes, and the Information Technology subject for two S.4 classes and two S.5 classes. He was familiar with the Computer subject curriculum for all levels of the school.

B) First Round of the Selection

Prior to the selection, the researcher conducted a meeting concerning the topics of the

four WebQuests with the three teachers. After discussion, it was agreed by all of them that the four WebQuests would be related to a broad theme – human and environment, in order to provide a kind of multidisciplinary learning experience to students.

There were two rounds in the selection of the WebQuests. In the first round, the researcher browsed the online collections mentioned above. In each collection, he examined all the WebQuests in the relevant categories for appropriate levels.

For the WebQuest database hosted by San Diego State University, the researcher examined 97 WebQuests in the category "Science" for Grades 6-8 and 105 WebQuests in the category "Social Studies" for Grades 6-8.

For the WebQuest database hosted by Tom March's Website, the researcher examined 22 WebQuests in the category "History and Social Studies" for middle level, 13 WebQuests in the category "Science" for middle level, and 8 WebQuests in the category "Interdisciplinary" for middle level.

For the WebQuest matrix hosted by the Web portal entitled *Zunal.Com*, the researcher examined 53 WebQuests in the category "Science" for Grades 6-8 and 86 WebQuests in the category "Social Studies" for Grades 6-8.

For the WebQuest matrix hosted by Alice Christie's Website, the researcher examined 35 WebQuests in the category "Social Studies" for middle level, 22 WebQuests in the category "Science" for middle level, and 24 WebQuests in the category "Cross Curricular" for middle level.

For the collection of WebQuests hosted by the University of Richmond, the researcher examined 27 WebQuests in the category "Social Studies" for middle level and 21 WebQuests in the category "Science" for middle level.

Table 3.2 summarizes the WebQuests examined by the researcher in the first round of the selection.

	Category / Content Area			
	Social Studies	Science	Interdisciplinary	Cross Curricular
WebQuest database hosted by San Diego State University	105 (Grades 6-8)	97 (Grades 6-8)		
WebQuest database hosted by Tom March's Website	22 (middle level)	13 (middle level)	8 (middle level)	
WebQuest matrix hosted by the Web portal entitled *Zunal.Com*	86 (Grades 6-8)	53 (Grades 6-8)		
WebQuest matrix hosted by Alice Christie's Website	35 (middle level)	22 (middle level)		24 (middle level)
Collection of WebQuests hosted by the University of Richmond	27 (middle level)	21 (middle level)		

Table 3.2: Summary of the WebQuests Examined by the Researcher in the First Round of Selection

Although there are thousands of WebQuests online, a number of them are not good and real WebQuests (March, 2003). The characteristics of real WebQuests are discussed in the subsequent part of this section. In general, the selection was determined by whether the WebQuest addressed an open issue being related to the theme "human and environment" and offered an authentic task for students. It was also not desired even if a relevant open issue was addressed in a WebQuest but it was specific to the local context of a particular foreign country or city.

In addition to addressing an open issue and offering an authentic task, it was important that the WebQuest allowed students to work in groups by assuming different roles or perspectives, and provided opportunities for students to use authentic information on the Web for analysis, synthesis, and evaluation. It was desired if a WebQuest provided four different roles or perspectives as the students would work in groups of four. However, most of the WebQuests examined by the researcher only allowed students to work in groups of three by assuming three different roles or perspective.

Upon completion of preliminary examination, thirteen WebQuests were selected by the researcher from the above online collections. Two of them were selected from the WebQuest database hosted by San Diego State University. They were entitled "Heat Transfer and El Nino" and "Paper or Plastic?". Three WebQuests were selected from the WebQuest database hosted by Tom March's Website. They were entitled "What Makes Someone Great?", "Dolphin-Safe Tuna?", and "Rainforest Vacations?". Two WebQuests were selected from the WebQuest matrix hosted by the Web portal entitled *Zunal.Com*. They were entitled "Healthiest Fast Food" and "Project Global Weather - Weather Patterns". Six WebQuests were selected from the collection of WebQuests hosted by the University of Richmond, they were entitled "Living With Disaster", "Quake, Rattle, and Roll", "The Heat is On", "Dr. Green's Rainforest Mystery", "When Disaster Strikes!", and "Journey Back in Time to Ancient Rome!". Among the thirteen selected WebQuests, none of them was from the WebQuest matrix hosted by Alice Christie's Website.

The table below summarizes the sources and titles of the WebQuests selected by the researcher in the first round.

Online Collection	Title and URL of Selected WebQuest
WebQuest database hosted by San Diego State University	WebQuest Title: Heat Transfer and El Nino URL: http://projects.edtech.sandi.net/roosevelt/elnino/studentelnino.html (Retrieved August 8, 2007)
	WebQuest Title: Paper or Plastic? URL: http://oncampus.richmond.edu/academics/education/projects/webquests/paper/ (Retrieved August 8, 2007)
WebQuest database hosted by Tom March's Website	WebQuest Title: What Makes Someone Great? URL: http://www.vickiwright.com/wq/index.htm (Retrieved August 8, 2007)
	WebQuest Title: Dolphin-Safe Tuna? URL: http://oncampus.richmond.edu/academics/education/projects/webquests/dolphins/ (Retrieved August 8, 2007)
	WebQuest Title: Rainforest Vacations? URL: http://oncampus.richmond.edu/academics/education/projects/webquests/rainforest/ (Retrieved August 8, 2007)

WebQuest matrix hosted by the Web portal entitled *Zunal.Com*	WebQuest Title: Healthiest Fast Food URL: http://www.amphi.com/~psteffen/cheeseburger/index.htm (Retrieved August 8, 2007)
	WebQuest Title: Project Global Weather - Weather Patterns URL: http://zunal.com/webquest.php?user=696 (Retrieved August 8, 2007)
Collection of WebQuests hosted by the University of Richmond	WebQuest Title: Living With Disaster URL: http://oncampus.richmond.edu/academics/education/projects/webquests/disaster/ (Retrieved August 8, 2007)
	WebQuest Title: Quake, Rattle, and Roll URL: http://oncampus.richmond.edu/academics/education/projects/webquests/quake/ (Retrieved August 8, 2007)
	WebQuest Title: The Heat is On URL: http://oncampus.richmond.edu/academics/education/projects/webquests/global/ (Retrieved August 8, 2007)
	WebQuest Title: Dr. Green's Rainforest Mystery URL: http://oncampus.richmond.edu/academics/education/projects/webquests/drgreen/ (Retrieved August 8, 2007)
	WebQuest Title: When Disaster Strikes! URL: http://oncampus.richmond.edu/academics/education/projects/webquests/tornado/ (Retrieved August 8, 2007)
	WebQuest Title: Journey Back in Time to Ancient Rome! URL: http://oncampus.richmond.edu/academics/education/projects/webquests/rome/ (Retrieved August 8, 2007)

Table 3.3: Summary of the WebQuests Selected by the Researcher in the First Round of Selection

C) Second Round of the Selection

In the second round of the selection, the thirteen selected WebQuests were further examined by the researcher together with the three experienced teachers. After that, three of them, entitled "The Heat is On", "Paper or Plastic?", and "Healthiest Fast Food", were selected finally to be used in the study, while the others were rejected with the main reasons given below.

First, for the WebQuest entitled "Heat Transfer and El Nino", although it was related to the theme "human and environment", it failed to offer an authentic task for students and the text described in the *Task* section was solely about the procedure for completing the learning product. Thus, the researcher decided to reject this WebQuest as it was expected that much

time would be spent on adapting or modifying it. The decision was agreed by the three teachers.

Second, for the WebQuest entitled "What Makes Someone Great?", although it allowed students to work in groups of four by providing four different roles, the content to be studied by students was considered too specific to the U.S. context. Thus, it was suggested by *Teacher L* to reject this WebQuest and there was no objection from the other two teachers and the researcher.

Third, for the WebQuest entitled "Dolphin-Safe Tuna?", although it offered a doable and interesting task for students and its topic was related to the theme "human and environment", it allowed students to work in groups of three by providing only three different roles. It was agreed by the researcher and the three teachers that there was difficulty to construct the fourth role according to the design and the context of that WebQuest. Thus, it was rejected.

Fourth, the WebQuest entitled "Rainforest Vacations?" was regarded as a good one. It not only offered an interesting task but also provided four different roles for students. However, the WebQuest required students to study the plants, animals, and native people in a rainforest in depth. It was suggested by *Teacher T* that such content for learning was not close to the theme as decided. Thus, *Teacher T* suggested reserving this WebQuest for spare use and such suggestion was accepted by the other two teachers and the researcher.

Fifth, for the WebQuest entitled "Project Global Weather - Weather Patterns", although it addressed an open issue being related to the theme "human and environment" and provided four different roles to students, the roles failed to allow students to explore the open issue from different perspectives but simply allocating different work, like completing a worksheet or designing a presentation, for the group members. In addition, there were no pre-selected Web resources provided in the WebQuest. Thus, it was rejected with no objection.

Sixth, similar to the WebQuest entitled "Dolphin-Safe Tuna?", the WebQuest entitled "Living With Disaster" offered a doable and interesting task for students and its topic was

also related to the theme as decided. However, it provided only three different roles for students and it was again agreed by the researcher and the three teachers that there was difficulty to construct the fourth role according to the design and the context of that WebQuest. Thus, it was rejected as well.

Seventh, for the WebQuest entitled "Quake, Rattle, and Roll", although it was designed with four different roles for studying an environmental issue from four different perspectives, the *Process* section of the WebQuest lacked support and guidance for helping students complete the task. It was expected that it would take time for the teachers and the researcher to redesign the *Process* section in order to provide scaffolding. Thus, *Teacher K* suggested reserving this WebQuest for spare use with no objection from the others.

Eighth, similar to the WebQuest entitled "Rainforest Vacations?", the WebQuest entitled "Dr. Green's Rainforest Mystery" offered an interesting task and provided guidance and support for students to explore the animals and plants in the tropical rainforests. It was again suggested by *Teacher T* that the content was not close to the theme as decided. In addition, the WebQuest was designed with only three different roles for students. Thus, *Teacher T* suggested reserving the WebQuest for spare use with no objection from the others.

Ninth, for the WebQuest entitled "When Disaster Strikes!", although it offered a doable task and provided four different roles of experts for students, there were no pre-selected Web materials for each role to study the issue according to his/her expert field. Thus, the researcher decided to reject this WebQuest as it was expected that much time would be spent on searching for appropriate Web materials for the four experts in the WebQuest. The decision was agreed by the three teachers.

Last, the WebQuest entitled "Journey Back in Time to Ancient Rome!" was regarded as a good one. It not only offered a challenging task but also provided four different roles for students. Besides, each role was provided with a set of specific Web materials and guiding questions for a student to explore the issue according to his/her perspective. However, most

of the pre-selected Web materials, for each role, were either expired or inaccessible. Thus, *Teacher L* suggested reserving the WebQuest for spare use with no objection from the others.

The table below summarizes the WebQuests rejected in the second round of selection and the major reasons for rejecting them.

Title of WebQuest Rejected	Major Reasons for Rejection
Heat Transfer and El Nino	• It failed to offer an authentic task for students. • The *Task* section described solely the procedure for completing the learning product.
What Makes Someone Great?	• The content to be studied by students was considered too specific to the U.S. context.
Dolphin-Safe Tuna?	• It allowed students to work in groups of three by providing only three different roles. • There was difficulty to construct the fourth role according to the design and the context of that WebQuest.
Rainforest Vacations?	• The content for learning was not close to the theme as decided.
Project Global Weather - Weather Patterns	• The roles failed to allow students to explore the open issue from different perspectives but simply division of work. • There were no pre-selected Web resources provided in the WebQuest.
Living With Disaster	• It allowed students to work in groups of three by providing only three different roles. • There was difficulty to construct the fourth role according to the design and the context of that WebQuest.
Quake, Rattle, and Roll	• The *Process* section of the WebQuest lacked support and guidance for helping students complete the task.
Dr. Green's Rainforest Mystery	• The content for learning was not close to the theme as decided. • It allowed students to work in groups of three by providing only three different roles.
When Disaster Strikes!	• There were no pre-selected Web materials for each role to study the issue according to his/her expert field.
Journey Back in Time to Ancient Rome!	• Most of the pre-selected Web materials provided for each of the four roles were either expired or inaccessible.

Table 3.4: Summary of the WebQuests Rejected in the Second Round of Selection

As mentioned, upon completion of the second round of selection, three WebQuests (*WQ1*, *WQ2*, and *WQ4*) were selected finally as part of the instrument. In particular, *WQ1*

was selected as it addressed a significant topic, global warming, for students to have inquiry activities in a multidisciplinary setting. Its task was challenging and doable, in which students would be treated as experts in four different areas. It also required synthesis of multiple sources of information provided by the U.S. Environmental Protection Agency, the University of Virginia Climatology Office, the U.S. Global Change Research Information Office, the United Nations Environment Program, etc. The four major steps in the *Process* section were clearly stated.

Like *WQ1*, *WQ2* addressed a real-life issue, using paper or plastic bags, for students to have exploration in a multidisciplinary setting. Its task was interesting that allowed students to discuss and debate based upon four different perspectives, which were clearly defined, and using different sources of information. The four major phases in the *Process* section were also clearly stated.

Like the previously selected ones, *WQ4* was selected as it addressed a real-life issue, healthiest fast food, that was related to students' eating habits. Thus, students might find interest in the task, which required the use of electronic spreadsheet for analyzing data collected from some online tools. For each of *WQ1*, *WQ2*, and *WQ4*, the criteria for success were clearly stated using qualitative descriptors in the form of a rubric.

In addition to the quality of the WebQuests, curriculum organization was another concern for the selection. *WQ1*, *WQ2*, and *WQ4* were selected as they were all short-term WebQuests. In such case, they could be integrated into the existing school curriculum with ease. Second, as the set of WebQuests would be implemented in the Computer subject of S.2 classes, it would be part of the subject curriculum of the case school. Therefore, the curriculum content and the difficult level of the tasks were also taken into account for the selection.

As mentioned, the set of WebQuests would be part of the S.2 Computer curriculum. It would last for about eight school cycles. Details of the implementation of the instrument are

reported in the subsequent chapter (see Section 4.2). Prior to the introduction of WebQuests, the original subject curriculum for that period was about teaching two application software packages: presentation software and electronic spreadsheet. The three WebQuests were selected as two of them required the use of presentation software to create the learning products, while the other required the use of electronic spreadsheet for data comparison and graphing. As a result, these WebQuests could fit the original subject curriculum by providing students with learning experience in using the software packages through authentic, meaningful activities. Furthermore, the researcher and the three experienced teachers, who were also the S.2 computer teachers of the school, considered the tasks of *WQ1*, *WQ2*, and *WQ4* appropriate and doable, in terms of difficulty, for the S.2 students in the school.

D) Adaptation of the Selected WebQuests

The three selected WebQuests were further adapted and modified in accordance with the level of the target group of students. The adaptation and modification were again the collaborative work of the researcher and the group of experienced teachers.

Generally, the three WebQuests were modified by:

- redesigning the *Task* section in order to fit the local context of the intended participants,
- modifying/redesigning the *Process* section in order to better facilitate and scaffold student learning,
- adjusting the task according to the objectives of the school curriculum,
- adjusting the vocabulary according to the intended participants' English level,
- updating the expired links and adding some appropriate links that would help students complete the *Process* section, and
- revising and refining the rubrics in correspondence with the learning products required.

Particularly, the changes discussed below were made to *WQ1* for adaptation. In the *Introduction* section, the Chinese term for global warming was added next to the English term for helping students understand its meaning and highlighting the topic of the WebQuest.

In the *Task* section, there were two minor changes. First, in the first paragraph, the term "*the President*" was replaced by "*the President of the United States*" in order to let students know the context of the task. Next, the original WebQuest required students to 1) prepare an informative brochure and 2) present the brochure during the classroom environmental forum. As the classroom setting of the intended participants was different from that described in the original WebQuest, this part was changed to requiring students to 1) prepare an informative presentation using PowerPoint and 2) give the presentation in front of the class.

In the *Process* section, similarly, the use of the term "*the President*" was changed to "*the President of the United States*" and the appearance of the term "*brochure*" was changed to "*presentation*", "*PowerPoint document*" or "*group work*". The Chinese name of each role was added next to the English term for helping students understand its meaning and highlighting the role's focus. As the required learning product was changed from a brochure to a presentation, its requirements were changed from "*this brochure must be colorful and creative, including cover page, one page that reflects each role, one picture that supports each role, credits page*" to "*the presentation should be attractive, including cover slide, at least one slide that reflects each role, at least one picture that supports each role, credits slide*". In order to offer opportunities for synthesizing information brought by the different roles, two additional requirements were added to the learning product, asking each group to include their conclusion on the issue based on their findings and to make suggestions for improvement.

There were also changes in the role-specific pages. In the page for the Climate Consultant, the links to "The U.S. Environmental Protection Agency Climate Change Kids Site", "One World.net's Kid Channel", and "The U.S. Environmental Protection Agency about Climate Change" were expired. They were fixed and updated. An additional link to a Web page, entitled "Hong Kong's Climate – What does the future hold?" and hosted by the Hong Kong Observatory, was added to that page for providing information regarding local

climate to the role. In the page for the Impact Consultant, the links to "The U.S. Environmental Protection Agency Climate Change Kids Site" and "The U.S. Environmental Protection Agency about Climate Change" were expired. They were fixed and updated. The links to "The A.R.M. Education Center" and "The Government of Canada Climate Change" were also expired and they were removed from the page. Two additional links to the Web pages, entitled "What is Global Climate Change? What are its Impacts?" and "How is Hong Kong affected?", were added to the page for the Impact Consultant. Both of the newly added Web pages were hosted by the Hong Kong Observatory for providing information regarding local impacts to the role. In the page for the Emission Consultant, the Chinese terms for deforestation, fossil fuels, greenhouse, and greenhouse effect were added next to the English terms for helping the role understand their meaning and highlighting some key words. Besides, the links to "The U.S. Environmental Protection Agency Kids Site", "The U.S. Environmental Protection Agency about Climate Change", and "Climate Change – Greenhouse Gas Emissions | Individual Emissions" were expired. They were fixed and updated. The link to "Introduction to Climate Change" hosted by the Website "www.climateark.org" was also expired and it was replaced by another Web page entitled "Vital Climate Graphics: Introduction to Climate Change" and hosted by the Website "www.grida.no". An additional link to a Web page, entitled "Climate Change" and hosted by the Hong Kong Observatory, was added to that page for providing information regarding local effects to the role. In the page for the Action Consultant, the Chinese terms for fossil fuels and politicians were added next to the English terms for helping the role understand their meaning and highlighting some key words. Besides, the links to "The U.S. Environmental Protection Agency Climate Change Kids Site", "EcoIQ Magazine Opinion: Earth Day Clean Energy Agenda", "World Wildlife Fund: Climate Change", "World Wildlife Fund: What You Can Do", and "World Wildlife Fund: Solutions" were expired. They were fixed and updated.

In the *Evaluation* and the *Conclusion* sections, the term "*brochure*" was changed to "*PowerPoint document*" or "*PowerPoint presentation*". Appendix 3 shows all the screenshots of the original WebQuest, while Appendix 4 shows those of the modified WebQuest (i.e. *WQ1*).

In addition to modifying the contents of the five sections mentioned above, five extra links were added to the left frame of the WebQuest page. To facilitate retrieval of the role specific pages, a link to the particular page for each role was added to the left frame of the WebQuest page under the link to the *Process* section. Besides, in order to help students understand any English words they might encounter while reading the WebQuest page or the Web materials, a link to an online dictionary (Yahoo Dictionary) was added to the left frame of the WebQuest page. To encourage students looking for and reading extra information, *Teacher T* suggested adding a link to Wikipedia to the left frame of the WebQuest page as well. The link was subsequently removed based on the findings of the pilot study. Particulars of the pilot study are discussed in the subsequent section of this chapter (see Section 3.5). *Figure 3.2* shows the left frame of the original WebQuest page, while *Figure 3.3* shows that of the modified page (*WQ1*), where there are four direct links to the specific pages for the four roles and a link to an online dictionary.

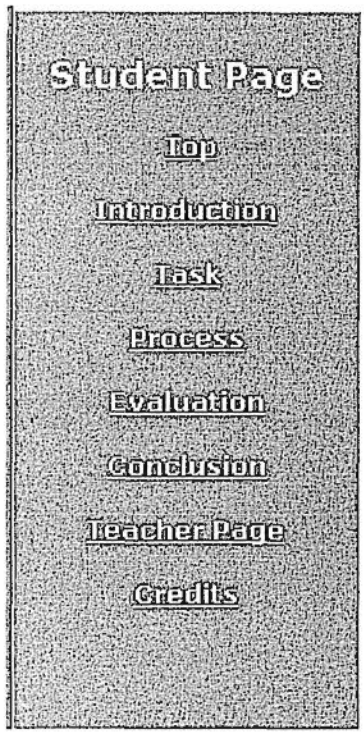


Figure 3.2: Snapshot of the Left Frame of the Original WebQuest Page for WQ1

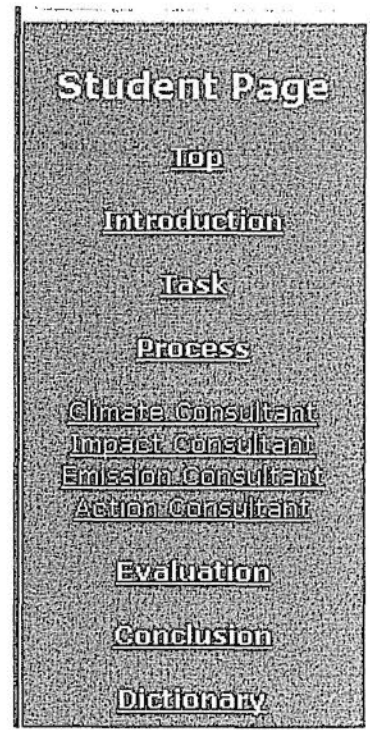


Figure 3.3: Snapshot of the Left Frame of the Modified WebQuest Page for WQ1

For the adaptation of *WQ2*, the changes discussed below were made. First, in the *Introduction* section, the term "*a grocery store*" was replaced by "*a grocery store in the United States*" in order to let students know the context of the task. Besides, the Chinese term for grocery store was added next to the English term for helping students understand its meaning and get ready for the situation. A hyperlink to a page containing detailed descriptions of grocery stores in Western countries was also inserted to the term "*grocery store*" for providing more relevant information to students.

For the original WebQuest, there was merely a short paragraph describing the task in the *Task* section. It was considered by *Teacher T* and the researcher that the short description was too simply and insufficient for constituting an authentic task for students. Therefore, the researcher and *Teacher T* redesigned the *Task* section by incorporating a popular school activity, study tour, in the task and giving an account of the scenario of the task so as to make it more authentic. Besides, the required learning product was changed from creating an informative poster that would be displayed in a grocery store to giving a presentation to the

shoppers of a grocery store.

In the *Process* section, the first paragraph was slightly modified by adding the instruction "*you will work in groups of four*". As the required learning product was changed from a poster to a presentation, the statement "*you will use the power of teamwork and the many resources on the Internet to learn all about paper, plastic and recycling*" in the original WebQuest was modified as "*your group will use the power of teamwork and the many resources on the Internet to research information about recycling, and paper and plastic bags so as to create an informative presentation using PowerPoint*". In the rest of the text, the appearance of the phrase "*create a poster*" was changed to "*prepare a presentation*".

The Chinese term for viewpoint was added next to the English term for helping students understand its meaning. The Chinese name of each role was also added next to the English term for helping students understand its meaning and highlighting the role's focus.

Two extra hyperlinks to two particular pages, presenting the process of recycling paper and that of recycling plastic respectively, were added to Phase 1 for providing more information regarding paper and plastic recycling to all members of a group.

For Phase 4 of the *Process* section, the phrase "*help other people in your community make an informed decision*" in the original WebQuest was modified as "*help other people make an informed decision*". In Step 1 of Phase 4, the appearance of the phrase "*create a poster*" was changed to "*prepare a presentation*" and the statement "*your group will send your posters to a grocery store in your area, for them to display*" in the original WebQuest was removed as it was not applicable to the task redesigned by the researcher and *Teacher T*. Owing to the classroom setting of the intended participants, the researcher and *Teacher T* rewrote Step 2 of Phase 4 for stating the requirements of the learning product and the procedure for submitting the learning product.

There were also changes in the role-specific pages. In the page for the Paper Advocate, the links to "Fun Facts About Recycling" and "American Forest & Paper Association – Pulp

& Paper" were expired. They were fixed and updated. In the page for the Plastic Advocate, the links to "Plastic Recycling Facts" and "Plastics Identification Guide" were expired. They were fixed and updated. An additional link to a Web page, entitled "How is plastic recycled?" and hosted by the Website "www.eng-forum.com" (Middle East Economic Engineering Forum), was added to that page for providing more information regarding plastic recycling to the role. In the page for the Recycling Pessimist, the Chinese term for drawbacks was added next to the English term for helping the role understand its meaning. Besides, the links to "Talking Trash" was expired. It was fixed and updated. The links to "Plastic Bags", hosted by the Website "www.sierraclub.org", and "Is Recycling Good or Bad or Both (PDF)", hosted by the Website "www.heartland.org", were also expired. They were replaced by another two Web pages entitled "Plastic / Polymer Recycling", hosted by the Website "www.lotfi.net", and "Grocery Bags – Paper or Plastic?", hosted by the Website "www.sierraclub.org". In the page for the Concerned Citizen, the Chinese terms for commitments, policies, and fossil fuels were added next to the English terms for helping the role understand their meaning and highlighting some key words. Besides, there were some changes to the guiding questions. An additional question "*What are International Paper and Visy*" was added at the beginning in order to allow the role to have an overall picture of the two firms before answering the questions related to the paper and the plastic industries. The question "*What do International Paper and Visy Industries do to recycle*" was slightly revised as "*What do International Paper and Visy do to recycle*". The question "*What environmental commitments did Union Camp and Visy Industries set for themselves*" was modified as "*What environmental commitments or policies did International Paper and Visy set for themselves*". The question "*What money is spent on environmental research by the paper industry*" was removed in order to balance the number of questions related to the paper industry and the plastic industry. Besides, the links to "American Forest & Paper Association" and "International Paper: News Release" were removed as they were not useful for the role to answer the revised guiding

questions. The links to "United States Environmental Protection Agency" and "101 Conservation Tips" were also expired and they were removed from the page. Six additional links to "International Paper", "International Paper: Current Environmental Issues", "International Paper: A History of Safety and Environmental Commitment", "International Paper: Global Climate Change", "Visy Recycling", and "Visy Environment" were added to that page for facilitating the role to look for required information for the revised guiding questions.

In the *Evaluation* section, the term "*poster*" was changed to "*PowerPoint presentation*". In addition to making use of the rubric presented in the original WebQuest, *Teacher W* suggested to add two more rubrics, which were particularly on the evaluation of PowerPoint document and that of oral presentation, to the *Evaluation* section in order to provide even more comprehensive, authentic self-assessment to students. The two rubrics were found from a WebQuest entitled "An Episode on Australian Animals" available at the collection hosted by the University of Richmond. It was agreed by the researcher and the three experienced teachers to enrich the *Evaluation* section of the original WebQuest by adding these two rubrics. Appendix 5 shows all the screenshots of the original WebQuest, while Appendix 6 shows those of the modified WebQuest (i.e. *WQ2*).

Like *WQ1*, a link to an online dictionary (Yahoo Dictionary) and a link to Wikipedia were added to the left frame of the WebQuest page for helping students understand any English words they might encounter and encouraging them looking for and reading extra information. Similarly, the link to Wikipedia was subsequently removed based on the findings of the pilot study. *Figure 3.4* shows the left frame of the original WebQuest page, while *Figure 3.5* shows that of the modified page (*WQ2*), where there is a link to an online dictionary.

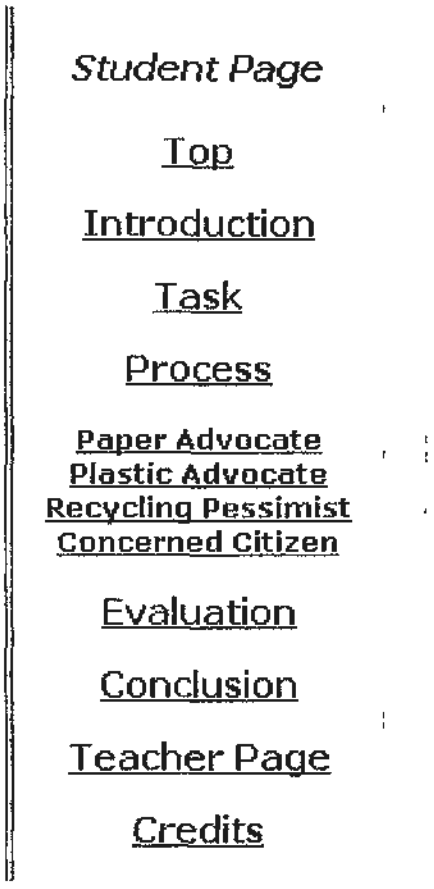


Figure 3.4: Snapshot of the Left Frame of the Original WebQuest Page for WQ2

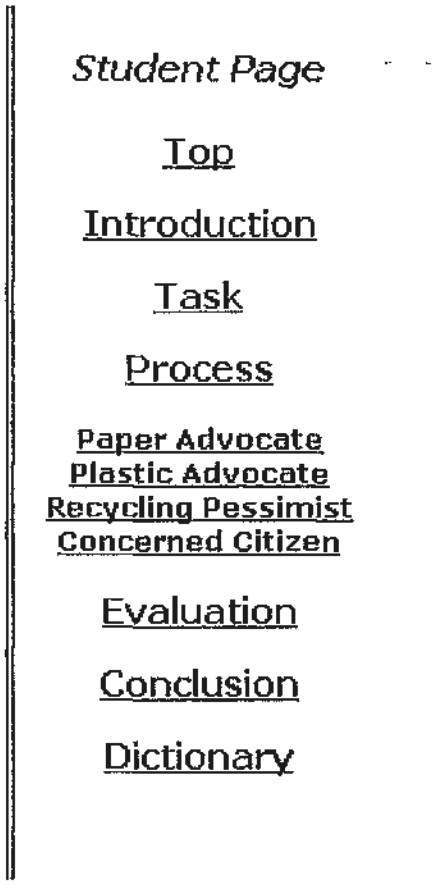


Figure 3.5: Snapshot of the Left Frame of the Modified WebQuest Page for WQ2

Considering the adaptation of *WQ4*, the following changes were made. First, the *Introduction* and the *Task* sections of the original WebQuest were not well-designed. Therefore, both of them were redesigned by the researcher. The *Introduction* section of the original WebQuest failed to present a situation being able to set the stage of the activity and provide some background information. It was merely a description of the task to be done by students. The *Task* section of the original WebQuest also failed to describe what students would accomplish during the activity but simply listed the procedures for completing the learning product. To rectify these two problems regarding WebQuest design, the researcher redesigned the *Introduction* section by briefly mentioning the expansion of American fast food restaurants followed by raising an issue about the healthiness of American fast food items. To raise students' interest in the activity, five pictures of American fast food items were added to the *Introduction* section as well. The researcher also redesigned the *Task* section by

shifting the original task to the local context of the intended participants and giving an account of the scenario of the task so as to make it more authentic. In responding to the modification of the *Process* section, the researcher avoided mentioning anything about calories or grams of fat while designing the *Task* section, so as not to limit students' thinking at the stage of reading this section.

As the task of the WebQuest required students to prepare a short report on the healthiest fast food restaurant, the *Process* section was first enhanced by adding two guiding questions at the beginning. Prior to mentioning calories and grams of fat, the two guiding questions induced students to think the meaning of healthy fast food and what makes food healthy. Together with the two questions, six links to some pre-selected Web materials were also provided for students to gain some ideas for the two questions. Next, 1) the instruction "*You will work in groups of two to create a short report for the local newspaper on the healthiest fast food restaurant*" and 2) the procedures for completing the task listed in the *Task* section of the original WebQuest were presented under the two guiding questions. Owing to the classroom setting of the intended participants, the last procedure was modified to indicate the method of submitting the learning product.

Subsequently in the *Process* section, the guideline for accessing the data source was modified as:

> "*One will open the Spreadsheet software, Excel. The other will go to the Washington Post Fast Food Calorie Counter web page. Alternatively, you may use the Calorie Guide provided by FastFood.com.*"

The statement "*Alternatively, you may use the Calorie Guide provided by FastFood.com*" was added in order to provide an alternative data source to students. Besides, the required data items to be entered into a spreadsheet were changed from "*Name of the Restaurant, Calories, Grams of Fat*" to "*Name of the Restaurant, Food Items, Calories, Grams of Fat*", where the data item "*Food Items*" was not required in the original WebQuest.

As the required learning product was changed from writing an article to preparing a short report, the paragraph stating the requirement of the learning product was modified as:

> "*Open a word processing document and write a short conclusion featuring which restaurant and food item would be the best to eat based on calories and grams of fat and be sure to include your graphs in the report.*"

Other than requiring students to write a short conclusion featuring the healthiest restaurant, the researcher and *Teacher T* added two questions for discussion at the end of the *Process* section. The two questions were designed to allow students making inferences from the data gathered. The last paragraph of the *Process* section was also rewritten for reminding students the method of submitting the learning product.

In the *Evaluation* section, there were two minor changes. First, the term "*article*" was changed to "*report*". Second, the criterion named "*Creativity in Article*" was removed from the original rubric as there was nothing about the encouragement of creativity in the WebQuest. Appendix 8 shows all the screenshots of the original WebQuest, while Appendix 9 shows those of the modified WebQuest (i.e. *WQ4*).

Like *WQ1* and *WQ2*, a link to an online dictionary (Yahoo Dictionary) and a link to Wikipedia were added to the left frame of the WebQuest page for helping students understand any English words they might encounter and encouraging them looking for and reading extra information. *Figure 3.6* shows the left frame of the original WebQuest page, while *Figure 3.7* shows that of the modified page (*WQ4*), where there are links to an online dictionary and Wikipedia.

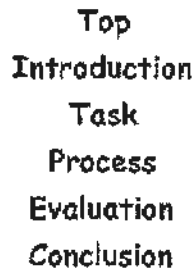


Figure 3.6: Snapshot of the Left Frame of the Original WebQuest Page for WQ4

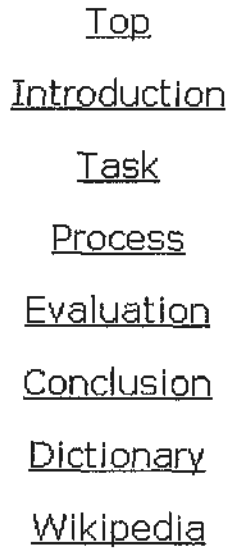


Figure 3.7: Snapshot of the Left Frame of the Modified WebQuest Page for WQ4

3.4.1.3 Brief Account of Individual WebQuests

Subsequent to discussing the adaptation of the three selected WebQuests (*WQ1*, *WQ2*, and *WQ4*), this section elaborates on the four WebQuests used in the study individually.

In *WQ1*, global warming was addressed as its central issue. As advisers to the President of the United States, students were asked to research and investigate the causes and effects of global warming in order to come up with a proposal to prevent further damage. They would work in groups of four. Each group member would become a consultant in one of the four areas: climate, emission, impact, and action. Specific prompts and particular Web resources were provided to each of the four consultants. Subsequent to the individual research done by the assigned role, the four members would come together to combine their findings for working out the learning product. A few guidelines on preparing the presentation were provided to students. They were also suggested to refer to the expectations stated in the rubric.

In *WQ2*, another real-world issue, recycling, was addressed. In order to help shoppers in a grocery store make decisions on choosing paper or plastic bags, students were invited by

the store owner to give a presentation to the shoppers in a special occasion. Students would again work in groups of four. Each group member would play the role of one of the following: the paper advocate, the plastic advocate, the recycling pessimist, and the concerned citizen. At the beginning, a common set of Web resources was provided to all group members for gaining background information about the topic. Afterwards, specific prompts and links were dedicated to each role for looking deeper from a particular perspective. Upon completion of individual research, several guidelines were given to the group members for debating, discussing, and reaching consensus. Lastly, an outline of the presentation was provided so as to help students in organizing and completing their group product.

For *WQ3*, a central question, wondering whether living in another country would be better, was addressed. Students would work in groups of two. The group members were asked to determine two Western countries that they would like to study. They would then make use of the CIA database to gather some real, statistical data for the following four countries: the two selected Western countries, their home country (China), and a developing country. After that, they would make use of appropriate information technology tools to analyze and compare some aspects among the four countries. Guidelines on conducting analysis and comparison were provided to students so as to facilitate their work. Lastly, students were given four discussion questions requiring them to use the data gathered for making inferences.

The theme of the fourth WebQuest (i.e. *WQ4*) was the healthiest fast food. Students would work in groups of two and be responsible for preparing a short report, for a local newspaper, about the healthiest fast food restaurant. At the beginning, they would be given some questions and a set of Web materials for gaining information about the meaning of healthy fast food and what made food healthy. Then, they would determine the number of calories and grams of fat in some food items at four fast food restaurants. They would gather the required data at an online fast food calorie counter. Like *WQ3*, students would employ

appropriate information technology tools to analyze the data for coming up with their conclusions. Guidance on data comparison was provided to students in order to assist them in completing the learning product. At last, they would make inferences based on the data gathered for two discussion questions.

To further facilitate students' inquiry, links to an online dictionary and Wikipedia were also available at the left frame of each WebQuest page. As mentioned, the links to Wikipedia were subsequently removed from *WQ1* and *WQ2* based on the findings of the pilot study.

Through this set of WebQuests, in general, students were expected to gain two major kinds of learning: knowledge and learning skills. For knowledge, since these WebQuests would be implemented in the Computer subject, students were expected to learn the use of a variety of information technology tools, such as PowerPoint and Excel, for making presentation and spreadsheet respectively. At the same time, it was to 1) inform students of the current issues, like global warming, recycling, development of other countries, healthy fast food, etc, that faced our/their lives, and also 2) learn the content knowledge involved in the topics of the WebQuests. For learning skills, students would be given the opportunities 1) to experience the ways of tackling real-life issues through the guided support (scaffolding) embedded in the *Process* section, 2) to experience viewing a real-life issue from different perspectives, and also 3) to make use of appropriate Web resources for dealing with a real-world problem.

3.4.1.4 Design Features of the WebQuests

March (2000) points out that good WebQuests are designed to engage students in making use of information sources on the Web for exploring real-world issues in a variety of domains. He further states that a real WebQuest is a scaffolded learning structure that uses links to essential resources on the World Wide Web and an authentic task to motivate students' investigation of an open-ended question, development of individual expertise, and participation in a group process that transforms newly acquired information into a more

sophisticated understanding (March, 2003).

By adopting March's characterization, six traits are identified for a real WebQuest. They are 1) authentic tasks that motivate, 2) open-ended questions, 3) individual expertise, 4) use of essential Web resources, 5) a scaffolded learning structure, and 6) transformative group process. In addition, as a supplement to his characterization, March (2003) advises that educators are not suggested to look for perfection, where every WebQuest should embrace all the six traits that he figures out. Instead, his suggestion is intended to serve as some sort of guidelines for WebQuest designers to better understand how to construct effective Web-based learning.

While the quality of the WebQuests would be a major concern of the research, *WQ1*, *WQ2*, *WQ3*, and *WQ4* were adapted and designed in best accordance with the six characteristics identified by March (2003). Owing to the design and nature of the tasks, one of the characteristics (individual expertise) was not applicable to *WQ3* and *WQ4*. *Table 3.5* summarizes the design features of each WebQuest and relates those features to the six key points suggested by March (2003) for a real WebQuest.

A) Design Features of *WQ1*

In *WQ1*, an authentic learning task was created and assigned to students. They would be the consultants for the President, helping the President prepare a presentation that would inform other world leaders at an environmental conference about their findings on global warming. The WebQuest also posed students an open-ended question. They would look at an issue, global warming, that concerned people in the real world. They were asked to consider the issue in its fullness, including causes and effects, and investigate it from four different sides. For individual expertise, students would work in groups of four. Each group member assumed a role from one of the four consultants (climate consultant, emission consultant, impact consultant, and action consultant), which matched the issue. Each role allowed a student to gain understanding of the issue from a particular aspect and the four roles together

provided multiple perspectives from which to view the issue/open-ended question.

Concerning the use of essential Web resources, the Web was used to access multiple perspectives and current information in the WebQuest. Relevant Web resources were pre-selected and direct links were provided. Role-specific resources were provided to each of the four consultants in the corresponding page. The *Process* section of the WebQuest formed a scaffolded learning structure. Each role was prompted by a set of guiding questions, which were designed to help the student make use of the role-specific Web resources to develop expertise in that particular field. Each role was also provided with a template (a Word document) for the student to record any useful information for or responses to the guiding questions. A few guidelines on preparing the presentation were provided to students. They were also suggested to refer to the expectations stated in the rubric, as a reference.

Again, for the development of individual expertise, each role would need to transform the newly acquired information, from the given Web resources via the scaffolding provided (e.g. the role-specific prompts), into some other form. Subsequent to individual research, the group members would need to synthesize the findings brought by all roles in order to construct their learning product.

B) Design Features of *WQ2*

Like *WQ1*, an authentic learning task was designed and given to students in *WQ2*. During a study tour abroad, students were invited by the host family (the owner of a grocery store) to give a presentation to shoppers in a grocery store, helping them make decisions on choosing paper or plastic bags. In this WebQuest, another open-ended question, recycling, was brought to students. Recycling was a real-world issue and an open-ended topic. People from different background might hold different attitudes towards the issue, which would inspire students to learn from views on using and/or recycling paper and/or plastic bags. For individual expertise, students would work in groups of four. Each group member assumed a role from one of the four viewpoints (paper advocate, plastic advocate, recycling pessimist,

and concerned citizen), which matched the issue. Each role allowed a student to deal with the problem according to a particular stand and the four roles together provided multiple perspectives from which to view the issue/open-ended question.

Like *WQ1*, the Web was used to access multiple perspectives and current information in *WQ2*. Relevant Web resources were pre-selected and direct links were provided. A set of Web resources was provided to all group members for gaining some background information about paper, plastic, and recycling, while role-specific resources were provided to each of the four viewpoints in the corresponding page. In a similar manner, the *Process* section of *WQ2* presented a scaffolded learning structure to students. First, each role was prompted by a set of guiding questions, which were designed to help the student make use of the role-specific Web resources to acquire useful information from that particular viewpoint. Each role was also provided with a template (a Word document) for the student to record any useful information for or responses to the guiding questions. Next, several guidelines were given to students for debating, discussing, and reaching consensus. Besides, an outline of the presentation was provided to students, helping them in organizing and completing the group product.

Lastly, for individual viewpoint development, each role would need to transform the newly acquired information, from the given Web resources via the scaffolding provided (e.g. the role-specific prompts), into some other form. Subsequent to individual research, the group members would need to discuss and debate among the four viewpoints in order to reach a consensus to be presented in their learning product.

C) Design Features of *WQ3*

At the beginning of *WQ3*, an authentic learning task was created. After returning from the study tour, students were asked by their friends whether the living conditions and development of the Western countries would be better or worse than those of their home country. In addition, it posed an open-ended question as well. A central question, wondering whether living in another country would be better or worse, was addressed. That would be an

attempt to make the topic more relevant to students, and to create a personal curiosity that inspired investigation. As mentioned, owing to the design and the nature of the task, the development of individual expertise was not applicable to *WQ3*.

Like *WQ1* and *WQ2*, the Web was used to access current information. Relevant Web resources were pre-selected and direct links were provided. Supplementary Web resources for assisting students in accomplishing the task were also provided. In relation to a scaffolded learning structure, at the beginning of the *Process* section, students were given some questions guiding them to gain 1) some ideas about the development of a country, and 2) an overview of the living conditions. Appropriate information technology tools were suggested to students for completing the task. Hints were also given to students for determining how crowded a country was using its population and area. In addition, procedure, instead of detailed step-by-step instructions, for achieving the task was provided. Two templates (table formats) for organizing the data to facilitate comparison were suggested to students and six samples were provided to them for facilitating the appropriate use of graphs.

Concerning the transformative strategy employed in the WebQuest, students would need to analyze the statistical data using appropriate information technology tools and skills for making comparison. Besides, they would attempt to find the correlations between three columns of data and to infer two new items. By comparing some aspects between the Western countries, their home country, and a developing country, students would also relate learning in global context to local setting.

D) Design Features of *WQ4*

In consistent with another three WebQuests, an authentic learning task was designed in *WQ4*, where students were taking a part-time job for a local newspaper, which would publish a special issue commenting on people's eating habits. They would be responsible for preparing a short report about the healthiest fast food restaurant in that special issue. Similarly, an open-ended question was posed to students as well. As students might differ in

their choices of fast food restaurants as well as food items, the healthiest fast food restaurant would be an issue that attempted to let students find their concerns by exploring among the various fast food items severed at common fast food restaurants, and to bring about a more robust understanding of the material. As mentioned, owing to the design and the nature of the task, the development of individual expertise was not applicable to *WQ4*.

Like *WQ3*, the Web was used to access current information. Relevant Web resources were pre-selected and direct links were provided. Supplementary Web resources for gaining background information about the meaning of healthy fast food and what made food healthy were also provided.

In relation to scaffolding, at the beginning of the *Process* section, instead of mentioning the number of calories and grams of fat, students were asked to think about what was meant by healthy fast food and what made food healthy. Relevant Web materials were also provided to them. Appropriate information technology tools were suggested to students for completing the task. In addition, procedure, instead of detailed step-by-step instructions, for achieving the task was provided. The fields to be covered in the spreadsheet were also suggested to students.

Concerning the transformative strategy employed in the WebQuest, students would need to analyze the statistical data using appropriate information technology tools and skills for making comparison. Besides, they would attempt to find the correlation between two columns of data and to derive a few common characteristics of American fast food. By comparing fast food items served by different Western fast food restaurants, students would apply learning in the Western context to their local lives.

Characteristics of a Real WebQuest (March, 2003)	WQ1	WQ2	WQ3	WQ4
Authentic Tasks that Motivate	• Students would be the consultants for the President, helping the President prepare a presentation that would inform other world leaders at an environmental conference about their findings on global warming.	• During a study tour abroad, students were invited by the host family (the owner of a grocery store) to give a presentation to shoppers in a grocery store, helping them make decisions on choosing paper or plastic bags.	• After returning from the study tour, students were asked by their friends whether the living conditions and development of the Western countries would be better or worse than those of their home country.	• Students were taking a part-time job for a local newspaper, which would publish a special issue commenting on people's eating habits. They would be responsible for preparing a short report about the healthiest fast food restaurant in that special issue.
Open-ended Questions	• Students would look at an issue, global warming, that concerned people in the real world. They were asked to consider the issue in its fullness, including causes and effects, and investigate it from four different sides.	• Recycling was a real-world issue and an open-ended topic. People from different background might hold different attitudes towards the issue, which would inspire students to learn from views on using and/or recycling paper and/or plastic bags.	• A central question, wondering whether living in another country would be better or worse, was addressed. That would be an attempt to make the topic more relevant to students, and to create a personal curiosity that inspired investigation.	• Students might differ in their choices of fast food restaurants as well as food items. The healthiest fast food restaurant would be an issue that attempted to let students find their concerns by exploring among the various fast food items severed at common fast food restaurants, and to bring about a more robust understanding of the material.
Individual Expertise	• Students worked in groups of four. Each group member assumed a role from one of the four consultants (climate consultant, emission consultant, impact consultant, and action consultant), which matched the issue.	• Students worked in groups of four. Each group member assumed a role from one of the four viewpoints (paper advocate, plastic advocate, recycling pessimist, and concerned citizen), which matched the issue. • Each role allowed a student to deal	• Not applicable owing to the nature of the task.	• Not applicable owing to the nature of the task.

	• Each role allowed a student to gain understanding of the issue from a particular aspect. • The roles provided multiple perspectives from which to view the issue/open-ended question.	with the problem according to a particular stand. • The roles provided multiple perspectives from which to view the issue/open-ended question.		
Use of Essential Web Resources	• The Web was used to access multiple perspectives and current information. • Relevant Web resources were pre-selected and direct links were provided. • Role-specific resources were provided to each of the four consultants.	• The Web was used to access multiple perspectives and current information. • Relevant Web resources were pre-selected and direct links were provided. • A set of Web resources was provided to all group members for gaining some background information about paper, plastic, and recycling. • Role-specific resources were provided to each of the four viewpoints.	• The Web was used to access current information. • Relevant Web resources were pre-selected and direct links were provided. • Supplementary Web resources for assisting students in accomplishing the task were also provided.	• The Web was used to access current information. • Relevant Web resources were pre-selected and direct links were provided. • Supplementary Web resources for gaining background information about the meaning of healthy fast food and what made food healthy were also provided.
A Scaffolded Learning Structure	• Each role was prompted by a set of guiding questions, which were designed to help the student make use of the role-specific Web resources to develop expertise in that particular field. • Each role was also provided with a template (a Word document) for the	• Each role was prompted by a set of guiding questions, which were designed to help the student make use of the role-specific Web resources to acquire useful information from that particular viewpoint. • Each role was also provided with a	• At the beginning, students were given some questions guiding them to gain 1) some ideas about the development of a country, and 2) an overview of the living conditions. • Appropriate information technology tools were suggested to students for completing the task.	• At the beginning, instead of mentioning the number of calories and grams of fat, students were asked to think about what was meant by healthy fast food and what made food healthy. Relevant Web materials were provided to them. • Appropriate information technology

	student to record any useful information for or responses to the guiding questions. • A few guidelines on preparing the presentation were provided to students. They were also suggested to refer to the expectations stated in the rubric, as a reference.	template (a Word document) for the student to record any useful information for or responses to the guiding questions. • Several guidelines were given to students for debating, discussing, and reaching consensus. • An outline of the presentation was provided to students, helping them in organizing and completing the group product.	• Hints were given to students for determining how crowded a country was using its population and area. • Procedure, instead of detailed step-by-step instructions, for achieving the task was provided. • Two templates (table formats) for organizing the data to facilitate comparison were suggested. • Six samples were provided to students for facilitating the appropriate use of graphs.	tools were suggested to students for completing the task. • Procedure, instead of detailed step-by-step instructions, for achieving the task was provided. • The fields to be covered in the spreadsheet were suggested.
Transformative Group Process	• For the development of individual expertise, each role would need to transform the newly acquired information, from the given Web resources via the scaffolding provided (e.g. the role-specific prompts), into some other form. • Subsequent to individual research, the group members would need to synthesize the findings brought by all roles in order to construct their learning product.	• For individual viewpoint development, each role would need to transform the newly acquired information, from the given Web resources via the scaffolding provided (e.g. the role-specific prompts), into some other form. • Subsequent to individual research, the group members would need to discuss and debate among the four viewpoints in order to reach a consensus to be presented in their learning product.	• Students would need to analyze the statistical data using appropriate information technology tools and skills for making comparison. • Besides, they would attempt to find the correlations between three columns of data and to infer two new items. • By comparing some aspects between the Western countries, their home country, and a developing country, students would relate learning in global context to local setting.	• Students would need to analyze the statistical data using appropriate information technology tools and skills for making comparison. • Besides, they would attempt to find the correlation between two columns of data and to derive a few common characteristics of American fast food. • By comparing fast food items served by different Western fast food restaurants, students would apply learning in the Western context to their local lives.

Table 3.5: Design Features of Individual WebQuests in Relation to March's (2003) Six Key Points for a Real WebQuest

3.4.1.5 Information Literacy Aspect of the WebQuests

In addition to looking at the features of a real WebQuest suggested by March (2003), it is crucial to consider how the set of WebQuests helps achieve the target (expected) learning outcomes, as stated in Section 3.4.1.1, since the improvement of information literacy should be the emphasis of the instrument.

Fundamentally, teaching with WebQuest consists of two major parts – designing a WebQuest followed by implementing the WebQuest (Carvalho, 2003). This section looks at the former by discussing the IL aspect of the WebQuest design, especially in discussing 1) what information skills that the WebQuests would help to develop, 2) how the skills are trained in the WebQuests, and 3) what learning outcomes that the WebQuests can help to achieve. Subsequently, Chapter 4 pays attention to the latter by looking at the implementation of the instrument (see Section 4.2). In particular, it describes and reports the details of the WebQuest implementation.

As summarized in *Table 3.1*, the WebQuests were designed to help students achieve five specific learning outcomes (Level III) defined in the cognitive dimension of the Information Literacy Framework for Hong Kong Students (EMB, 2005). Among this set of learning outcomes, *WQ1* and *WQ2* aimed at four of them ([C6.1], [C7.1], [C8.1], and [C8.2]). The other two, *WQ3* and *WQ4*, also aimed at four of the target learning outcomes ([C6.1], [C7.1], [C8.1], and [C11.1]). The two pairs of WebQuests shared three target learning outcomes ([C6.1], [C7.1], and [C8.1]) in common.

The relations between the set of target learning outcomes and the set of WebQuests are discussed and explained one by one in the following sections (*Sections A to E*). Besides, *Table 3.6* and *Table 3.7* summarize the relation between the target learning outcomes and the WebQuests by indicating (in *Table 3.6*) and explaining (in *Table 3.7*) the specific learning outcomes that each of the four WebQuests was designed for.

The relation and the explanation of the relation were determined and examined by three

WebQuest experts. Details of the procedure for determining the relation and examining the explanation are delineated in the subsequent section (see Section 3.4.1.6). Basically, except the one between *WQ1* and [C8.2], the experts agreed with the relations indicated in *Table 3.6* (see Appendix 23b for their determination) and supported the explanation, as stated in *Table 3.7*, regarding the relation (see Appendix 23c for their comments). They agreed that the design of the four WebQuests could help students achieve the target learning outcomes.

		The Set of WebQuests			
		WQ1	*WQ2*	*WQ3*	*WQ4*
Codes of the Target Learning Outcomes (Level III) in the Cognitive Dimension	[C6.1]	☑	☑	☑	☑
	[C7.1]	☑	☑	☑	☑
	[C8.1]	☑	☑	☑	☑
	[C8.2]	☑	☑		
	[C11.1]			☑	☑
	Total:	4	4	4	4

Table 3.6: Relation between Specific Learning Outcomes and Individual WebQuests – Indication

A) Relation with Target Learning Outcome [C6.1]

This section discusses the relation between the four WebQuests and the target learning outcome "[C6.1]: make judgments and draw conclusions from research to solve problems".

In *WQ1*, before joining the group for combining the findings brought by the four different roles, each group member needed to complete individual research on his/her assigned role. As a consultant in a particular area, the member would need to conclude the findings, about the current global conditions and the effects of human behaviors on the world, of that area based upon his/her individual research. So that, when the four members came together to prepare an informational presentation, he/she could contribute to the group by bringing an overview of the area to the other members. Using the information brought by the four members, the group would need to determine 1) what were the causes and effects of global warming in the past, and 2) how human behaviors would affect the global conditions in the future.

In *WQ2*, each group member needed to carry out individual research according to an

assigned viewpoint. After that, the four members came together to get a better understanding of the topic and decide what might be the best answer to the question 'Paper or Plastic'. In such case, they would need to use their findings from the different viewpoints for not only reaching a consensus on the answer to the given question but also making an informed decision for the issue.

In *WQ3*, through gathering some real, statistical items about the development and living conditions of their home country and three other countries, the students needed to compare several aspects of life in four different countries. After that, they would apply such information (comparison) to determine whether living in another country would be better. From the data gathered, the students might also have conclusions about the correlation between literacy rate and average life expectancy, and that between crowdedness and average life expectancy.

In *WQ4*, through gathering the amounts of calories and grams of fat in four sets of fast food items chosen at four fast food restaurants respectively, the students needed to analyze the data and use the results (comparison) to determine which of the four fast food restaurants they selected would have the healthiest fast food meal, so as to determine the healthiest fast food restaurant. From the data gathered, the students might also have conclusions about the correlation between the number of calories and grams of fat in fast food items.

B) Relation with Target Learning Outcome [C7.1]

This section discusses the relation between the four WebQuests and the target learning outcome "[C7.1]: draw conclusion from the information collected and apply the knowledge to solve problems of similar nature".

In *WQ1*, through individual inquiry, the student could gather information and acquire knowledge, about the theme of the WebQuest, in the area of his/her role. The student could also apply such information or knowledge, or even the Web resources provided in the WebQuest, to the study of similar topics, such as environment, natural resources,

modernization, and other current global issues. Through the WebQuest activity, the students would be informed that a global issue, like the theme of the WebQuest, was complicated. Collecting information from multiple roles and areas was required for the consideration of such an issue. As a result, this way of handling a real-life problem might influence the students that they would apply it to other issues or problems with similar nature.

In *WQ2*, through individual inquiry, the student could gather information and acquire knowledge, about the theme of the WebQuest, in the area of his/her assigned viewpoint. The student could also apply such information or knowledge, or even the Web resources provided in the WebQuest, to the study of similar topics, such as environment, energy sources, renewable and nonrenewable resources, etc. Through the WebQuest activity, the students would be informed that people from different background may hold different attitudes and viewpoints towards a real-world issue. Thus, collecting information from people with different viewpoints was required for the consideration of such an issue. As a result, this way of handling a real issue might influence the students that they would make use of it to deal with other real-world issues with similar nature.

In *WQ3*, the students needed to collect information regarding the development and living conditions of different countries using the *CIA World Factbook* and the country profiles provided by FCO, BBC, UNICEF, etc. These online resources contained massive real and statistical data about countries and regions in the world. The students could acquire some basic knowledge about a country through exploring in these databases. They could also apply such knowledge, or even these Web resources, to the study of other areas and subjects, like economy, government, geography, history, etc. Through the WebQuest activity, the students could experience the use of tables and graphs for facilitating data comparison and also the use of graphs for demonstrating points or supporting explanation. As a result, this might influence how they would perform other similar tasks for data analysis and explanation. In creating the graphs, the students might 1) find that some graphs demonstrated a better visual aid than

others, and 2) gain a new understanding in which ways graphs could demonstrate a point better than words. These might also influence how they would make use of graphs to deal with problems with similar nature.

In *WQ4*, the students would acquire some knowledge about healthy fast food by, first, 1) thinking about two questions on this topic using the relevant Web materials provided, and, then, 2) gathering and analyzing the amounts of calories and grams of fat in four sets of chosen fast food items using the *Washington Post Fast Food Calorie Counter* or the *Calorie Guide* provided by *FastFood.com*. They could also apply the knowledge and information acquired, or other calorie counters or fat intake calculators provided in the WebQuest, to looking at issues with similar nature, such as comparing other items at fast food restaurants or looking at the food they ate in order to determine how many calories and grams of fat they consumed each day. Through the WebQuest activity, the students could experience the use of tabular form and chart to represent and analyze data. As a result, this might influence how they would perform other similar tasks for data representation and analysis.

C) Relation with Target Learning Outcome [C8.1]

This section discusses the relation between the four WebQuests and the target learning outcome "[C8.1]: use multiple keywords or phrases to label information; categorize and connect the concepts derived from information".

In *WQ1*, during individual inquiry, each role was prompted by a set of guiding questions helping the student make use of the role-specific Web resources to develop expertise in that particular field. Once any useful information was found from the Web resources, the student would need to use certain means to record or mark the information, as well as its source, so as to answer the guiding questions or facilitate further retrieval. To answer the questions, the student would need to categorize the concepts derived from the information, such as climate, weather, human health, food supply, greenhouse, fossil fuels, etc, according to the focus of each question. Some questions would also require the student to connect different concepts

derived from the information. For example, climate and weather, global warming and sea level, atmosphere and greenhouse, fossil fuels and pollution. Upon completion of individual inquiry, the four members came together to get into a group process, where they would not only categorize the information brought by the different roles but also attempt to combine the information so as to prepare their learning product.

In *WQ2*, during individual inquiry, each role was prompted by a set of guiding questions helping the student make use of the role-specific Web resources to acquire useful information from that particular viewpoint. Once any useful information was found from the Web resources, the student would need to use certain means to record or mark the information, as well as its source, so as to answer the guiding questions or facilitate further retrieval. To answer the questions, the student would need to categorize the concepts derived from the information, such as reuse, paper recycling, plastic recycling, paper industry, recycling processes, types of plastics, environment friendly, environmental policies, fossil fuels, etc, according to the focus of each question. Some questions would also require the student to connect different concepts derived from the information. For example, paper bags and reuse/recycling, plastic bags and reuse/recycling, paper industry and environment friendly, types of plastics and recycling, plastic recycling and recycling processes, paper industry and fossil fuels, paper/plastic industry and environmental policies.

In *WQ3*, after gathering the required statistical items from the CIA database, the students needed to label them in a spreadsheet by relevant keywords, like size, population, average life expectancy, literacy rate, and crowdedness. The students would also categorize the statistical items in different rows or columns of the spreadsheet according to their types. To analyze the statistical items, the students would need to connect some concepts derived from the information. For example, the crowdedness of a country could not be found from the CIA database. Thus, the students would need to, and they were also hinted to, construct an approximation of such item using the population and the area of a country. Besides, to study

any correlation between two items (e.g. literacy rate and average life expectancy), the students would need to connect the concepts derived from the items as well. In order to make inference on an item with no information (e.g. average income or number of people who own computer at home) from other relevant items they had collected (e.g. literacy rate), the students would need to connect the concepts derived from these items (e.g. using literacy rate to infer average income).

In *WQ4*, at the beginning, the students were prompted by two questions asking what was meant by healthy fast food and what made food healthy. To gain some ideas for the questions, the students would need to look at the Web materials provided. Once any useful information was found from the Web resources, the students would need to use certain means to record or mark the information, as well as its source, so as to answer the questions and facilitate further retrieval. To answer the questions, the students would need to categorize the concepts derived from the information, such as diet, nutrition, health, etc. They would also make connections between the concepts. For example, nutrition and diet, nutrition and health. Subsequently, after gathering the required numerical data from the online fast food calorie counter, the students needed to label them in a spreadsheet by relevant keywords, like number of calories, and grams of fat. The students would also categorize the data in different rows or columns of the spreadsheet according to their types. To facilitate data comparison, the students would need to connect the two concepts, nutrition and health, again that were derived from the information for the two questions at the beginning. To study any correlation between the number of calories and grams of fat in fast food items, the students would need to connect the concepts derived from the relevant data.

D) Relation with Target Learning Outcome [C8.2]

This section discusses the relation between the two WebQuests (*WQ1* and *WQ2*) and the target learning outcome "[C8.2]: integrate the agreement and disagreement among sources".

In *WQ1*, during individual research, the four members of a group took on different roles

of consultants and were provided with different, specific Web resources for inquiry. Afterwards, the group would need to combine the findings brought by the four roles. For a particular point regarding the theme of the WebQuest, the four roles might vary in the arguments on that point owing to the different sources of information. In such case, the students would need to bring the agreement and disagreement from information sources together for completing their learning product.

In *WQ2*, the four members of a group assumed the roles from four different viewpoints. Each of them was provided with a set of role-specific Web resources for individual inquiry. Subsequently, they would need to use their findings for discussing and debating among the four viewpoints in order to reach a consensus to be presented in their learning product. Since the four members varied in their viewpoints on the topic, they would need to integrate both agreement and disagreement for the topic, which came from different information sources supporting different viewpoints, in the process of reaching consensus.

E) Relation with Target Learning Outcome [C11.1]

This section discusses the relation between the two WebQuests (*WQ3* and *WQ4*) and the target learning outcome "[C11.1]: make inferences and simple generalizations from the evidence collected".

In *WQ3*, upon completion of the report, the students were given four questions for discussion. In responding to the questions, they would need to give their inferences by referring to the data that they had analyzed, including the graphs, in the report. The first two questions asked the students if they could find any correlation between literacy rate and average life expectancy, and that between crowdedness and average life expectancy. To tell the correlations, the students would need to 1) study the relevant graphs, 2) discover any similar patterns from the graphs, and 3) attempt to arrive at a conclusion based on the limited data set. The third and the fourth questions asked the students what they could tell about the average income among their selected countries and the number of people who owned a

computer, with Internet access, at home in the selected countries. Since the students were not provided with these two items of information throughout the activity, they would need to make inferences from the relevant items, like inferring average income from literacy rate, and then inferring the number of people who owned computer at home from average income together with literacy rate.

In *WQ4*, upon completion of the report, the students were given two questions for discussion. In responding to the questions, they would need to make simple generalizations and give their inferences by referring to 1) their answers to the two questions prompted at the beginning, and 2) the data that they had analyzed, including the charts, in the report. The first discussion question asked the students, in general, what they could tell about the food items provided by American fast food restaurants. In such case, the students would need to derive some common characteristics of American fast food items from the particular data set that they had collected in the report together with the use of the knowledge or information about healthy fast food that they had acquired through the activity. The second discussion question asked the students if they could find any correlation between the number of calories and grams of fat in fast food items. To tell the correlation, the students would need to 1) study the relevant charts, 2) discover any similar patterns from the charts, and 3) attempt to arrive at a conclusion based on the limited data set.

Target Learning Outcomes	*WQ1*	*WQ2*	*WQ3*	*WQ4*
[C6.1] make judgments and draw conclusions from research to solve problems	• Before joining the group for combining the findings brought by the four different roles, each group member needed to complete individual research on his/her assigned role. As a consultant in a particular area, the member would need to conclude the findings, about the current global conditions and the effects of human behaviors on the world, of that area based upon his/her individual research. So that, when the four members came together to prepare an informational presentation, he/she could contribute to the group by bringing an overview of the area to the other members. • Using the information brought by the four members, the group would need to determine 1) what were the causes and effects of global warming in the past, and 2) how human behaviors would affect the global conditions in the future.	• Each group member needed to carry out individual research according to an assigned viewpoint. After that, the four members come together to get a better understanding of the topic and decide what might be the best answer to the question 'Paper or Plastic?' • In such case, they would need to use their findings from the different viewpoints for not only reaching a consensus on the answer to the given question but also making an informed decision for the issue.	• Through gathering some real, statistical items about the development and living conditions of their home country and three other countries, the students needed to compare several aspects of life in four different countries. After that, they would apply such information (comparison) to determine whether living in another country would be better. • From the data gathered, the students might also have conclusions about the correlation between literacy rate and average life expectancy, and that between crowdedness and average life expectancy.	• Through gathering the amounts of calories and grams of fat in four sets of fast food items chosen at four fast food restaurants respectively, the students needed to analyze the data and use the results (comparison) to determine which of the four fast food restaurants they selected would have the healthiest fast food meal, so as to determine the healthiest fast food restaurant. • From the data gathered, the students might also have conclusions about the correlation between the number of calories and grams of fat in fast food items.

[C7.1] draw conclusion from the information collected and apply the knowledge to solve problems of similar nature	• Through individual inquiry, the student could gather information and acquire knowledge, about the theme of the WebQuest, in the area of his/her role. The student could also apply such information or knowledge, or even the Web resources provided in the WebQuest, to the study of similar topics, such as environment, natural resources, modernization, and other current global issues. • Through the WebQuest activity, the students would be informed that a global issue, like the theme of the WebQuest, was complicated. Collecting information from multiple roles and areas was required for the consideration of such an issue. As a result, this way of handling a real-life problem might influence the students that they would apply it to other issues or problems with similar nature.	• Through individual inquiry, the student could gather information and acquire knowledge, about the theme of the WebQuest, in the area of his/her assigned viewpoint. The student could also apply such information or knowledge, or even the Web resources provided in the WebQuest, to the study of similar topics, such as environment, energy sources, renewable and nonrenewable resources, etc. • Through the WebQuest activity, the students would be informed that people from different background may hold different attitudes and viewpoints towards a real-world issue. Thus, collecting information from people with different viewpoints was required for the consideration of such an issue. As a result, this way of handling a real issue might influence the students that they would make use of it to deal with other real-world issues with similar nature.	• In the WebQuest, the students needed to collect information regarding the development and living conditions of different countries using the *CIA World Factbook* and the country profiles provided by FCO, BBC, UNICEF, etc. These online resources contained massive real and statistical data about countries and regions in the world. The students could acquire some basic knowledge about a country through exploring in these databases. They could also apply such knowledge, or even these Web resources, to the study of other areas and subjects, like economy, government, geography, history, etc. • Through the WebQuest activity, the students could experience the use of tables and graphs for facilitating data comparison and also the use of graphs for demonstrating points or supporting explanation. As a result, this might influence how they would perform other similar tasks for data analysis and explanation.	• In the WebQuest, the students would acquire some knowledge about healthy fast food by, first, 1) thinking about two questions on this topic using the relevant Web materials provided, and, then, 2) gathering and analyzing the amounts of calories and grams of fat in four sets of chosen fast food items using the *Washington Post Fast Food Calorie Counter* or the *Calorie Guide* provided by *FastFood.com*. They could also apply the knowledge and information acquired, or other calorie counters or fat intake calculators provided in the WebQuest, to looking at issues with similar nature, such as comparing other items at fast food restaurants or looking at the food they ate in order to determine how many calories and grams of fat they consumed each day. • Through the WebQuest activity, the students could experience the use of tabular form and chart to represent and analyze data. As a result, this might influence how they would

			• In creating the graphs, the students might 1) find that some graphs demonstrated a better visual aid than others, and 2) gain a new understanding in which ways graphs could demonstrate a point better than words. These might also influence how they would make use of graphs to deal with problems with similar nature.	perform other similar tasks for data representation and analysis.
[C8.1] use multiple keywords or phrases to label information; categorize and connect the concepts derived from information	• During individual inquiry, each role was prompted by a set of guiding questions helping the student make use of the role-specific Web resources to develop expertise in that particular field. Once any useful information was found from the Web resources, the student would need to use certain means to record or mark the information, as well as its source, so as to answer the guiding questions or facilitate further retrieval. • To answer the questions, the student would need to categorize the concepts derived from the information, such as climate,	• During individual inquiry, each role was prompted by a set of guiding questions helping the student make use of the role-specific Web resources to acquire useful information from that particular viewpoint. Once any useful information was found from the Web resources, the student would need to use certain means to record or mark the information, as well as its source, so as to answer the guiding questions or facilitate further retrieval. • To answer the questions, the student would need to categorize the concepts derived from the	• After gathering the required statistical items from the CIA database, the students needed to label them in a spreadsheet by relevant keywords, like size, population, average life expectancy, literacy rate, and crowdedness. The students would also categorize the statistical items in different rows or columns of the spreadsheet according to their types. • To analyze the statistical items, the students would need to connect some concepts derived from the information. For example, the crowdedness of a country could not be found from the CIA database.	• At the beginning, the students were prompted by two questions asking what was meant by healthy fast food and what made food healthy. To gain some ideas for the questions, the students would need to look at the Web materials provided. Once any useful information was found from the Web resources, the students would need to use certain means to record or mark the information, as well as its source, so as to answer the questions and facilitate further retrieval. • To answer the questions, the students would need to categorize the concepts derived from the

	weather, human health, food supply, greenhouse, fossil fuels, etc, according to the focus of each question. Some questions would also require the student to connect different concepts derived from the information. For example, climate and weather, global warming and sea level, atmosphere and greenhouse, fossil fuels and pollution. • Upon completion of individual inquiry, the four members came together to get into a group process, where they would not only categorize the information brought by the different roles but also attempt to combine the information so as to prepare their learning product.	information, such as reuse, paper recycling, plastic recycling, paper industry, recycling processes, types of plastics, environment friendly, environmental policies, fossil fuels, etc, according to the focus of each question. Some questions would also require the student to connect different concepts derived from the information. For example, paper bags and reuse/recycling, plastic bags and reuse/recycling, paper industry and environment friendly, types of plastics and recycling, plastic recycling and recycling processes, paper industry and fossil fuels, paper/plastic industry and environmental policies.	Thus, the students would need to, and they were also hinted to, construct an approximation of such item using the population and the area of a country. Besides, to study any correlation between two items (e.g. literacy rate and average life expectancy), the students would need to connect the concepts derived from the items as well. • In order to make inference on an item with no information (e.g. average income or number of people who own computer at home) from other relevant items they had collected (e.g. literacy rate), the students would need to connect the concepts derived from these items (e.g. using literacy rate to infer average income).	information, such as diet, nutrition, health, etc. They would also make connections between the concepts. For example, nutrition and diet, nutrition and health. • Subsequently, after gathering the required numerical data from the online fast food calorie counter, the students needed to label them in a spreadsheet by relevant keywords, like number of calories, and grams of fat. The students would also categorize the data in different rows or columns of the spreadsheet according to their types. • To facilitate data comparison, the students would need to connect the two concepts, nutrition and health, again that were derived from the information for the two questions at the beginning. • To study any correlation between the number of calories and grams of fat in fast food items, the students would need to connect the concepts derived from the relevant data.
[C8.2]	• During individual research, the four	• The four members of a group		

integrate the agreement and disagreement among sources	members of a group took on different roles of consultants and were provided with different, specific Web resources for inquiry. Afterwards, the group would need to combine the findings brought by the four roles. For a particular point regarding the theme of the WebQuest, the four roles might vary in the arguments on that point owing to the different sources of information. In such case, the students would need to bring the agreement and disagreement from information sources together for completing their learning product.	assumed the roles from four different viewpoints. Each of them was provided with a set of role-specific Web resources for individual inquiry. Subsequently, they would need to use their findings for discussing and debating among the four viewpoints in order to reach a consensus to be presented in their learning product. Since the four members varied in their viewpoints on the topic, they would need to integrate both agreement and disagreement for the topic, which came from different information sources supporting different viewpoints, in the process of reaching consensus.		
[C11.1] make inferences and simple generalizations from the evidence collected			• Upon completion of the report, the students were given four questions for discussion. In responding to the questions, they would need to give their inferences by referring to the data that they had analyzed, including the graphs, in the report. • The first two questions asked the students if they could find any correlation between literacy rate and	• Upon completion of the report, the students were given two questions for discussion. In responding to the questions, they would need to make simple generalizations and give their inferences by referring to 1) their answers to the two questions prompted at the beginning, and 2) the data that they had analyzed, including the charts, in the report.

			average life expectancy, and that between crowdedness and average life expectancy. To tell the correlations, the students would need to 1) study the relevant graphs, 2) discover any similar patterns from the graphs, and 3) attempt to arrive at a conclusion based on the limited data set. • The third and the fourth questions asked the students what they could tell about the average income among their selected countries and the number of people who owned a computer, with Internet access, at home in the selected countries. Since the students were not provided with these two items of information throughout the activity, they would need to make inferences from the relevant items, like inferring average income from literacy rate, and then inferring the number of people who owned computer at home from average income together with literacy rate.	• The first discussion question asked the students, in general, what they could tell about the food items provided by American fast food restaurants. In such case, the students would need to derive some common characteristics of American fast food items from the particular data set that they had collected in the report together with the use of the knowledge or information about healthy fast food that they had acquired through the activity. • The second discussion question asked the students if they could find any correlation between the number of calories and grams of fat in fast food items. To tell the correlation, the students would need to 1) study the relevant charts, 2) discover any similar patterns from the charts, and 3) attempt to arrive at a conclusion based on the limited data set.

Table 3.7: Relation between Specific Learning Outcomes and Individual WebQuests – Explanation

3.4.1.6 Quality Assurance of the WebQuests

To ensure the quality of the WebQuests, as mentioned, a group of experts were invited to review the design of each of them. The group consisted of three experts, namely *Expert A*, *Expert W*, and *Expert Y*, who were familiar with WebQuest.

A) Background of the Experts

Expert A was a PhD student, whose research focus was on Computer Supported Collaborative Learning. He was a university instructor, teaching a number of courses of a master's program in Information Technology in Education. He was also the instructor of a number of refresher training courses, organized by the Education Bureau of the HKSAR, on the design and application of WebQuest in teaching and learning for primary and secondary schools.

Expert W was an EdD candidate, whose research area was about teachers' perception of teaching with WebQuests. She was a teaching fellow in a tertiary institute, teaching a number of courses of a bachelor's program in Education and a diploma in Education program.

Expert Y was a PhD candidate, whose research focus was on the comparison of the WebQuest approach and project-based learning. She was a researcher in a university, taking part in a number of WebQuest research projects conducted in primary and secondary schools.

B) Evaluation Procedure

The evaluation procedure included two main parts. One was for evaluating the quality of the WebQuests. The other one was for examining the appropriateness of the WebQuests for information literacy instruction.

Concerning the quality of the WebQuests, the evaluation process began with March's (2007) evaluation rubric for assessing well-designed WebQuests (see Appendix 16). The rubric was made of eight criteria, namely "engaging opening", "the task", "background for everyone", "roles / expertise", "use of the Web", "transformative thinking", "real world

feedback", and "conclusion", and three scoring levels, which were labeled "low: 1 score", "medium: 2 scores", and "high: 3 scores".

On the basis of March's (2007) evaluation rubric, a grading system was adopted as an operational means among the reviewers. Each reviewer was requested to look at the set of WebQuests one by one and then score each WebQuest in accordance with the eight aspects and the scoring levels defined in March's (2007) rubric.

In regard to the appropriateness of the WebQuests for information literacy instruction, the reviewers were provided with two tables (*Table 3.6* and *Table 3.7*) in this dissertation. As mentioned above, *Table 3.6* indicates the relation between the set of target learning outcomes and the set of WebQuests, while *Table 3.7* explains how each WebQuest could help achieve individual target learning outcomes.

Each reviewer was first requested to examine and determine the relation indicated in *Table 3.6* on his/her own. He/she was then requested to examine the explanation of the relation stated in *Table 3.7*, followed by providing descriptive comments on the explanation.

To allow sufficient time for the reviewers, they were given one month to complete the evaluation. The researcher invited *Expert A*, *Expert W*, and *Expert Y* to be the reviewers via electronic mail. Together with the invitation (see Appendix 17a), a number of documents were attached to the email message that included:

- a WORD document containing four duplicated copies of March's (2007) evaluation rubric (see Appendix 17b), where each copy of the rubric was for one of the four WebQuests and a reviewer was required to enter the scores for the eight aspects in a rubric,
- a WORD document containing a table (*Table 3.6*) indicating the relation between the set of target learning outcomes and the set of WebQuests (see Appendix 17c), where a reviewer was required to indicate whether he/she agreed or disagreed with each relation shown in the table,

- a WORD document containing a table (*Table 3.7*) explaining the relation between the set of target learning outcomes and the set of WebQuests (see Appendix 17d), where a reviewer was required to give comments on the explanation of the relation presented in different cells of the table, and
- a WORD document containing the instructions, for the evaluation process, to the reviewers (see Appendix 17e).

Upon completion of the evaluation, each reviewer sent the modified WORD documents, in which the scores and comments given by him/her were shown, to the researcher via electronic mail.

C) Scores Assigned by WebQuest Experts

For the first document, the corresponding scores assigned by the three experts on each WebQuest were entered into a table in a spreadsheet. As a result, there were four tables in the spreadsheet. Since there were eight criteria in March's (2007) evaluation rubric, each table in the spreadsheet contained 24 scores (8 criteria × 3 experts) given by the three experts on a WebQuest.

In each table, 1) the total score given by an expert on the WebQuest and 2) the average of the three total scores were also calculated. Thus, there were 9 rows and 4 columns in the table. Each row indicated the scores given by the three experts for a criterion, while the last row contained the total scores given by each of the three experts and the average of the three total scores. Each column referred to the scores, together with the total, given by an expert.

The figure below presents a summary of the four tables showing an overview of the scores assigned by the three experts on the four WebQuests.

	WQ1				*WQ2*				*WQ3*				*WQ4*			
	EA	EW	EY	Avg	EA	EW	EY	Avg	EA	EW	EY	Avg	EA	EW	EY	Avg
Engaging Opening	3	2	2	2.33	3	3	3	3.00	3	2	3	2.67	3	3	3	3.00
The Question / Task	3	3	3	3.00	3	3	3	3.00	3	2	3	2.67	3	3	3	3.00
Background for Everyone	3	2	2	2.33	3	3	2	2.67	3	3	2	2.67	3	2	3	2.67
Roles / Expertise	3	2	3	2.67	3	3	3	3.00	3	2	2	2.33	3	2	3	2.67
Use of the Web	3	3	3	3.00	3	3	3	3.00	3	3	3	3.00	3	3	3	3.00
Transformative Thinking	3	2	2	2.33	3	3	2	2.67	3	3	2	2.67	3	2	2	2.33
Real World Feedback	3	2	3	2.67	3	2	3	2.67	3	2	2	2.33	3	2	3	2.67
Conclusion	3	2	2	2.33	3	2	2	2.33	3	2	2	2.33	3	2	3	2.67
Total Score:	**24**	**18**	**20**	**20.7**	**24**	**22**	**21**	**22.3**	**24**	**19**	**19**	**20.7**	**24**	**19**	**23**	**22.0**

* EA represents *Expert A*, EW represents *Expert W*, EY represents Expert Y, Avg represents average score.

Figure 3.8: Overview of Scores Assigned by Three Experts on the Four WebQuests

As indicated in the above figure, the scores given by *Expert A*, *Expert W*, and *Expert Y* on *WQ1* were 24, 18, and 20 respectively, while the average score on *WQ1* was 20.7. The scores given by the three experts on *WQ2* were 24, 22, and 21 respectively, while the average score on *WQ2* was 22.3. For *WQ3*, the three scores were 24, 19, and 19 respectively, while the average score was 20.7. For *WQ4*, they were 24, 19, and 23 respectively, while the average was 22.

In summary, the average scores assigned by the three experts on the four WebQuests were 20.7, 22.3, 20.7, and 22 respectively. According to the rating scale stated in March's (2007) evaluation rubric (see Appendix 16), a WebQuest with a total score between 20 and 24 is rated as 5 stars, the highest rank in his evaluation rubric, and regarded as a well-designed one.

Based upon the average scores assigned by the three experts, each of the four WebQuests in the study was rated as 5 stars and they were all well-designed WebQuests.

D) Determination of Expected Learning Outcomes

For the second document, it contained a table (*Table 3.6*) indicating the learning outcomes to be achieved by individual WebQuests. As an expert was required to determine

whether he/she agreed or disagreed with each learning outcome to be achieved by a WebQuest, any cells marked by the expert as "Disagree" were highlighted for further examination, especially looking at the comments given by the expert in the corresponding cells in the third document. The figure below presents a summary of the tables returned by the experts indicating their determination.

Target Learning Outcomes	Expert A				Expert W				Expert Y			
	WQ1	*WQ2*	*WQ3*	*WQ4*	*WQ1*	*WQ2*	*WQ3*	*WQ4*	*WQ1*	*WQ2*	*WQ3*	*WQ4*
[C6.1]	A	A	A	A	A	A	A	A	A	A	A	A
[C7.1]	A	A	A	A	A	A	A	A	A	A	A	A
[C8.1]	A	A	A	A	A	A	A	A	A	A	A	A
[C8.2]	A	A	N/A	N/A	D	A	N/A	N/A	D	A	N/A	N/A
[C11.1]	N/A	N/A	A	A	N/A	N/A	A	A	N/A	N/A	A	A

* A indicates agree, D indicates disagree, N/A represents not applicable.

Figure 3.9: Summary of Tables Returned by Three Experts Indicating Their Determination

As indicated in the above figure, there is no box marked by *Expert A* as "Disagree". *Expert A* determined that the four WebQuests could help students achieve the five learning outcomes.

Similarly, according to the responses given by *Expert W* and *Expert Y*, both of them determined that the WebQuests could basically help achieve the target learning outcomes, except the one relating *WQ1* and [C8.2]. As indicated in the above figure, the box between *WQ1* and [C8.2] was marked by both *Expert W* and *Expert Y* as "Disagree", which means the two experts disagreed that one of the WebQuests, *WQ1*, would be helpful in achieving the learning outcome [C8.2]. Thus, their comments, given in the third document, on the explanation of how *WQ1* could help achieve the learning outcome [C8.2] would be studied.

For the third document, it contained a table (*Table 3.7*) explaining how the set of

WebQuests offered opportunities for students to achieve the target learning outcomes. It allowed an expert to comment on the explanation of how each WebQuest helped achieve individual target learning outcomes. Appendix 23c presents the complete comments given by the three experts on the explanation.

As shown in Appendix 23c, *Expert A* provided comment on every point of the explanation in the given table (*Table 3.7*). In consistent with his determination of the target learning outcomes shown in *Figure 3.9*, there were no negative comments given by *Expert A* on the explanation. His comments supported every single point of the explanation stated in each box of the table. An example is shown below. Concerning the first point in the box explaining how *WQ1* could help achieve the learning outcome [C6.1], *Expert A* wrote "*the explanation is appropriate and well-grounded, matching with my examination*" (see *Table 23.9* in Appendix 23c for complete comments given by *Expert A*).

While looking at the comments given by *Expert W*, she provided comment on the explanation in each box of the given table (*Table 3.7*). In consistent with her determination of the target learning outcomes shown in *Figure 3.9*, there was one negative comment given by *Expert W* on the explanation. According to her comments (see *Table 23.10* in Appendix 23c for complete comments given by *Expert W*), *Expert W* supported and agreed with almost all points of explanation in the table, except the one explaining the relation between *WQ1* and the learning outcome "[C8.2]: integrate the agreement and disagreement among sources" that refers to the box marked by her as "Disagree" in the above figure. In her discussion, she argued that "*there was a lack of evidence showing that strong chasm among the sources of information would be induced during the group process though there were different roles in the WebQuest*".

Lastly, the comments given by *Expert Y* are concerned. Among the 16 boxes with explanation in the given table (*Table 3.7*), *Expert Y* provided comments on the explanation in 7 boxes only. In consistent with her determination of the target learning outcomes, there was

one negative comment given by *Expert Y* on the explanation in the 7 boxes (see *Table 23.11* in Appendix 23c for complete comments given by *Expert Y*). According to her comments, *Expert Y* supported and agreed with the explanation in 6 boxes and argued against the one explaining the relation between *WQ1* and the learning outcome "[C8.2]: integrate the agreement and disagreement among sources" that refers to the box marked by her as "Disagree" in the above figure. In her discussion, she did not agree that there were disagreements in the sources, regarding global warming, provided in *WQ1*. Thus, she did not agree that students might vary in the arguments on a point regarding global warming owing to different sources of information.

In summary of the expert review, the three experts recognized the information literacy aspect of the instrument. They determined that the design of the four WebQuests involved in the instrument could help students achieve the target learning outcomes. Two of them disagreed with the usefulness of one WebQuest in achieving a particular learning outcome. In spite of that, the instrument was considered as a whole that consisted of four WebQuests. Though one of the WebQuests (*WQ1*) was regarded by two experts as not useful for helping achieve the learning outcome [C8.1], according to the design of the instrument, there was another WebQuest (*WQ2*) that could help achieve the same learning outcome. As presented in Appendix 23c (see *Tables 23.9 – 23.11* in the appendix), all of the experts also supported the explanation of how *WQ2* could help achieve that learning outcome. At last, the results of the expert review addressed the appropriateness of the instrument, as a whole, for helping students achieve the target learning outcomes for information literacy.

Based upon the results of the expert review, the original *Table 3.6* was slightly modified to indicate the learning outcomes to be achieved by individual WebQuests in the instrument. The modified version is shown below. Subsequent to the modification, *WQ1* aimed at helping students achieve three of the target learning outcomes ([C6.1], [C7.1], and [C8.1]), while there were no changes to the learning outcomes to be achieved by students through the other

WebQuests in the instrument.

		Four WebQuests in the Instrument			
		WQ1	*WQ2*	*WQ3*	*WQ4*
Codes of the Target Learning Outcomes (Level III) to be Achieved by Students	[C6.1]	☑	☑	☑	☑
	[C7.1]	☑	☑	☑	☑
	[C8.1]	☑	☑	☑	☑
	[C8.2]		☑		
	[C11.1]			☑	☑
	Total:	3	4	4	4

Table 3.8: Summary of the Target Learning Outcomes to be achieved by Individual WebQuests

3.4.2 Instruments for Measuring Learning Effects

As reported, upon completion of the implementation of the WebQuests, the study investigated the effects of using the WebQuests on the improvement of students' information literacy. To achieve this purpose, so as to answer the research question, the instruments for measuring students' achievement of the target learning outcomes for information literacy were required.

As indicated in *Figure 3.1*, there were two major instruments developed and employed in this study for measuring the learning effects of using the WebQuests. These instruments studied the participants' overall achievement of the five learning outcomes summarized in the following table.

Codes of Learning Outcomes	Learning Outcomes for Information Literacy to be Achieved Through the WebQuests
[C6.1]	• make judgments and draw conclusions from research to solve problems
[C7.1]	• draw conclusion from the information collected and apply the knowledge to solve problems of similar nature
[C8.1]	• use multiple keywords or phrases to label information; categorize and connect the concepts derived from information
[C8.2]	• integrate the agreement and disagreement among sources
[C11.1]	• make inferences and simple generalizations from the evidence collected

Table 3.9: Summary of Learning Outcomes to be achieved through the WebQuests

Primarily, as mentioned, a pre-test/post-test approach was employed in the present study.

A pre-test and a post-test would be administered before and after the WebQuests. The tests were not subject-specific. The target learning outcomes of the WebQuests, as shown in the above table, were assessed by the tests. In addition, the work completed by students during the four WebQuests, including reports and presentation documents, would be analyzed to serve as a reference to part of the findings from the tests.

A group of three experienced teachers, as multiple raters, would be involved in analyzing the student work based upon four specially designed rubrics, which aimed at identifying the achievement of three target learning outcomes ([C6.1], [C7.1], and [C11.1]) from students' work.

3.4.2.1 Pre-test and Post-test

The two tests were developed by the researcher together with *Teacher T*, *Teacher W*, and *Teacher L*, who were all experienced teachers. The background of the three teachers is introduced in Section 3.4.1.2. In addition, the tests were reviewed and commented by three academics, namely *Academic M*, *Academic Y*, and *Academic L*.

Academic M and *Academic Y* were two PhD candidates, whose research areas were about information technology in education. *Academic L* was a university professor and also one of the originators and designers of the Information Literacy Framework for Hong Kong Students (EMB, 2005). The academics helped review the tests by providing professional comments on the design of the test items. *Academic L* further assisted the test designers (i.e. the researcher and the three experienced teachers) in interpreting the target learning outcomes defined in the Framework properly and designing appropriate assessment tasks for the target learning outcomes.

A) Two Concerns for the Tests

Basically, the pre-test (see Appendix 18) and the post-test (see Appendix 19) were similar in nature. They shared similar types of questions, equal number of tasks, and

equivalent format but differed in their themes. The theme of the pre-test was about volcanoes, which meant most of the information given in the test was related to this topic, while the theme of the post-test was about cloning technologies. The two tests were judged to be of equivalent difficulty.

As the two tests were designed to assess students' information skills, like the ability of using the given information, there were two concerns for the design of the tests. One related to the lower levels of content knowledge required for the test. Another one related to the avoidance of being a reading test.

For the first concern, the test designers sought to minimize the assessment of content knowledge. However, to design a test, in which students were presented with situations and were required to use the given information to answer questions or complete tasks that were related to the situations presented, it was inevitable that content knowledge was involved in the questions or tasks.

After much discussion, the test designers decided to adopt the two themes mentioned above for the tests. The decision was agreed by the researcher and the three experienced teachers. It was made on the basis of minimizing the assessment of content knowledge and, thus, maximizing the use of information given in the test. In other words, the test designers sought to find a topic or theme that had not been covered in the school curriculum by the time when the participants took the test.

As mentioned, the intended participants of the study were S.2 students. They would take the pre-test in the middle of the school year for Secondary 2, while they would learned about volcanoes at the end of that school year (a few months after the pre-test) through a school subject: Geography. Likewise, the theme of the post-test (cloning technologies) was chosen as it was not covered in the school curriculum for junior secondary levels. The purpose of such design was to minimize the assessment of content knowledge based upon the assumption that the participants did not learn about the themes, through the school curriculum,

prior to the tests. In such case, instead of using their prior knowledge, they might need to make use of the given information about the theme to answer the questions or complete the tasks in the test.

For the second concern, the test designers sought to limit the amount and difficulty of reading required. As the tests were paper-and-pencil tests, it was inevitable that written text was required to state situations and present information. Consequently, reading comprehension was a pre-requisite for completion of the tests. In the two tests, written texts were kept to a minimum for describing situations and key points were used for presenting information needed by students. In addition, to help students understand the given information, all information and test items were written in both English and Chinese. So that, students were not hindered by their English competence that might lead to misunderstanding of the information content.

B) Six Tasks Assessing Five Learning Outcomes

For each of the pre-test and the post-test, there were six tasks assessing the five learning outcomes ([C6.1], [C7.1], [C8.1], [C8.2], and [C11.1]), as summarized in *Table 3.9*. Each task was carefully designed to assess the corresponding learning outcomes.

Among the five learning outcomes, two of them were further divided into two parts. The learning outcome "[C8.1]: use multiple keywords or phrases to label information; categorize and connect the concepts derived from information" was further divided into "[C8.1a]: use multiple keywords or phrases to label information" and "[C8.1b]: categorize and connect the concepts derived from information". The learning outcome "[C7.1]: draw conclusion from the information collected and apply the knowledge to solve problems of similar nature" was further divided into "[C7.1a]: draw conclusion from the information collected" and "[C7.1b]: apply the knowledge to solve problems of similar nature". The table below shows the distribution of the learning outcomes assessed by each task in the pre-test and the post-test.

Task in Pre-test and Post-test	Learning Outcomes Assessed by Each Task
Task 1:	[C8.1a]: use multiple keywords or phrases to label information
Task 2:	[C8.1b]: categorize and connect the concepts derived from information
Task 3:	[C8.2]: integrate the agreement and disagreement among sources [C7.1a]: draw conclusion from the information collected
Task 4:	[C11.1]: make inferences and simple generalizations from the evidence collected
Task 5:	[C6.1]: make judgments and draw conclusions from research to solve problems
Task 6:	[C7.1b]: apply the knowledge to solve problems of similar nature

Table 3.10: Learning Outcomes Assessed by the Six Tasks in Pre-test and Post-test

As presented in the above table, each of Task 1, Task 2, Task 4, Task 5, and Task 6 was designed to assess one learning outcome. They were [C8.1a], [C8.1b], [C11.1], [C6.1], and [C7.1b] respectively. Task 3 was designed to assess a pair of learning outcomes. They were [C8.2] and [C7.1a]. Each of the six tasks is delineated in the rest of this section.

C) Task 1 of the Tests

Task 1 was designed to assess the learning outcome "[C8.1a]: use multiple keywords or phrases to label information". In the pre-test, the student was given two sets of authentic Web information (denoted by *WebInfo1-Pretest* and *WebInfo2-Pretest*), which were two particular pages from two Websites. The former (*WebInfo1-Pretest*) was an article, in Chinese, issued by an online magazine titled "SCIENTIFIC AMERICAN" (see Appendix 18a). The latter (*WebInfo2-Pretest*) was the front page of a portal Website, entitled "Volcano World", about volcanoes (see Appendix 18b). The Website was in English and hosted by Oregon State University.

For each given set of Web information, the student was required to use at most five sets of key words or phrases to label or record the key information of it. In order to utilize the test time, the Websites were printed on paper (see Appendix 18a and Appendix 18b) and delivered to the student as hardcopies.

Task 1 of the pre-test was revised two times since its initial design. The revision was all about the selection of the first set of Web information (i.e. *WebInfo1-Pretest*) and there was no change to the second one (i.e. *WebInfo2-Pretest*). At the beginning, a Website entitle "Introduction to Kilauea Volcano, Hawaii", with the URL "http://hvo.wr.usgs.gov/kilauea/", was selected for *WebInfo1-Pretest*. The Website was in English and, thus, it was suggested by *Teacher T* to replace it by a Website that was in Chinese. As mentioned in the previous paragraphs, the test was not a reading test for assessing English competence. The suggestion made by *Teacher T* resulted in balancing the English and Chinese reading materials for the student. It was accepted by other test designers.

In following with the suggestion made by *Teacher T*, the initial *WebInfo1-Pretest* was replaced by a Website entitled "Classification of Volcanoes", with the URL "http://ihouse.hkedcity.net/~hm1203/lithosphere/mount-v-types.htm", in which all the information was in Chinese. The Website contained plenty of information regarding volcanoes. It was designed by a Geography teacher of a local secondary school and hosted by the Hong Kong Education City (HKEdCity). However, it was replaced subsequently by the one adopted in the pre-test based upon the comment given by *Academic L*. It was pointed out by *Academic L* that the Website entitled "Classification of Volcanoes" served as a good teaching Website, which provided useful and well-organized materials about the topic, but failed to act as a kind of authentic information on the Web. According to his comment, some sort of authentic information was suggested for *WebInfo1-Pretest*. Eventually, following the professional comment given by *Academic L*, the test designers selected an article issued by an online magazine for *WebInfo1-Pretest*, while there was no change to the original *WebInfo2-Pretest* since it was a portal Website of a topic that was regarded by the test designers as a kind of authentic information.

Likewise, in the post-test, Task 1 was designed with similar requirements for the student. It provided two sets of authentic Web information (denoted by *WebInfo1-Posttest* and

WebInfo2-Posttest) to the student and required the student to use at most five sets of key words or phrases to label or record the key information of each given set.

To be consistent with the pre-test, the test designers selected two sets of authentic information, which were similar to those adopted in the pre-test, for *WebInfo1-Posttest* and *WebInfo2-Posttest*. They were also two particular pages from two Websites. The former (*WebInfo1-Posttest*) was an article, in Chinese, issued by the online magazine titled "SCIENTIFIC AMERICAN" (see Appendix 19a). The latter (*WebInfo2-Posttest*) was the front page of a portal Website, entitled "Cloning -- A Webliography", about cloning technologies (see Appendix 19b). The Website was in English and hosted by Michigan State University. The two Websites were also printed on paper (see Appendix 19a and Appendix 19b) and delivered to the student as hardcopies during the post-test.

D) Marking Scheme for Task 1 of the Tests

The marking scheme for Task 1 of the two tests was developed by the researcher, *Teacher T*, and two experienced language teachers (a Chinese teacher and an English teacher).

For the first given set of authentic Web information (in Chinese), the researcher, *Teacher T*, and the Chinese teacher read the Website carefully for figuring out a list of key words and phrases that represented the key information of the site. After much discussion, they finalized the list of key words and phrases, and decided on the scheme for scoring, as shown in *Figure 3.10*.

For the second given set of authentic Web information (in English), similar procedure was employed to develop the marking scheme. The researcher, *Teacher T*, and the English teacher read the Website carefully for figuring out a list of key words and phrases that represented the key information of the site. After much discussion, they finalized the list of key words and phrases, and decided on the scheme for scoring, as shown in *Figure 3.10*.

The tables below present the lists of finalized key words and phrases for the two sets of authentic Web information given in Task 1 of the pre-test.

1. 自我重建的火山 / 自我重建 / 火山重建過程
2. 聖海倫斯火山
3. 填補火山口 / 填滿火山口
4. 火山 / 火山活動
5. 火山警報
6. 噴發輕盈火山灰 / 掀起火山灰
7. 緩慢安靜的噴發
8. 至今持續噴發
9. 週期性吐出火山氣體
10. 液態的岩漿
11. 挖掘通往地表的通道 / 岩漿通往地表的路徑
12. 新的熔岩穹丘 / 狹長如脊椎的穹丘
13. 巨大的牙膏
14. 岩漿流動 / 熔岩持續噴出 / 持續好幾年的熔岩流
15. 緩慢的疊加在穹丘之上
16. 岩石穩定
17. 爆發的型態
18. 滲漏取代爆發

Table 3.11: List of Key Words and Phrases for the First Website Given in Task 1 of Pre-test

1. Volcanoes
2. Current Eruptions
3. Volcano FAQ
4. Volcano Adventures
5. Volcano History
6. New features of VW
7. Gamkonora volcano
8. Indonesia
9. eliminating pest / getting rid of a pest / free of a pest
10. sexava pest
11. shooting rocks, ash and smoke into air
12. coconut trees / leaves of the coconut tree
13. Ganesa Macula
14. Cryovolcano / ice volcano / cryovolcanism
15. Cryovolcanic flows
16. Undersea volcano
17. East Pacific Rise
18. Glossary and Terms
19. Satellite Images

Table 3.12: List of Key Words and Phrases for the Second Website Given in Task 1 of Pre-test

The tables below present the lists of finalized key words and phrases for the two sets of authentic Web information given in Task 1 of the post-test.

1. 複製 / clone / 克隆 /複製技術
2. 複製豬酷比
3. 複製的真正意涵 / 複製內涵
4. 複製動物
5. 細胞核的複製
6. 細胞核內的遺傳物質
7. 人工合成卵子培養胚胎的技術
8. 人為的基因轉殖技術
9. 有性生殖
10. 複製的本尊 / 本尊
11. 核移置技術
12. 早期胚細胞
13. 同卵雙生的雙胞胎
14. 遺傳缺陷
15. 早衰或早死
16. 醫學或經濟上的貢獻
17. 異體器官移植技術
18. 瀕臨絕種動物

Table 3.13: List of Key Words and Phrases for the First Website Given in Task 1 of Post-test

1. Cloning / issue of cloning
2. Webliography
3. Introduction to Cloning / how cloning works
4. Latest News/Science
5. Public Policy
6. Ethics / legal and ethical issues
7. Animal and human cloning / animal cloning / human cloning
8. biotechnology and biomedical research
9. whole organism cloning / cloning of organisms
10. genetically identical / genetic makeup / genetic material
11. embryonic cells / non-embryonic cell
12. nuclear transfer
13. clones of mammals
14. splitting embryos
15. artificial twinning
16. cloning from adult cells
17. cloned animals
18. therapeutic cloning and reproductive cloning / therapeutic cloning / reproductive cloning
19. misinformation of cloning / misinformation

Table 3.14: List of Key Words and Phrases for the Second Website Given in Task 1 of Post-test

The figure below presents the scheme for scoring the key words or phrases jotted by students in Task 1 of both tests.

- 1 score is given for matching any one of the key words/phrases in the list
- 0.5 score is given for partially matching any one of the key words/phrases in the list

Figure 3.10: Scheme for Scoring Key Words Jotted by Students in Task 1 of Both Tests

E) Tasks 2 and 3 of the Tests

Task 2 was designed to assess the learning outcome "[C8.1b]: categorize and connect the concepts derived from information", while Task 3 was designed for assessing two learning outcomes, which were "[C8.2]: integrate the agreement and disagreement among sources" and "[C7.1a]: draw conclusion from the information collected".

In the pre-test, subsequent to Task 1, the student was given twenty four items of information. Each of them was in the form of a short sentence. The items were all about a variety of effects of the theme (i.e. various effects caused by volcanoes in the pre-test, while various effects caused by cloning technologies in the post-test), where ten of them were positive effects and the rest were negative ones. The student was required to categorize the items (i.e. the effects) by drawing a mind map, in Task 2, and to give simple illustration or conclusion on those effects by integrating the given items, in Task 3.

To develop the twenty four items, the test designers browsed the FAQ section of the Website entitled "Volcano World", which was hosted by the Department of Geosciences at Oregon State University with the URL "http://volcano.und.edu/", to collect various effects of volcanoes. There were one hundred and one questions in the FAQ section. The test designers read through all the questions and extracted some key points from the answers of the questions. After the first round of extraction, the test designers collected 36 items about the effects of volcanoes. The items were then rephrased into simple sentences and also translated into Chinese, so that each item was presented to the student as a simple and short sentence, and also in both English and Chinese. After that, the 36 items were checked by a Geography teacher against their content.

In the second round of extraction, it was pointed out by *Teacher L* that the amount of reading (i.e. number of items) would be too much for the student. Thus, *Teacher L* suggested that there was a need to reduce the number of items in the pre-test and his suggestion was accepted by other test designers. The researcher together with the three experienced teachers

read carefully the 36 items a number of times and, finally, removed 12 of them from the pre-test (see Appendix 18c for the removed items).

Among the initial 36 items, 24 of them were negative effects of volcanoes and 12 were positive ones. Thus, in second round of selection, the test designers sought to balance the two groups of effects by removing more negative ones. Consequently, 10 items of negative effects (see Items 27-36 in Appendix 18c) and 2 of positive effects (see Items 25 & 26 in Appendix 18c) were removed. In addition to balancing the items of positive and negative effects, there were another two concerns in the second round of item selection. The first one related to the content of the items. If the effects presented by two or more items belonged to the same or similar category, only one of the items was kept in the pre-test and the others were removed. For example, it was considered by the test designers that Item 36 in Appendix 18c (i.e. "air quality near an eruption is poor") and Item 5 in the pre-test (i.e. "heavy ashfall can make people impossible to breathe") were close to each other in terms of meaning. Both of them were related to the air around an eruption and, thus, the effects presented by the two items would belong to the same or similar category. As a result, one of them was removed. The second concern was about the concept involved in an item. An item was removed if it included a concept that might be difficult to the student or out of his/her knowledge. For example, the test designers considered that the concept "pioneer species" involved in Item 25 in Appendix 18c (i.e. "eruption can provide habitat to pioneer species") might be difficult for the student to understand and, thus, the item was removed.

Upon completion of item selection, the test designers arranged the order of the 24 items carefully, so that neither a number of items of positive effects nor those of negative effects were clustered in the list.

With the presence of the 24 items, the student was required to categorize the effects using a mind map in Task 2. There was no limit on the number of categories. In the mind map, the student was not required to name each category. He/she could simply use a bubble to

represent a category and connect the appropriate items to the category by indicating the numbers of the items. An example was also given in the test. If necessary, the student might add sub-categories under certain categories.

Since its initial design, there was a major revision of the task. The initial design of Task 2 (see Appendix 18d) was different from that in the pre-test. It consisted of two parts. In the first part, the student was given 11 different ways of categorizing the 24 items. He/she was required to select two ways that he/she thought most appropriate for categorizing the effects. In the second part, the student was required to select one categorization method he/she chose previously. Then, the student needed to complete a mind map by connecting the 24 items to the categories defined in the chosen method. It was pointed out by *Academic L* that such design would fail to assess the learning outcome "[C8.1b]: categorize and connect the concepts derived from information". *Academic L* further assisted the test designers in interpreting the learning outcome by pointing out that an appropriate assessment task should provide the student a number of items followed by allowing the student to categorize the items on his/her own, instead of presenting a number of predefined categories to the student and requiring the student to make choices according to the given methods of categorization. Eventually, following the professional comment given by *Academic L*, the test designers revised the task as the one adopted in the pre-test.

Subsequent to Task 2, Task 3 required the student to give simple illustration and conclusion on the effects (both positive and negative) brought by volcanoes by integrating the 24 items. The student was allowed to write either in English or Chinese. Since its initial design, there was no revision to this task.

In the post-test, Task 2 and Task 3 were designed with similar settings and requirements. Prior to the two tasks, the student was presented with twenty one items of information. Each of them was in the form of a short sentence. The items were all about a variety of effects caused by cloning technologies, where nine of them were positive effects, nine were negative

effects, and the rest were neither positive nor negative ones. Like the two tasks in the pre-test, the student was required to categorize the items (i.e. the effects) by drawing a mind map, in Task 2, and to give simple illustration or conclusion on those effects by integrating the given items, in Task 3.

To develop the twenty one items, the test designers sought to maintain consistency with those in the pre-test, including the format of each item, and the amount of reading for the student. Like the development procedure employed in the pre-test, the test designers collected various effects of cloning technologies by browsing a number of Websites, which included mainly:

- the Website entitled "genome.gov | Cloning", hosted by the U.S. National Human Genome Research Institute, with the URL "http://www.genome.gov/25020028",
- the Website entitled "Understanding Animal Research", funded by two UK organizations, Research Defense Society and Coalition for Medical Progress, with the URL "http://www.understandinganimalresearch.org.uk/",
- an article, titled "From 'Cloned Sheep' to 'Cloned Human'", written by Dr. Wing-Hung KO, and issued by the Newsletter of the Society for Truth and Light, with the URL "http://www.truth-light.org.hk/article_v1/doc/a0000362.doc", and
- the Website entitled "Is Cloned Human Really Needed", hosted by the Chinese Academy of Sciences, with the URL "http://www.kepu.net.cn/big5/news/clone/".

The test designers gathered the required information (i.e. effects of cloning technologies) by extracting and summarizing some key points from the contents of the above Websites, and then rephrasing the points into short sentences. After the first round of extraction, the test designers collected 23 items about the effects of cloning technologies. Since two of the Websites mentioned above were in English and the other two were in Chinese, some of the items developed were in English and the others were in Chinese. In following with the practice done in the pre-test, those items in English were translated into Chinese and vice

versa, so that each item was presented to the student as a simple and short sentence, and also in both English and Chinese. After that, the 23 items were checked by a Biology teacher against their content.

To be consistent with the pre-test in respect of the amount of reading, the test designers read carefully the 23 items a number of times and, finally, removed 2 of them from the post-test in the second round of item selection (see Appendix 19c for the removed items). The removed items presented the negative effects of cloning technologies. They were removed because of long text description (see Items 22 & 23 in Appendix 19c). Upon completion of item selection, the test designers arranged the order of the 21 items carefully, so that neither a number of items of positive effects nor those of negative effects were clustered in the list.

Similarly, with the presence of the 21 items in the post-test, the student was required to categorize the effects using a mind map in Task 2. There was no limit on the number of categories. In the mind map, the student was not required to name each category. He/she could simply use a bubble to represent a category and connect the appropriate items to the category by indicating the numbers of the items. An example was also given in the test. If necessary, the student might add sub-categories under certain categories. Subsequently, task 3 required the student to give simple illustration and conclusion on the effects (both positive and negative) brought by cloning technologies by integrating the 21 items. The student was allowed to write either in English or Chinese.

F) Marking Scheme for Task 2 of the Tests

The marking scheme for Task 2 of the two tests took the form of a rubric for scoring students' mind maps. The rubric was developed and revised by the test designers.

To develop the rubric, the test designers first examined the mind maps from 50 samples, where half of them were selected randomly from the collected pre-test papers, with 5 from each of G_a, G_b, G_c, G_d, and G_e, and another half were selected randomly from the collected

post-test papers, with 5 from each of G_a, G_b, G_c, G_d, and G_e.[1] After that, the test designers attempted to figure out and summarize some specific performance characteristics from the chosen samples, so as to write the descriptors for the lowest and highest levels of a criterion followed by deliberating and writing those for the middle levels.

As Task 2 was designed to assess the learning outcome "[C8.1b]: categorize and connect the concepts derived from information", the rubric was developed with two criteria, namely "Categorization of Concepts" and "Connection of Items", and four levels of descriptors, termed beginning (score=1), developing (score=2), accomplished (score=3), and exemplary (score=4).

The first criterion, named "Categorization of Concepts", put emphasis on the first verb stated in the learning outcome (i.e. "categorize"). It looked at how the given items were categorized in the mind map. As shown in *Figure 3.11*, a score of 1 (beginning level) was given to a mind map, in which only two categories were established and a category was distinguishable from another. For the exemplary level, a score of 4 was given to a mind map, in which three or more categories were established. Each category represented a distinguishable concept that could be clearly distinguished from the others. Besides, sub-categories, representing distinguishable sub-concepts, were added under certain categories.

	Beginning (1 score)	Developing (2 scores)	Accomplished (3 scores)	Exemplary (4 scores)
Categorization of Concepts	Only two categories are established. A category is distinguishable from another.	Three or more categories are established. The concepts represented by two categories intersect each other.	Three or more categories are established. Each category represents a distinguishable concept that can be clearly	Three or more categories are established. Each category represents a distinguishable concept that can be clearly

[1] G_a, G_b, G_c, G_d, and G_e were the five groups of participants taking part in the main study. Details of the procedure of the research, including the participants, are delineated in Chapter 4.

			distinguished from the others.	distinguished from the others. Sub-categories, representing distinguishable sub-concepts, are added under certain categories.

Figure 3.11: First Criterion in the Rubric for Scoring Task 2 of Pre-test and Post-test

The second criterion, named "Connection of Items", put emphasis on the second verb stated in the learning outcome (i.e. "connect"). It looked at how the given items were connected to the categories in the mind map. As shown in *Figure 3.12*, a score of 1 (beginning level) was given to a mind map, in which only a few items connected to a category represented the instances of a common concept, while the others were discrete instances of different concepts. For the exemplary level, a score of 4 was given to a mind map, in which all items connected to a category represented correctly the instances of that category. Besides, for all categories in the mind map, there was no inappropriate connection of items.

	Beginning (1 score)	Developing (2 scores)	Accomplished (3 scores)	Exemplary (4 scores)
Connection of Items	Only a few items connected to a category represent the instances of a common concept, while the others are discrete instances of different concepts.	Most of the items connected to a category represent the instances of a common concept, while the others are discrete instances of different concepts.	All items connected to a category represent the correct instances of that category. For all categories in the mind map, there are a few inappropriate connections of items.	All items connected to a category represent correctly the instances of that category. For all categories in the mind map, there is no inappropriate connection of items.

Figure 3.12: Second Criterion in the Rubric for Scoring Task 2 of Pre-test and Post-test

Prior to marking the mind maps in the collected test papers based upon the rubric developed, *Teacher W*, *Teacher L*, and the researcher randomly selected 40 samples (20 from the pre-test papers and 20 from the post-test papers) for undertaking a trial run of the rubric.

Each of them examined and scored the samples on his own. Subsequent to piloting the rubric, two remarks for clarifying its usage were addressed.

First, it was about the names or labels of the categories written by students. A rater should be reminded that, even a name or a label of a category was given in the mind map, he/she should take it as a reference only and attempt to figure out a common concept shared by the connected items.

The second remark was a consensus on two particular cases of marking students' mind maps. It was agreed by *Teacher W*, *Teacher L*, and the researcher that a score of 3 (accomplished level) for the criterion "Connection of Items" should be given to a mind map when 1) all the items connected to a category represented the correct instances of that category, even with a few (1 or 2) items missing, or 2) an item connected to a category should be connected to another category but it was still reasonable for the category being connected. Another case related to the developing level. It was agreed by the two teachers and the researcher that a score of 2 for the criterion "Connection of Items" should be given to a mind map when there was one incorrect instance being connected to a category. The consensus on these two cases should help clarify the descriptors for the developing and accomplished levels of the criterion "Connection of Items" and maintain the consistency of scores assigned by independent raters.

G) Marking Scheme for Task 3 of the Tests

Like the one for Task 2, the marking scheme for Task 3 of the two tests took the form of a rubric for scoring students' writings (illustration and conclusion). The rubric was developed and revised by the researcher, *Teacher L*, and an experienced English teacher.

To develop the rubric, the researcher and the two teachers first examined the writings from 50 samples, where half of them were selected randomly from the collected pre-test papers, with 5 from each of G_a, G_b, G_c, G_d, and G_e, and another half were selected randomly

from the collected post-test papers, with 5 from each of G_a, G_b, G_c, G_d, and G_e.[2] After that, the test designers attempted to figure out and summarize some specific performance characteristics from the chosen samples, so as to write the descriptors for the lowest and highest levels of a criterion followed by deliberating and writing those for the middle levels.

As Task 3 was designed to assess two learning outcomes: "[C8.2]: integrate the agreement and disagreement among sources" and "[C7.1a]: draw conclusion from the information collected", the rubric was developed with two criteria, namely "Integration of Positive and Negative Items" and "Summarization of Items", and four levels of descriptors, termed beginning (score=1), developing (score=2), accomplished (score=3), and exemplary (score=4).

The first criterion, named "Integration of Positive and Negative Items" was designed to assess the learning outcome "[C8.2]: integrate the agreement and disagreement among sources". It looked at how the given positive and negative items were integrated in the illustration. As shown in *Figure 3.13*, a score of 1 (beginning level) was given to an illustration, in which a number of positive and/or negative instances were cited discretely. For the exemplary level, a score of 4 was given to an illustration, in which almost all positive and negative items were brought together according to their respective aspects/categories, and presented as a holistic discussion of the effects of the topic.

	Beginning (1 score)	Developing (2 scores)	Accomplished (3 scores)	Exemplary (4 scores)
Integration of Positive and Negative Items	A number of positive and/or negative instances are cited discretely.	The positive effects of one category and the negative effects of another (or the same) category of the given items are grouped and stated.	Most positive and negative items are brought together according to their respective aspects/categories. The overall (positive or negative) effects of	Almost all positive and negative items are brought together according to their respective aspects/categories, and presented as a holistic discussion of the effects

[2] G_a, G_b, G_c, G_d, and G_e were the five groups of participants taking part in the main study. Details of the procedure of the research, including the participants, are delineated in Chapter 4.

			individual aspects/categories are stated respectively.	of the topic.

Figure 3.13: First Criterion in the Rubric for Scoring Task 3 of Pre-test and Post-test

The second criterion, named "Summarization of Items" was designed to assess the learning outcome "[C7.1a]: draw conclusion from the information collected". It looked at how the given items were summarized in the conclusion. As shown in *Figure 3.14*, a score of 1 (beginning level) was given to a conclusion, in which a number of instances, particular effects or given items were stated discretely. For the exemplary level, a score of 4 was given to a conclusion, in which an overview covering the effects of various aspects of the given items was concisely presented.

	Beginning (1 score)	Developing (2 scores)	Accomplished (3 scores)	Exemplary (4 scores)
Summarization of Items	A number of instances, particular effects or given items are stated discretely.	The effects of one aspect of the given items are summarized and stated.	The effects of more than one aspect of the given items are summarized and stated.	An overview covering the effects of various aspects of the given items is concisely presented.

Figure 3.14: Second Criterion in the Rubric for Scoring Task 3 of Pre-test and Post-test

Prior to marking students' writings (illustration and conclusion) in the collected test papers based upon the rubric developed, the researcher, *Teacher L*, and the English teacher randomly selected 40 samples (20 from the pre-test papers and 20 from the post-test papers) for undertaking a trial run of the rubric. Each of them examined and scored the samples on his/her own. Subsequent to piloting the rubric, a consensus on two particular cases of marking students' writings was addressed.

It was agreed by the researcher and the two teachers that a score of 1 (beginning level) for the criterion "Integration of Positive and Negative Items" should be given to an illustration when merely negative points or instances were discussed in it. For another case, it was agreed by the researcher and the teachers that a score of 1 (beginning level) for the

criterion "Integration of Positive and Negative Items" and a score of 2 (developing level) for the criterion "Summarization of Items" should be given to a piece of writing merely mentioning that there were positive and negative effects without further explanation, summaries or examples. The consensus on these two cases should help clarify the corresponding descriptors of the rubric and maintain the consistency of scores assigned by independent raters.

H) Task 4 of the Tests

Task 4 was designed to assess the learning outcome "[C11.1]: make inferences and simple generalizations from the evidence collected". In each of the two tests, the student was given a set of historical facts and research findings about the theme followed by a series of true/false test items. To answer the true/false items, the student was required to make use of the given facts, together with the effects given previously, for making inferences or generalizations. The true/false test items were designed carefully by the researcher and the three experienced teachers, and further reviewed by *Academic M* and *Academic Y*.

In the pre-test, the set of historical facts and research findings was about volcanoes. It was presented to the student in tabular form, listing the deadly eruptions in the history since A.D. There were four columns in the table indicating the number of deaths, name and location of the volcano, year of eruption, and major cause of death. The table contained twenty four rows listing twenty four records of the most deadly eruptions. The records were arranged in descending order according to the number of deaths. All records were retrieved from the Website entitled "Volcano World", which was hosted by the Department of Geosciences at Oregon State University with the URL "http://volcano.und.edu/". Each English key word in the table, including column title, country name, and cause of death, was accompanied by a Chinese term so as to help the student understand its meaning. The student was suggested to use the records given in the table and the 24 items given previously to

answer twenty true/false questions.

In each question, the student was given a short statement in both English and Chinese. The statement set forth a conclusion, inference, or generalization related to the records in the table. The student was given four choices, namely "True", "Mostly True", "Cannot Decide", and "False", to determine the conclusion, inference, or generalization. The first choice, "True", referred to a condition that adequate or concrete evidence could be found from the data in the table or the 24 items for Tasks 2 and 3 to reach the given conclusion or inference. The second choice, "Mostly True", referred to a condition that a few positive instances could be found from the data in the table or the 24 items to support the given statement but it was not enough to reach a conclusion, inference, or generalization. The third choice, "Cannot Decide", referred to a condition that 1) one or a few negative instances could be found from the data in the table or the 24 items for the given statement, or 2) no evidence could be found from the data in the table or the 24 items to support the given statement. Lastly, the fourth choice, "False", referred to a condition that adequate or concrete evidence could be found from the data in the table or the 24 items to reject the given statement.

The following figure presents the statement given in the first item. To draw the conclusion, the student needed to go through all records in the table and locate the maximum number of deaths. He/she also needed to ensure that the table presented the most deadly eruptions in the history.

1.	The deadliest eruption on record killed about 92,000 people. 自有記錄以來，最嚴重的火山爆發令約九萬二千人致命。

Figure 3.15: Statement Given in the First Item of Task 4 in Pre-test

The following figure presents the statement given in the second item. To make the inference, the student needed to determine whether the comparison of the numbers of deadly eruptions in the past three centuries was sufficient to reach a conclusion about the number of deadly eruptions that would happen in this century.

2.	The number of deadly eruptions in the 19th century (i.e. 18XX) was more than that in the 18th century (i.e. 17XX), while that in the 20th century (i.e. 19XX) is again more than that in the 19th century (i.e. 18XX). Thus, we infer that there will be even more in the 21st century (i.e. 20XX). 在十九世紀發生致命火山爆發的次數比十八世紀為多，二十世紀的次數又比十九世紀為多，由此推論，廿一世紀將發生比二十世紀更多次數的致命火山爆發。

Figure 3.16: Statement Given in the Second Item of Task 4 in Pre-test

The following figure presents the statement given in the third item. To make the inference, the student needed to check whether there was an eruption in 1883 in Indonesia and look at the major cause of death. Once the student was informed that there was tsunami with the eruption, he/she needed to make use of Item 20 (i.e. "volcanism produces large amount of carbon dioxide") and Item 22 (i.e. "explosive eruptions near water can generate tsunami") given prior to Task 2 to determine whether it was possible that the eruption produced large amount of carbon dioxide.

3.	In 1883, there was large amount of carbon dioxide over Indonesia. 一八八三年，印尼上空曾出現大量二氧化碳。

Figure 3.17: Statement Given in the Third Item of Task 4 in Pre-test

The following figure presents the statement given in the fourth item. To make the generalization, the student needed to find out whether there were eruptions in Indonesia and Japan.

4.	There are some active volcanoes in Indonesia and Japan. 印尼及日本擁有一些活火山。

Figure 3.18: Statement Given in the Fourth Item of Task 4 in Pre-test

The following figure presents the statement given in the fifth item. To make the generalization, the student needed to find out whether there were eruptions in Indonesia and Japan and whether such eruptions resulted in serious damages and fatalities.

5.	Both Indonesia and Japan are threatened by volcanoes. 印尼及日本皆受火山威脅。

Figure 3.19: Statement Given in the Fifth Item of Task 4 in Pre-test

The following figure presents the statement given in the sixth item. To draw the

conclusion, the student needed to count the total number of deaths caused by eruptions in Asian countries and that in European countries, and then compare the two numbers.

6.	The number of deaths caused by volcano eruptions in Asia is more than that in Europe. 在亞洲，因火山爆發而致命的人數比歐洲為多。

Figure 3.20: Statement Given in the Sixth Item of Task 4 in Pre-test

The following figure presents the statement given in the seventh item. To make the inference, the student needed to find out whether there were more active volcanoes in Asian countries than those in European countries and also whether the possibility of eruptions by the active volcanoes in Asian countries was higher than that in European countries.

7.	There are more dangerous volcanoes in Asia than that in Europe. 亞洲比歐洲有較多具危險性的火山。

Figure 3.21: Statement Given in the Seventh Item of Task 4 in Pre-test

The following figure presents the statement given in the eighth item. To make the inference, the student needed to compare the total number of deaths due to eruptions in Asian countries and that in European countries. He/she might also compare other damages and influences caused by eruptions in Asian countries and that in European countries.

8.	The effects of volcanoes on Asia are worse than that on Europe. 火山對亞洲的影響較對歐洲的影響為嚴重。

Figure 3.22: Statement Given in the Eighth Item of Task 4 in Pre-test

The following figure presents the statement given in the ninth item. To make the inference, the student needed to find the major cause of death of that eruption (i.e. the eruption in Italy in 79 A.D.). Once the student was informed that the major cause of death related to ash flows and falls, he/she needed to make use of Item 15 (i.e. "heavy ashfall affects visibility") given prior to Task 2 to determine whether it was possible that those ash flows and falls affected visibility and also caused difficulty for people in escaping.

9.	In 79 A.D., the eruption in Italy affected visibility and thus caused difficulty in escaping. 公元七九年，意大利發生火山爆發，曾影響能見度，導致逃生困難。

Figure 3.23: Statement Given in the Ninth Item of Task 4 in Pre-test

The following figure presents the statement given in the tenth item. To draw the conclusion, the student needed to go through all records in the table and count the number of records, in which the major cause of death was related to mudflows or ash, followed by comparing the number with the total number of records in the table. Alternatively, the student might go through all records in the table and count the number of deaths due to mudflows and ash, followed by comparing the number with the total number of deaths in the table.

10.	Mudflows and ash are the major causes of deaths. 泥石流及火山灰為主要致命的原因。

Figure 3.24: Statement Given in the Tenth Item of Task 4 in Pre-test

The following figure presents the statement given in the eleventh item. To make the inference, the student needed to check whether there were volcanoes and eruptions in Indonesia. Then, he/she needed to make use of Item 6 (i.e. "volcanoes create new environments for plants and animals to migrate into"), Item 14 (i.e. "volcanoes provide refuges for rare plants and animals from the ravages of humans and livestock"), Item 16 (i.e. "eruption produces spectacular scenery and beautiful landscapes"), and Item 19 (i.e. "eruption can create new islands and land") given prior to Task 2 to determine whether the potentials for volcanic tourism, like new islands and land created by eruption, rare plants and animals living in environments created by eruption, and spectacular scenery and beautiful landscapes made by eruption, etc, were available in Indonesia.

11.	There is potential for Indonesia to develop volcanic tourism. 印尼具備發展火山旅遊業的潛在條件。

Figure 3.25: Statement Given in the Eleventh Item of Task 4 in Pre-test

The following figure presents the statement given in the twelfth item. To make the inference, the student needed to check whether there was an eruption in 1783 in Iceland and find the major cause of death and also the number of deaths.

12.	In 1783, there was starvation somewhere in Iceland that caused thousands of deaths. 冰島某處曾於一七八三年缺乏糧食，導致數以千人死亡。

Figure 3.26: Statement Given in the Twelfth Item of Task 4 in Pre-test

The following figure presents the statement given in the thirteenth item. To make the inference, the student needed to check whether there was an eruption in 1902 in Caribbean and look at the major cause of death. Once the student was informed that the major cause of death related to ash flows, he/she needed to make use of Item 20 (i.e. "volcanism produces large amount of carbon dioxide") given prior to Task 2 to determine whether it was possible that the eruption produced large amount of carbon dioxide.

13.	In 1902, there was large amount of carbon dioxide over Caribbean. 一九零二年，加勒比海群島上空曾出現大量二氧化碳。

Figure 3.27: Statement Given in the Thirteenth Item of Task 4 in Pre-test

The following figure presents the statement given in the fourteenth item. To make the inference, the student needed to find the number of eruptions in Japan in the 18th century and also the major cause of death of each eruption. Once the student was informed that there were three eruptions during that period and there was tsunami with two of them, he/she needed to make use of Item 22 (i.e. "explosive eruptions near water can generate tsunami") given prior to Task 2 to determine whether it was possible that the two eruptions with tsunami happened underwater.

14.	In the 18th century (i.e. 17XX), there were at least two eruptions underwater in Japan. 在十八世紀，日本曾發生至少兩次水底火山爆發。

Figure 3.28: Statement Given in the Fourteenth Item of Task 4 in Pre-test

The following figure presents the statement given in the fifteenth item. To make the inference, the student needed to find the number of eruptions in Indonesia in the 19th century and count the total number of deaths caused by those eruptions.

15.	In the 19th century (i.e. 18XX), the population of Indonesia decreased by more than one hundred thousand. 在十九世紀，印尼減少了十多萬人口。

Figure 3.29: Statement Given in the Fifteenth Item of Task 4 in Pre-test

The following figure presents the statement given in the sixteenth item. To make the inference, the student needed to find the major cause of death of that eruption (i.e. the

eruption in Philippines in 1991) and the number of deaths caused by the eruption. Once the student was informed that the major cause of death related to roof collapses and disease, and there were about 800 deaths, he/she needed to determine the number of roof collapses based upon the number of deaths, so as to determine the number of houses destroyed.

16.	In 1991, the eruption in Philippines destroyed a number of houses. 一九九一年，菲律賓發生火山爆發，摧毀了不少房屋。

Figure 3.30: Statement Given in the Sixteenth Item of Task 4 in Pre-test

The following figure presents the statement given in the seventeenth item. To make the inference, the student needed to find the major cause of death of that eruption (i.e. the eruption in Colombia in 1985) and the number of deaths caused by the eruption. Once the student was informed that the major cause of death related to mudflows and there were about 25000 deaths, he/she needed to make use of Item 24 (i.e. "explosive eruptions can make lahars and mudflows that flood valleys") given prior to Task 2 to determine whether it was possible that those mudflows flooded a number of valleys.

17.	In 1985, the mudflows from the eruption in Colombia flooded a number of valleys. 一九八五年，哥倫比亞多處低窪地方被泥石流淹沒。

Figure 3.31: Statement Given in the Seventeenth Item of Task 4 in Pre-test

The following figure presents the statement given in the eighteenth item. To draw the conclusion, the student needed to count the total number of deaths caused by eruptions in each country, as shown in the table, and then compare the numbers to locate the country with the most number of deaths.

18.	Indonesia is the country that has the most number of deaths caused by eruptions. 印尼是全球因火山爆發而導致死亡人數最多的國家。

Figure 3.32: Statement Given in the Eighteenth Item of Task 4 in Pre-test

The following figure presents the statement given in the nineteenth item. To make the inference, the student needed to compare the number of eruptions in Indonesia with those in other countries, as shown in the table. In addition, he/she needed to be aware that the table

indicated only the deadly eruptions in the history but not all eruptions in the history.

19.	Indonesia is the country that has the most number of eruptions. 印尼為全球火山爆發次數最多的國家。

Figure 3.33: Statement Given in the Nineteenth Item of Task 4 in Pre-test

The following figure presents the statement given in the twentieth item. To make the inference or generalization, the student needed to determine whether the examination of the number of deaths caused by eruptions in a country was sufficient to reach a conclusion about the warning system for eruptions of the country.

20.	Over the past two hundred years, there were about one hundred and thirty-eight thousand deaths caused by eruptions in Indonesia. Therefore, we infer that there is a lack of early warning system on eruptions in this country. 在過往二百年間，印尼因山火爆發導致死亡的總人數高達十三萬八千，由此推論，印尼缺乏一套有效的火山爆發預警系統。

Figure 3.34: Statement Given in the Twentieth Item of Task 4 in Pre-test

Similarly, in the post-test, the given set of historical facts and research findings was about cloning technologies. It was also presented to the student in tabular form, listing some major events about the recent development of cloning technologies. There were two columns in the table indicating the year of an event and a short description of the event. The table contained thirteen rows listing thirteen events related to the recent development of cloning technologies. All events were derived from a variety of online sources, including:

- the Web page entitled "Timeline of Cloning History", hosted by the New York Times Company, with the URL: "http://atheism.about.com/library/chronologies/blchron_sci_cloning.htm",
- the Web page entitled "Cloning Timeline", supported by the ORACLE ThinkQuest Education Foundation, with the URL: "http://library.thinkquest.org/24355/data/details/timeline.html",
- the Web page entitled "Milestones in Cloning", hosted by the News & Observer Publishing Company, with the URL "http://www.newsobserver.com/news/story/888509.html",

- the Web page entitled "The Cloning Milestones", hosted by the British Broadcasting Corporation, with the URL "http://news.bbc.co.uk/1/hi/health/3406611.stm",
- the Web page entitled "Cloning Milestones", hosted by Pearson Education publishing as Infoplease, with the URL "http://www.infoplease.com/ipa/A0193002.html", and
- the Web page entitled "Overview of World Human Cloning Policies", supported by the William & Flora Hewlett Foundation, with the URL "http://cnx.org/content/m14834/latest/".

To construct the table of the events, the test designers browsed the above online sources to collect a number of historical facts regarding cloning technologies. They arranged the information collected in chronological order followed by extracting part of the vast information for Task 4 of the post-test. After that, the test designers rephrased the events into simple sentences. Each event was also accompanied by its Chinese translation so as to help the student understand its meaning. As a result, each event was presented to the student as a simple and short sentence, and also in both English and Chinese, while all events in the table were arranged in chronological order. The student was suggested to use the events listed in the table and the 21 items given previously to answer twenty true/false questions.

Like the pre-test, in each true/false question, the student was given a short statement in both English and Chinese. The statement set forth a conclusion, inference, or generalization related to the events reported in the table. The student was given four choices, namely "True", "Mostly True", "Cannot Decide", and "False", to determine the conclusion, inference, or generalization. The interpretation of the four choices was the same as that of the choices employed in Task 4 of the pre-test.

The following figure presents the statement given in the first item. To make the inference, the student needed to be aware of the nature of data in the table. He/she needed to be aware that the table reported only the recent development of cloning technologies but not the development of cloning technologies in the history.

1.	Britain was the first country researching cloning technologies. 英國是全球最早研究複製技術的國家。

Figure 3.35: Statement Given in the First Item of Task 4 in Post-test

The following figure presents the statement given in the second item. To draw the conclusion, the student needed to study the first event in the table and extend the meaning of the case, as described in the event (i.e. "English embryologist cloned the world's first organism"), to determine whether the event and the statement given in Item 2 shared the same meaning.

2.	Britain was the first country that succeeded in cloning organism from adult cells. 英國是全球首個利用動物細胞複製出哺乳類動物的國家。

Figure 3.36: Statement Given in the Second Item of Task 4 in Post-test

The following figure presents the statement given in the third item. To make the inference, the student needed to study the second event in the table. He/she needed to focus on the year of the event (i.e. 1998) and also determine the purpose of the action, as reported in the event (i.e. "19 European nations signed a ban on human cloning"), by reasoning.

3.	A number of European nations planned to ban human cloning before 2000. 不少歐洲國家在二零零零年前已打算禁止複製人類的活動。

Figure 3.37: Statement Given in the Third Item of Task 4 in Post-test

The following figure presents the statement given in the fourth item. To make the generalization, the student needed to study the third event in the table and derive a general notion, as presented in the statement (i.e. "grasped the technology for cloning animals from frozen cells"), from an instance or case, as reported in the event (i.e. "cloned calves from frozen cells taken from a Japanese bull").

4.	Scientists have grasped the technology for cloning animals from frozen cells. 科學家已經掌握利用冷凍細胞來複製動物的技術。

Figure 3.38: Statement Given in the Fourth Item of Task 4 in Post-test

The following figure presents the statement given in the fifth item. To make the generalization, the student needed to study the fifth event in the table and derive a general

notion, as presented in the statement (i.e. "cloned animals can be cloned again"), from an instance or case, as reported in the event (i.e. "scientists cloned a baby bull from a bull that was a clone itself").

5.	Cloned animals can be cloned again. 複製動物可以再被複製。

Figure 3.39: Statement Given in the Fifth Item of Task 4 in Post-test

The following figure presents the statement given in the sixth item. To make the inference, the student needed to study the second and sixth events in the table together and determine the attitude of a country towards human cloning (i.e. "Britain did not sign a ban on human cloning in 1998") based upon her subsequent action (i.e. "Britain legalized the cloning of human embryos in 2000").

6.	Britain was not involved in the 19 European nations that signed a ban on human cloning in 1998. 一九九八年簽署有關複製人類禁令的十九個歐洲國家並不包括英國。

Figure 3.40: Statement Given in the Sixth Item of Task 4 in Post-test

The following figure presents the statement given in the seventh item. To draw the conclusion, the student needed to study the fourth event in the table and determine whether the instance reported in the event (i.e. "teams of Japanese and Scottish researchers announced that they had cloned pigs") led to a broad notion, as presented in the statement (i.e. "there was cooperation between Asian and European countries").

7.	There was cooperation between Asian and European countries for the research of cloning technologies. 曾有亞洲國家和歐洲國家共同研究複製技術。

Figure 3.41: Statement Given in the Seventh Item of Task 4 in Post-test

The following figure presents the statement given in the eighth item. To draw the conclusion, the student needed to go through all events in the table and look for those about successful cloning of animals, especially pig, bull, and sheep.

8.	Scientists succeeded in cloning several domestic animals, like pig, bull, and sheep. 科學家已成功複製出多種家畜動物，如豬、牛、羊。

Figure 3.42: Statement Given in the Eighth Item of Task 4 in Post-test

The following figure presents the statement given in the ninth item. To make the inference, the student needed to study the sixth event in the table and determine whether the legalization of one issue in a country was sufficient to conclude the entire legal system of the country.

9.	According to the event in 2000, we infer that Britain has a well-developed legal system. 從二零零零年的事件能看出，英國是一個具備完善法律制度的國家。

Figure 3.43: Statement Given in the Ninth Item of Task 4 in Post-test

The following figure presents the statement given in the tenth item. To draw the conclusion, the student needed to go through all events in the table and look for those about successful cloning of human embryo in the U.S. and Britain respectively followed by comparing the years of the events found.

10.	Human embryo was cloned in the U.S. at a later time than that was done in Britain. 美國比英國較遲複製出人類胚胎。

Figure 3.44: Statement Given in the Tenth Item of Task 4 in Post-test

The following figure presents the statement given in the eleventh item. To make the inference, the student needed to study the sixth event in the table and extend the meaning of the law, as described in the event (i.e. "cloned human embryos must be destroyed after 14 days").

11.	Subsequent to 2000, it is legal for scientists in Britain to keep the cloned human embryos for long period. 二零零零年後，科學家在英國可以把複製出來的人類胚胎長期保存。

Figure 3.45: Statement Given in the Eleventh Item of Task 4 in Post-test

The following figure presents the statement given in the twelfth item. To make the inference, the student needed to study the first six events in the table and figure out the research focus of scientists from those events. He/she also needed to be aware that the table

reported only some major events about the development of cloning technologies but not all events about the development of cloning.

12.	From 1996 to 2000, scientists mainly worked on the research of animal cloning. 一九九六至二零零零年間，科學家們主要集中研究動物複製技術。

Figure 3.46: Statement Given in the Twelfth Item of Task 4 in Post-test

The following figure presents the statement given in the thirteenth item. To make the inference, the student needed to study the sixth, seventh, eighth, and ninth events in the table. From the sixth and seventh events, he/she needed to be aware that there was research on human cloning in both the U.S. and Britain. From the action done by the U.S., as reported in the eighth event (i.e. "the U.S. asked for banning all forms of human cloning"), the student needed to determine the position taken by the U.S. on human cloning. From the actions done by Britain, as reported in the sixth and ninth events (i.e. "Britain legalized the cloning of human embryos" and "Britain wanted to allow therapeutic cloning"), the student needed to determine the position taken by Britain on human cloning followed by comparing the positions taken by the two countries on the issue.

13.	In 2004, the U.S. and Britain were divided in opinion on banning cloning. 二零零四年，英、美兩國對禁止複製活動的問題，意見有所分歧。

Figure 3.47: Statement Given in the Thirteenth Item of Task 4 in Post-test

The following figure presents the statement given in the fourteenth item. To make the inference, the student needed to study the tenth event in the table and determine whether the instance reported in the event (i.e. "a U.S. woman paid a company for cloning her cat, the first cat cloned for commercial reasons") led to a broad notion, as presented in the statement (i.e. "there is commercial business related to cloning technologies in the U.S.").

14.	In the U.S., there is commercial business related to cloning technologies. 以複製科技賺錢的行業已於美國出現。

Figure 3.48: Statement Given in the Fourteenth Item of Task 4 in Post-test

The following figure presents the statement given in the fifteenth item. To make the

inference, the student needed to study the eleventh event in the table and figure out whether South Korea had grasped the technology for cloning pets. In addition, he/she needed to determine whether technology was the only requirement for a country to develop cloning business.

15.	South Korea also meets the requirements for developing pet cloning business. 南韓也具備發展複製寵物行業的條件。

Figure 3.49: Statement Given in the Fifteenth Item of Task 4 in Post-test

The following figure presents the statement given in the sixteenth item. To make the inference, the student needed to study the second last event in the table and find out how many countries were members of the United Nations. Then, he/she needed to determine whether 84 countries were sufficient to represent most members of the United Nations, or even to represent most countries in the world. He/she also needed to determine whether the countries voting in favor of a nonbinding statement for an issue could reveal their attitudes towards supporting or opposing the issue.

16.	In 2005, most countries in the world supported a total ban on human cloning. 二零零五年，全球大部份國家支持禁止所有複製人類的活動。

Figure 3.50: Statement Given in the Sixteenth Item of Task 4 in Post-test

The following figure presents the statement given in the seventeenth item. To make the inference, the student needed to study the last event in the table and extend the meaning of the case, as described in the event (i.e. "the 5 cloned human embryos were destroyed as being unethical and illegal").

17.	Nowadays in the U.S., cloning human embryos is illegal. 現今在美國，複製人類胚胎屬於違法行為。

Figure 3.51: Statement Given in the Seventeenth Item of Task 4 in Post-test

The following figure presents the statement given in the eighteenth item. To make the generalization, the student needed to go through all events in the table and look for the cases about successful human or animal cloning in different countries. Then, he/she needed to

compare the cases occurred in the four countries, as mentioned in the statement (i.e. the U.S., Britain, Japan, and Korea), with those occurred in other countries, so as to determine the leading ones.

18.	The U.S., Britain, Japan and Korea are the leading countries in cloning technologies. 美、英、日、韓四國在複製科技方面具有領導地位。

Figure 3.52: Statement Given in the Eighteenth Item of Task 4 in Post-test

The following figure presents the statement given in the nineteenth item. To make the generalization, the student needed to go through all events in the table and look for those related to each of the four countries, as mentioned in the statement (i.e. the U.S., Britain, Japan, and Korea). Then, he/she needed to conclude the events related to each country, so as to determine the research focus of the country. The student also needed to be aware that the table reported only some major events about the development of cloning technologies but not all events about the development of cloning.

19.	The U.S. and Britain mainly work on the research of human cloning, while Japan and Korea work on that of animal cloning. 美、英兩國主要研究人類複製技術，日、韓則以研究動物複製為主。

Figure 3.53: Statement Given in the Nineteenth Item of Task 4 in Post-test

The following figure presents the statement given in the twentieth item. To make the inference, the student needed to go through all events in the table and look for those about cloning of animals, especially the animals mentioned in the statement (i.e. dog, bull, and sheep). Then, from the events or cases found, he/she needed to figure out the difficulty of cloning each kind of animals, so as to facilitate further comparison. Alternatively, the student might go through all events in the table and look for the years of the first cloning of the three kinds of animals, as mentioned in the statement (i.e. dog, bull, and sheep). Then, he/she might take the years as a reference for estimating and comparing the difficulties.

20.	It is more difficult to clone dogs than to clone bull or sheep. 複製狗隻所需的技術比起複製牛、羊的技術較為困難。

Figure 3.54: Statement Given in the Twentieth Item of Task 4 in Post-test

l) Marking Scheme for Task 4 of the Tests

The answers to the test items in Task 4 of the two tests were determined by the test designers and two academics (*Academic M* and *Academic Y*). As reported above, the two academics also helped review and comment on the test items during the development stage.

After much discussion, the test designers carefully determined the answer to each true/false test item in Task 4. Subsequently, the researcher further discussed those answers with *Academic M* and *Academic Y* to check for the need of any necessary revision.

The figure below presents the answers to the twenty true/false items in Task 4 of the pre-test. As shown in *Figure 3.55*, multiple answers were accepted for Items 2, 5, 8, 10, 13, 15, 16, 18, and 20. For example, either "Mostly True" or "Cannot Decide" was considered correct for Item 8.

Item No.	True	Mostly True	Cannot Decide	False	Item No.	True	Mostly True	Cannot Decide	False	Item No.	True	Mostly True	Cannot Decide	False
1.	☑	☐	☐	☐	8.	☐	☑	☑	☐	15.	☑	☑	☐	☐
2.	☐	☐	☑	☑	9.	☐	☐	☑	☐	16.	☑	☑	☐	☐
3.	☐	☐	☑	☐	10.	☑	☑	☐	☐	17.	☐	☐	☑	☐
4.	☑	☐	☐	☐	11.	☐	☐	☑	☐	18.	☑	☑	☐	☐
5.	☑	☑	☐	☐	12.	☑	☐	☐	☐	19.	☐	☐	☑	☐
6.	☑	☐	☐	☐	13.	☑	☑	☐	☐	20.	☐	☐	☑	☑
7.	☐	☐	☑	☐	14.	☐	☐	☑	☐					

Figure 3.55: Answers to True/False Items in Task 4 of Pre-test

The figure below presents the answers to the twenty true/false items in Task 4 of the post-test. As shown in *Figure 3.56*, multiple answers were accepted for Items 4, 5, 6, 8, 9, 12, 13, 15, 17, 18, 19, and 20. For example, either "Cannot Decide" or "False" was considered

correct for Item 9.

Item No	True	Mostly True	Cannot Decide	False	Item No.	True	Mostly True	Cannot Decide	False	Item No.	True	Mostly True	Cannot Decide	False
1.	☐	☐	☑	☐	8.	☑	☑	☐	☐	15.	☐	☑	☑	☐
2.	☑	☐	☐	☐	9.	☐	☐	☑	☑	16.	☐	☐	☑	☐
3.	☑	☐	☐	☐	10.	☐	☐	☑	☐	17.	☑	☑	☐	☐
4.	☑	☑	☐	☐	11.	☐	☐	☐	☑	18.	☐	☑	☑	☐
5.	☑	☑	☐	☐	12.	☐	☐	☑	☑	19.	☐	☐	☑	☑
6.	☐	☑	☑	☐	13.	☑	☑	☐	☐	20.	☐	☑	☑	☐
7.	☑	☐	☐	☐	14.	☐	☐	☑	☐					

Figure 3.56: Answers to True/False Items in Task 4 of Post-test

J) Task 5 of the Tests

Task 5 was designed to assess the learning outcome "[C6.1]: make judgments and draw conclusions from research to solve problems". In each of the two tests, the student was presented with a situation in relation to the theme. He/she was required to make decisions on the questions posed in the situation by making use of all the information acquired from the test. The student could select from the choices provided or specify others. For each of his/her decision, the student was required to provide the reason.

In the pre-test, the student was asked what he/she would do if there was a sudden volcano eruption near where he/she lived. The student was given 14 choices, which were presented to him/her as simple and short phrases, and also in both English and Chinese. The choices were further divided into 2 groups, namely "before the eruption" and "after the eruption", where the key words "before" and "after" were marked with underlines in order to highlight the two different conditions. In each group, the student was required to select two

that he/she considered the most important among the seven given choices. In addition, an extra choice, named "Others, please specify", was available for the student to specify any particular action, which was not included in the given ones. For each of his/her choice, the student was required to give a brief reason. The student was allowed to write either in English or Chinese. The figure below presents the choices given in Task 5 of the pre-test.

During the eruption, I will 火山爆發時，我會 (Please select two 請選兩項)：	After the eruption, I will 火山爆發後，我會 (Please select two 請選兩項)：
☐ Seek shelter indoors 尋找室內地方作庇護	☐ Stay indoors and close doors, windows, and all ventilation 留在室內及關上所有門窗及抽風系統
☐ Avoid river valleys or low-lying area 避免走進河谷或低窪地區	☐ Wear long-sleeved shirts and long pants 穿上長袖衫及長褲
☐ Stay away from open space 遠離空曠地方	☐ Use goggles or wear eyeglasses 戴上護目鏡
☐ Stay away from seashore 遠離海邊	☐ Put on a dust mask or hold a damp cloth over the face 戴上防塵面具或用濕布罩面
☐ Stay away from hillside 遠離山坡	☐ Stay away from volcanic ashfall 遠離降火山灰的地方
☐ Cover my mouth and nose 掩蔽口鼻	☐ Avoid driving or turning on truck engines 避免駕車或發動汽車引擎
☐ Avoid areas downwind of the volcano 避免走進風向從火山吹來的地方	☐ Clear heavy ash from flat or low-pitched roofs and rain gutters 清理積累的火山灰及雨水渠
☐ Others 其他，please specify 請說明：	☐ Others 其他，please specify 請說明：

Figure 3.57: Sixteen Choices given in Task 5 of Pre-test

To develop the choices, the test designers browsed the Website entitled "What to Do During a Volcanic Eruption", hosted by the U.S. Department of Homeland Security with the URL "http://www.fema.gov/hazard/volcano/vo_during.shtm", and the Website entitled "Preparing for Events, Volcanoes", hosted by the American Red Cross with the URL "http://www.redcross.org/", to gather a number of suggested actions during and after a volcanic eruption. Afterwards, they selected carefully some key points from the suggestions to develop

the choices, so that each selected choice was supported by a reason that could be found from the 24 items given prior to Task 2 or the records listed in the table for Task 5. Subsequently, the test designers rewrote the choices using simple phrases and supplied a Chinese translation to each of them so as to help the student understand its meaning. As a result, each choice was presented to the student as a simple and short phrase, and also in both English and Chinese.

Likewise, in the post-test, Task 5 was designed with similar settings and requirements. The student was presented with a situation, in which he/she was the general manager of an advanced technology company. The company was going to establish a new department, which would be dedicated for the research of cloning technologies. Soon, the company received a number of objections from different community organizations and religious people. However, the government and a number of medical practitioners strongly supported the establishment of such department. As the general manager, the student was asked to make decisions for the company.

The student was given 14 choices, which were presented to him/her as simple and short phrases, and also in both English and Chinese. He/she was required to select two that he/she considered the most appropriate among the given choices. One of the choices was named "Others, please specify", which allowed the student to specify any particular decision that was not included in the given ones. For each of his/her choice, the student was required to give a brief reason. The student was allowed to write either in English or Chinese. The figure below presents the choices given in Task 5 of the post-test. As shown in *Figure 3 58*, the key words in each choice were marked with underlines in order to highlight the focus of the choice.

- ☐ Establish the new department researching all kinds of cloning technologies.
  成立新部門，全面研究各種生物複製技術。
- ☐ Establish the new department researching all kinds of technologies for animal cloning.
  成立新部門，全面研究各種動物複製技術。
- ☐ Establish the new department researching the technology for mammal cloning only.
  成立新部門，只研究哺乳類動物的複製技術。
- ☐ Establish the new department researching the technology for livestock cloning only.
  成立新部門，只研究家畜動物的複製技術。
- ☐ Establish the new department researching the technology for pet cloning only.
  成立新部門，只研究寵物的複製技術。
- ☐ Establish the new department researching the technology only for cloning endangered species.
  成立新部門，只研究瀕臨絕種動物的複製技術。
- ☐ Establish the new department researching the technology only for cloning extinct species.
  成立新部門，只研究已絕種動物的複製技術。
- ☐ Establish the new department researching all kinds of technologies for human cloning.
  成立新部門，全面研究各種人類複製技術。
- ☐ Establish the new department researching the technology for human embryo cloning only.
  成立新部門，只研究人類胚胎的複製技術。
- ☐ Establish the new department researching the technology for therapeutic cloning only.
  成立新部門，只研究醫療性（或治療性）複製技術。
- ☐ Establish the new department researching the technology for human organ cloning only.
  成立新部門，只研究人類器官的複製技術。
- ☐ Establish the new department researching the technology for bone marrow cloning only.
  成立新部門，只研究骨髓的複製技術。
- ☐ Give up the establishment of the new department researching cloning technologies.
  放棄成立研究複製技術的新部門。
- ☐ Others 其他，please specify 請說明：

Figure 3.58: Fourteen Choices given in Task 5 of Post-test

To develop the choices, the test designers reviewed carefully all the information provided to the student in the post-test. Through a number of discussions, they created the choices of decisions one by one, so that each of them was supported by a reason that could be found from the 21 items given prior to Task 2 or the events listed in the table for Task 5. After that, the test designers refined the expression of the choices with simple phrases and supplied

a Chinese translation to each of them so as to help the student understand its meaning. As a result, like the pre-test, each choice was presented to the student as a simple and short phrase, and also in both English and Chinese.

K) Marking Scheme for Task 5 of the Tests

The marking scheme for Task 5 of the two tests was developed by the test designers. Through a number of discussions, they decided on the following scheme for scoring the reasons provided by a student along with his/her choices.

A maximum score of 2 was given to a reason according to the following two conditions. First, a score of 1 was given to a reason if it fulfilled the two requirements below:

1. the reason was relevant to the choice, and
2. it was clear and specific (not general).

The emphasis of the first requirement was on whether a student could provide a reason to support his/her judgment. A score of 0.5 was given to a reason if it solely fulfilled the first requirement but failed to meet the second one. However, no score was given to a reason even if it was clear and specific enough (i.e. fulfilling the second requirement) but failed to meet the first requirement.

Next, another score of 1 was given to a reason if it fulfilled the two requirements below:

1. it was derived from the information given in the test, and
2. it was relevant to the choice.

The emphasis of the first requirement was on whether a student could make use of the facts and findings acquired from the test to solve problems. A score of 0.5 was given to a reason if it solely fulfilled the first requirement but failed to meet the second one. However, no score was given to a reason even if it was relevant to the choice (i.e. fulfilling the second requirement) but failed to meet the first requirement.

L) Task 6 of the Tests

Lastly, Task 6 was designed to assess the learning outcome "[C7.1b]: apply the knowledge to solve problems of similar nature". In each of the two tests, the student was given four short-answer test items concerning the knowledge of generic skills. The test items were presented to the student in both English and Chinese, and the key words in each item were bold and marked with underlines in order to highlight its focus. The student was allowed to answer the test items in English or Chinese.

In the pre-test (i.e. before the WebQuests), the questions were about the research experience that the student would go through in the WebQuests. Since the participants were supposed to gain generic skills through the WebQuests, like taking four different viewpoints into account for an open issue, collecting relevant statistical data for a given research question, etc, they were expected to apply such knowledge of generic skills to problems or research with similar nature after completing the WebQuests. Thus, the student was asked similar questions with different content and context in the post-test (i.e. after the WebQuests), such as which four viewpoints were required to take into account for another open issue, what statistical data was necessary for another research question, etc.

Question 1 of the two tests related to *WQ4* in the instrument. In the pre-test, there were two parts in Question 1. As shown in *Figure 3.59*, part (a) presented a situation to the student that he/she was going to do a research about the healthiest fast food restaurant in Hong Kong. The student was required to state two questions that he/she would like to study before the research. Subsequently, as shown in *Figure 3.60*, part (b) required the student to give three items of information that he/she needed to collect for the research.

In the WebQuests, especially in *WQ4*, the participants went through some sort of learning experience in preparing a short report about the healthiest fast food restaurant by researching a number of fast food items at different fast food restaurants. At the beginning of the activity, there were two guiding questions inducing the participants to think 1) the

meaning of healthy fast food and 2) what makes food healthy. Subsequently, the participants underwent a research process of gathering the calories and grams of fat of some fast food items for analysis. Through the activity, the participants were supposed to gain some generic skills, including raising relevant questions (i.e. the meaning of healthy fast food and what makes food healthy) prior to studying the main research question (i.e. the healthiest fast food restaurant), and collecting required statistical data (i.e. calories of fast food items and grams of fat of fast food items) for the research question.

Therefore, in the post-test, the student was given a similar research question and was required to raise two relevant questions prior to studying the given research question and to state three kinds of data required for the research question. Like the pre-test, there were two parts in Question 1. As shown in *Figure 3 61*, part (a) presented a situation to the student that he/she was going to do a research about the most environmentally friendly secondary school in Hong Kong. The student was required to state two questions that he/she would like to study before the research. Subsequently, as shown in *Figure 3 62*, part (b) required the student to give three items of information that he/she needed to collect for the research.

Q6.1 (a) Suppose you are going to do a research about **the healthiest fast food restaurant** in Hong Kong. What **questions** would you like to study first? Please write **two questions** on the following lines.
假若你將進行一項關於"全港最健康快餐店"的研究，你會先定立哪兩條研究問題作為開始？請在下列橫線，寫出這兩條問題。

Figure 3 59 Question 1(a) of Task 6 in Pre-test

Q6.1 (b) To do the above research, what kind of **information** do you need to collect? Please write **three items of information** on the following lines.
如若進行以上研究，你需要收集什麼資料？請在下列橫線，寫出三項該等資料。

Figure 3 60 Question 1(b) of Task 6 in Pre-test

Q6.1 (a) Suppose you are going to do a research about **the most environmentally friendly secondary school** in Hong Kong. What **questions** would you like to study first? Please write **two questions** on the following lines.
假若你將進行一項關於"全港最環保中學"的研究，你會先定立哪兩條研究問題作為開始？請在下列橫線，寫出這兩條問題。

Figure 3.61: Question 1(a) of Task 6 in Post-test

Q6.1 (b) To do the above research, what kind of **information** do you need to collect? Please write **three items of information** on the following lines.
如若進行以上研究，你需要收集什麼資料？請在下列橫線，寫出三項該等資料。

Figure 3.62: Question 1(b) of Task 6 in Post-test

Question 2 of the two tests related to *WQ3* in the instrument. In the pre-test, as shown in *Figure 3.63*, the question presented a situation to the student that he/she wanted to know whether the living conditions and the development of another country was better or worse than those of his/her home country. The student was required to give three items of information that he/she would like to collect for analysis.

In the WebQuests, especially in *WQ3*, the participants went through some sort of learning experience in comparing the living conditions and the development of four countries by gathering and analyzing their areas, populations, average life expectancies, literacy rates, and crowdedness. Through the activity, the participants were supposed to gain some generic skills, including collecting relevant statistical data (i.e. area, population, average life expectancy, literacy rate, and crowdedness) for a research question (i.e. whether the living conditions and development of the Western countries were better or worse than those of the home country).

Therefore, in the post-test, the student was given a similar research question and was required to state three kinds of data required for the research question. Like the pre-test, as shown in *Figure 3.64*, the question presented a situation to the student that he/she wanted to know whether the public transportation of another city was better or worse than that of Hong

Kong. The student was required to give three items of information that he/she would like to collect for analysis.

Q6.2	If you want to know whether **the living conditions and the development** of another country is better or worse than those of your home country, what kind of **information** would you like to collect for analysis? Please write **three items of information** on the following lines. 假若你想了解某國家的生活條件及發展是否比自己國家更好或更差，你會收集什麼資料作分析？請在下列橫線，寫出三項該等資料。

Figure 3.63: Question 2 of Task 6 in Pre-test

Q6.2	If you want to know whether **the public transportation** of another city is better or worse than that of Hong Kong, what kind of **information** would you like to collect for analysis? Please write **three items of information** on the following lines. 假若你想了解某城市的公共交通工具是否比香港更好或更差，你會收集什麼資料作分析？請在下列橫線，寫出三項該等資料。

Figure 3.64: Question 2 of Task 6 in Post-test

Question 3 of the two tests related to *WQ2* in the instrument. In the pre-test, as shown in *Figure 3.65*, the question presented a situation to the student that he/she was going to help the government establish a law about whether all supermarkets should provide paper bags instead of plastic bags to their customers. The student was required to state three viewpoints from people that he/she should take into consideration.

In the WebQuests, especially in *WQ2*, the participants went through some sort of learning experience in helping shoppers of a grocery store make decisions on choosing paper or plastic bags by considering the viewpoints from the paper advocate, plastic advocate, recycling pessimist, and concerned citizen. Through the activity, the participants were supposed to gain some generic skills, including taking four different viewpoints (i.e. paper advocate, plastic advocate, recycling pessimist, and concerned citizen) into account for an open issue (choosing paper or plastic bags).

Therefore, in the post-test, the student was given another open issue and was required to state three different viewpoints that should be taken into account for the issue. Like the

pre-test, as shown in *Figure 3.66*, the question presented a situation to the student that he/she was going to help the government establish a reclamation plan deciding whether to increase the area of harbor reclamation near Central and Wan Chai. The student was required to state three viewpoints from people that he/she should take into consideration.

Q6.3	If you are going to help the government establish a law about whether all supermarkets should provide **paper bags instead of plastic bags** to their customers, what **viewpoints from people** should you take into consideration? Please write **three** of them on the following lines. 假若你將協助政府制定一條法例，關於是否規定超級市場不得為顧客提供膠袋，而只能提供紙袋。你應該聽取持哪些觀點的人們的意見？請在下列橫線，寫出三類你會納入作考慮的觀點。

Figure 3.65: Question 3 of Task 6 in Pre-test

Q6.3	If you are going to help the government establish a reclamation plan deciding whether to **increase** the **area of harbor reclamation** near Central and Wan Chai, what **viewpoints from people** should you take into consideration? Please write **three** of them on the following lines. 假若你將協助政府制定填海計劃，並須決定是否加大中環及灣仔的填海範圍。你應該聽取持哪些觀點的人們的意見？請在下列橫線，寫出三類你會納入作考慮的觀點。

Figure 3.66: Question 3 of Task 6 in Post-test

Question 4 of the two tests related to *WQ1* in the instrument. In the pre-test, as shown in *Figure 3.67*, the question presented a situation to the student that he/she was going to do a research about global warming. The student was required to state three kinds of experts that he/she would like to consult for the research.

In the WebQuests, especially in *WQ1*, the participants went through some sort of learning experience in researching and investigating the causes and effects of global warming by taking the roles of four different experts: climate consultant, emission consultant, impact consultant, and action consultant. Through the activity, the participants were supposed to gain some generic skills, including dealing with or looking into a real-world issue (i.e. global warming) from four different areas or aspects (i.e. climate, emission, impact, and action).

Therefore, in the post-test, the student was given another real-world issue and was required to state three different areas or aspects that were suitable for studying the issue. Like the pre-test, as shown in *Figure 3.68*, the question presented a situation to the student that he/she was going to do a research about environmental pollution. The student was required to state three kinds of experts that he/she would like to consult for the research.

Q6.4	If you are going to do a research about **global warming**, what **kinds of experts** would you like to consult? Please write **three kinds of experts** on the following lines. 假若你將進行一項關於全球暖化的研究，你會向哪三方面的專家請教？請在下列橫線，寫出這三方面的專家。

Figure 3.67: Question 4 of Task 6 in Pre-test

Q6.4	If you are going to do a research about **environmental pollution**, what **kinds of experts** would you like to consult? Please write **three kinds of experts** on the following lines. 假若你將進行一項關於環境污染的研究，你會向哪三方面的專家請教？請在下列橫線，寫出這三方面的專家。

Figure 3.68: Question 4 of Task 6 in Post-test

M) Marking Scheme for Task 6 of the Tests

The marking scheme for Task 6 of the two tests was developed by the test designers. Through a number of discussions, they decided on the following schemes for scoring students' responses to the four short-answer test items.

For the pre-test, a maximum score of 2 was given to the response to Question 1(a). A score of 1 was given to a question stated by a student if it was similar to "*What is the meaning of healthy fast food?*" in terms of meaning. Another score of 1 was given to another question stated by the student if it was similar to "*What makes food healthy?*" in terms of meaning.

Likewise, for the post-test, a maximum score of 2 was given to the response to Question 1(a). A score of 1 was given to a question stated by a student if it was similar to "*What is the meaning of environmentally friendly school?*" in terms of meaning. Another score of 1 was

given to another question stated by the student if it was similar to "*What makes a school environmentally friendly?*" in terms of meaning.

As reported above, Question 1 in Task 6 of the two tests related to *WQ4* in the instrument. In *WQ4*, two concrete and specific items (number of calories and grams of fats in food items), which were practical for data collection, were suggested to students. The items were relevant to the research topic. They were measurable and comparable, and could be treated as two significant factors for determining the research result (i.e. the healthiest fast food restaurant). Therefore, for Question 1(b) in Task 6, a score of 1 was given to each of the three items stated by a student if it fulfilled the three requirements below:

1. the item was relevant to the given research topic and could be considered as a significant factor for determining the research result,
2. a concrete or specific item that was practical for data collection, and
3. it was measurable and comparable.

A score of 0.5 was given to an item if it solely fulfilled the first and second requirements but failed to meet the third one. However, no score was given to an item even if it was specific enough or measurable and comparable (i.e. fulfilling the second or third requirements) but failed to meet the first requirement.

It is also reported above that Question 2 in Task 6 of the two tests related to *WQ3* in the instrument. In *WQ3*, three concrete and specific items (average life expectancy, literacy rate, and crowdedness), which were practical for data collection, were suggested to students. The items were relevant to the research topic. They were measurable and comparable, and could be treated as three factors for determining the research result (i.e. the living conditions and development of different countries). Therefore, for Question 2 in Task 6, a score of 1 was given to each of the three items stated by a student if it fulfilled the three requirements below:

1. the item was relevant to the given research topic and could be considered as a factor for determining the research result,

2. a concrete or specific item that was practical for data collection, and
3. the item was measurable and comparable.

A score of 0.5 was given to an item if it solely fulfilled the first and second requirements but failed to meet the third one. However, no score was given to an item even if it was specific enough or measurable and comparable (i.e. fulfilling the second or third requirements) but failed to meet the first requirement.

For Question 3 of Task 6, a score of 1 was given to each of the three answers given by a student if it fulfilled the two requirements below:

1. the answer was sufficient for either 1) the constitution of a point of view or 2) the representation of the common interest/concern of a group of people that could be taken into account for studying the given issue, and
2. the viewpoint was distinguishable from the other two with respect to points of view from different groups of people.

A score of 0.5 was given to an answer if it solely fulfilled the first requirement but failed to meet the second one. However, no score was given to a viewpoint even if it was distinguishable from the other two with respect to points of view from different groups of people (i.e. fulfilling the second requirement) but failed to meet the first requirement.

Lastly, for Question 4 of Task 6, a score of 1 was given to each of the three answers given by a student if it fulfilled the two requirements below:

1. the answer referred to someone who could be regarded as a specialist in a particular area/field of work/study that was related to the given research topic, and
2. the kind of expert was distinguishable from the other two with respect to areas/fields of work/study.

A score of 0.5 was given to an answer if it solely fulfilled the first requirement but failed to meet the second one. However, no score was given to a kind of expert even if it was distinguishable the other two with respect to areas/fields of work/study (i.e. fulfilling the

second requirement) but failed to meet the first requirement.

3.4.2.2 Rubrics for Analysis of Student Work

As mentioned above, other than the pre-test and post-test, the work completed by the participants during the four WebQuests, including reports and presentation documents, would be analyzed to serve as a reference to part of the findings from the tests. It was done by involving a group of three experienced teachers, as multiple raters, in analyzing students' work based on four specially designed rubrics (denoted by *RB1*, *RB2*, *RB3*, and *RB4*).

The four rubrics were different from the ones in the *Evaluation* sections of the four WebQuests. As mentioned above, they were designed to identify the achievement of three target learning outcomes ([C6.1], [C7.1a], and [C11.1]) from students' work. Each rubric was used to analyze students' work completed for a particular WebQuest. The table below presents the achievement of learning outcomes identified by each of them.

Rubric	Target WebQuest	Achievement of Learning Outcomes Identified by Each Rubric
RB1	***WQ1***	[C6.1]: make judgments and draw conclusions from research to solve problems [C7.1a]: draw conclusion from the information collected
RB2	***WQ2***	[C6.1]: make judgments and draw conclusions from research to solve problems
RB3	***WQ3***	[C7.1a]: draw conclusion from the information collected [C11.1]: make inferences and simple generalizations from the evidence collected
RB4	***WQ4***	[C6.1]: make judgments and draw conclusions from research to solve problems [C7.1a]: draw conclusion from the information collected [C11.1]: make inferences and simple generalizations from the evidence collected

Table 3.15: Achievement of Learning Outcomes Identified by the Four Rubrics

The rubrics were developed and revised by the researcher together with *Teacher T*, *Teacher W*, and *Teacher L*. To develop a rubric, the rubric designers (i.e. the researcher and the three experienced teachers) first discussed and determined 1) the number of criteria and performance levels required, 2) the emphasis of each criterion, and 3) some general

performance indicators for constituting its basic structure. They then examined the products completed by 10 working groups in order to obtain a basic understanding of the quality of students' work. The 10 groups were chosen by random selection. After that, the researcher and the teachers attempted to figure out and summarize some specific performance characteristics from the chosen samples, so as to write the descriptors for the lowest and highest levels of a criterion or outcome followed by deliberating and writing those for the middle levels. The designers also took reference from rubrics available at several online collections and creation tools for writing and revising the descriptors. Those collections and tools included:

- the creation tool called "*RubiStar*", hosted by the University of Kansas, with the URL "http://rubistar.4teachers.org/",
- the collection of rubrics, hosted by Winona State University, with the URL "http://www.winona.edu/AIR/rubrics.htm", and
- the collection of rubrics from the Handbook of Engaged Learning Projects, funded by the North Central Regional Technology in Education Consortium, with the URL "http://ed.fnal.gov/help/97/sightsound/ssrubhom.html".

The design features of individual rubrics are delineated in the rest of this section. In addition, a pilot study was conducted to test the rubrics. It was done by involving a group of teachers in scoring some of the student work. Particulars of the pilot study are discussed in the subsequent section of this chapter (see Section 3.5).

A) Rubric for Student Work in *WQ1*

As presented in *Table 3.15*, *RB1* was used to examine students' work completed in *WQ1*. Specifically, it was designed to identify the achievement of two learning outcomes: [C6.1] and [C7.1a]. In *RB1* (see Appendix 20a), there were two criteria with four levels of descriptors assessing the presentation (PowerPoint) document completed by each working group in the

WebQuest activity (i.e. *WQ1*). The four levels were termed beginning (score=1), developing (score=2), accomplished (score=3), and exemplary (score=4).

There were five groups of participants (denoted by G_a, G_b, G_c, G_d, and G_e) involved in the main study. Each group consisted of 20 students, who worked in groups of four in *WQ1*. Therefore, each group of students comprised 5 working groups and there were 25 working groups altogether in *WQ1*. Details of the procedure of the research, including the participants, are delineated in Chapter 4.

At the beginning, the rubric designers randomly selected 2 working groups from each of G_a, G_b, G_c, G_d, and G_e and, thus, there were a total of 10 working groups selected as samples. To develop the descriptors for the criteria, the rubric designers examined carefully the presentation (PowerPoint) documents completed by the 10 working groups. For each of the criteria in the rubric, the designers developed the descriptors to identify the characteristics reflecting the lowest and highest levels of performance followed by filling in those for the middle levels. Throughout the examination of the selected samples, the rubric designers kept revising the descriptors towards better description of the performance levels.

As shown in *Figure 3.69*, the first criterion, named "Conclusion on Global Warming", was designed to identify the achievement of the learning outcome "[C7.1a]: draw conclusion from the information collected". It looked at the conclusion (on global warming) drawn by a working group in their presentation. A score of 1 (beginning level) was given to a conclusion that was too simple or not clear and there was no connection with the findings by the four consultants. For the exemplary level, a score of 4 was given to a conclusion that was concise by pulling important pieces of information from the findings by the four consultants. Besides, causes and effects of global warming were clearly distinguished in the conclusion, which also included prediction of future effects.

	Beginning (Rating = 1)	Developing (Rating = 2)	Accomplished (Rating = 3)	Exemplary (Rating = 4)

Conclusion on Global Warming ([C7.1a] draw conclusion from the information collected)	The conclusion is too simple or not clear. There is no connection with the findings by the four consultants.	The conclusion is recognizable by extracting relevant information from the findings by the four consultants. Causes and effects of global warming are not clearly distinguished in the conclusion.	The conclusion is recognizable by tying up most of the main points from the findings by the four consultants. Causes and effects of global warming are clearly distinguished in the conclusion.	The conclusion is concise by pulling important pieces of information from the findings by the four consultants. Causes and effects of global warming are clearly distinguished in the conclusion, which also includes prediction of future effects.

Figure 3.69: First Criterion in RB1 for Examining Student Work Completed in WQ1

The second criterion, as shown in *Figure 3.70*, named "Suggestions for Improvement", was designed to identify the achievement of the learning outcome "[C6.1]: make judgments and draw conclusions from research to solve problems". It looked at the suggestions (for improvement) made by a working group in their presentation. A score of 1 (beginning level) was given to general suggestions for environmental protection that were not specific to solving global warming. In addition, the suggestions had no connection with the issues or causes discussed and concluded previously. For the exemplary level, a score of 4 was given to specific suggestions for slowing down or stopping the issues and causes discussed and concluded previously. Besides, the suggestions were practical and attainable, and classified according to some extends or levels.

	Beginning (Rating = 1)	Developing (Rating = 2)	Accomplished (Rating = 3)	Exemplary (Rating = 4)
Suggestions for Improvement ([C6.1] make judgments and draw	General suggestions, which are not specific to solving global warming, for environmental protection are given.	General suggestions for solving global warming are given. The suggestions have little connection with the issues and	Specific suggestions for solving most of the issues and causes discussed and concluded previously are given.	Specific suggestions for slowing down or stopping the issues and causes discussed and concluded previously

conclusions from research to solve problems)	The suggestions have no connection with the issues or causes discussed and concluded previously.	causes discussed and concluded previously. Some suggestions are impractical and unattainable.	Most of the suggestions are practical and attainable. Attempts for classifying the suggestions are demonstrated.	are given. The suggestions are practical and attainable, and classified according to some extends or levels.

Figure 3.70: Second Criterion in RB1 for Examining Student Work Completed in WQ1

B) Rubric for Student Work in *WQ2*

RB2 was used to examine students' work completed in *WQ2*. Specifically, it was designed to identify the achievement of one learning outcome ([C6.1]). In *RB2* (see Appendix 20b), there were two criteria with four levels of descriptors assessing the presentation (PowerPoint) document completed by each working group in the WebQuest activity (i.e. *WQ2*). Like *RB1*, the four levels in *RB2* were also termed beginning (score=1), developing (score=2), accomplished (score=3), and exemplary (score=4).

As reported above, students worked in groups of four in *WQ2*. Therefore, like *WQ1*, there were 25 working groups altogether in *WQ2*. Following the development procedure for *RB1*, at the beginning, the rubric designers randomly selected 2 working groups from each of G_a, G_b, G_c, G_d, and G_e and, thus, there were a total of 10 working groups selected as samples. To develop the descriptors for the criteria, the rubric designers examined carefully the presentation (PowerPoint) documents completed by the 10 working groups. For each of the criteria in the rubric, the designers developed the descriptors to identify the characteristics reflecting the lowest and highest levels of performance followed by filling in those for the middle levels. Throughout the examination of the selected samples, the rubric designers kept revising the descriptors towards better description of the performance levels.

As shown in *Figure 3.71*, the two criteria, named "Appropriateness of Choice" and "Explanation of Choice", were grouped together and they were designed to identify the achievement of the learning outcome "[C6.1]: make judgments and draw conclusions from research

to solve problems". In particular, they examined the choice made by a working group in their presentation.

The first criterion looked at the appropriateness of the choice. A score of 1 (beginning level) was given to a choice that neither embraced the advantages of using paper and plastic bags nor avoided the disadvantages of that. For the exemplary level, a score of 4 was given to a choice that embraced the advantages and avoided the disadvantages of using paper and plastic bags. Besides, the choice was considered not only practical but also effective in the context of the task. The second criterion looked at the explanation of the choice. A score of 1 (beginning level) was given to a case that there was no reason to support the choice, or fallacious, irrelevant or unwarranted reasons were used. In addition, there was no reference to the findings of using paper and plastic bags. For the exemplary level, a score of 4 was given to a choice that was not only supported by relevant reasons, which took most of the findings of using paper and plastic bags into account, but also justified by sufficient evidence.

		Beginning (Rating = 1)	Developing (Rating = 2)	Accomplished (Rating = 3)	Exemplary (Rating = 4)
[C6.1] make judgments and draw conclusions from research to solve problems	Appropriateness of Choice	The choice neither embraces the advantages of using paper and plastic bags nor avoids the disadvantages of that.	The choice embraces some advantages of using paper and plastic bags and avoids some disadvantages of that. It is considered possibly practical or probably appropriate in the context of the task.	The choice embraces most advantages of using paper and plastic bags and avoids most disadvantages of that. It is considered practical or appropriate in the context of the task.	The choice embraces the advantages and avoids the disadvantages of using paper and plastic bags. It is considered not only practical but also effective in the context of the task.
	Explanation of Choice	There is no reason to	General or simple reasons,	Relevant reasons, which	The choice is not only supported

		support the choice; or fallacious, irrelevant or unwarranted reasons are used. There is no reference to the findings of using paper and plastic bags.	which are not adequate for supporting the choice, are given. Part of the explanation is related to the findings of using paper and plastic bags.	take most of the findings of using paper and plastic bags into account, are given to support the choice.	by relevant reasons, which take most of the findings of using paper and plastic bags into account, but also justified by sufficient evidence.

Figure 3.71: Criteria in RB2 for Examining Student Work Completed in WQ2

C) Rubric for Student Work in *WQ3*

As presented in *Table 3.15*, *RB3* was used to examine students' work completed in *WQ3*. Specifically, it was designed to identify the achievement of two learning outcomes: [C7.1a] and [C11.1]. In *RB3* (see Appendix 20c), there were five criteria with four levels of descriptors assessing the report (Word document) completed by each working group in the WebQuest activity (i.e. *WQ3*). Like *RB1* and *RB2*, the four levels in *RB3* were also termed beginning (score=1), developing (score=2), accomplished (score=3), and exemplary (score=4).

As reported above, students worked in groups of two in *WQ3*. Therefore, each group of participants comprised 10 working groups and there were 50 working groups altogether in *WQ3*. Following the development procedure for the rubrics delineated above, at the beginning, the rubric designers randomly selected 4 working groups from each of G_a, G_b, G_c, G_d, and G_e and, thus, there were a total of 20 working groups selected as samples. To develop the descriptors for the criteria, the rubric designers examined carefully the reports (Word documents) completed by the 20 working groups. For each of the criteria in the rubric, the designers developed the descriptors to identify the characteristics reflecting the lowest and highest levels of performance followed by filling in those for the middle levels. Throughout the examination of the selected samples, the rubric designers kept revising the descriptors

towards better description of the performance levels.

As shown in *Figure 3.72*, the first criterion, named "Explanation or Description of Graphs", was designed to identify the achievement of the learning outcome "[C7.1a]: draw conclusion from the information collected". It looked at the description or explanation of the graphs included in the report. A score of 1 (beginning level) was given to a case that explanation of graphs was omitted or the explanation totally misinterpreted the data graphed. For the exemplary level, a score of 4 was given to a case that the explanation not only accurately described the data graphed but also identified some details or key relationships from the data.

	Beginning (Rating = 1)	Developing (Rating = 2)	Accomplished (Rating = 3)	Exemplary (Rating = 4)
Explanation or Description of Graphs ([C7.1a] draw conclusion from the information collected)	Explanation of graphs is omitted; or explanation totally misinterprets the data graphed.	Explanation is somewhat inconsistent with the data graphed. It misinterprets the data somewhat.	Explanation is consistent with the data graphed. It accurately describes the data.	Explanation not only accurately describes the data graphed but also identifies some details or key relationships from the data.

Figure 3.72: First Criterion in RB3 for Examining Student Work Completed in WQ3

The next four criteria, named "Questions for Discussion (Q1 and Q2) – Inference", "Questions for Discussion (Q1 and Q2) – Reason", "Questions for Discussion (Q3 and Q4) – Inference", and "Questions for Discussion (Q3 and Q4) – Reason", were grouped together and they were designed to identify the achievement of the learning outcome "[C11.1]: make inferences and simple generalizations from the evidence collected". In particular, they examined a working group's responses or answers to the four questions for discussion in the report.

As shown in *Figure 3.73*, the second criterion looked at the responses or answers (inference) to the first two questions (Q1 and Q2) for discussion. A score of 1 (beginning

level) was given to some sort of response or answer that there was no inference, or fallacious or illogical inference being inconsistent with the data presented was suggested. For the exemplary level, a score of 4 was given to some sort of response or answer, in which logical inference was suggested based on the data gathered. Moreover, the inference reflected and matched the data presented.

The third criterion looked at the responses or answers (reason) to the first two questions (Q1 and Q2) for discussion. A score of 1 (beginning level) was given to some sort of response or answer, in which no reason or irrelevant reason was given to support the inference. For the exemplary level, a score of 4 was given to some sort of response or answer, in which clear reasons that flowed logically and reasonably from one aspect to another for explaining the relationship between them were given to support the inference.

		Beginning (Rating = 1)	Developing (Rating = 2)	Accomplished (Rating = 3)	Exemplary (Rating = 4)
[C11.1] make inferences and simple generalizations from the evidence collected	Questions for Discussion (Q1 and Q2) – Inference	There is no inference; or fallacious or illogical inference being inconsistent with the data presented is suggested.	Plausible inference is suggested. It is somewhat inconsistent with the data presented.	Logical inference is suggested. It is somewhat inconsistent with the data presented.	Logical inference is suggested based on the data gathered. The inference reflects and matches the data presented.
	Questions for Discussion (Q1 and Q2) – Reason	No reason or irrelevant reason is given to support the inference.	Simple and general reasons that are related to the two aspects are given as explanation. The explanation is insufficient to reasonably establish a connection	Reasonable explanation is given to support the inference. The explanation is not clear or specific enough to illustrate the relationship between two aspects.	Clear reasons that flow logically and reasonably from one aspect to another for explaining the relationship between them are given to support the inference.

			between two aspects.		

Figure 3.73: Second and Third Criteria in RB3 for Examining Student Work Completed in WQ3

As shown in *Figure 3.74*, the fourth criterion looked at the responses or answers (inference) to the last two questions (Q3 and Q4) for discussion. The descriptors were the same as those for the first two questions (Q1 and Q2). The fifth criterion looked at the responses or answers (reason) to the last two questions (Q3 and Q4) for discussion. A score of 1 (beginning level) was given to some sort of response or answer, in which no reason or irrelevant reason was given to support the inference. For the exemplary level, a score of 4 was given to some sort of response or answer, in which clear reasons that flowed logically and reasonably from an appropriate and relevant aspect to the target one for explaining the relationship between them were given to support the inference.

		Beginning (Rating = 1)	Developing (Rating = 2)	Accomplished (Rating = 3)	Exemplary (Rating = 4)
[C11.1] make inferences and simple generalizations from the evidence collected	Questions for Discussion (Q3 and Q4) – Inference	There is no inference; or fallacious or illogical inference being inconsistent with the data presented is suggested.	Plausible inference is suggested. It is somewhat inconsistent with the data presented.	Logical inference is suggested. It is somewhat inconsistent with the data presented.	Logical inference is suggested based on the data gathered. The inference reflects and matches the data presented.
	Questions for Discussion (Q3 and Q4) – Reason	No reason or irrelevant reason is given to support the inference.	An appropriate and relevant aspect for making reference to the target one is identified in the explanation, which is insufficient to reasonably establish a connection	An appropriate and relevant aspect for making reference to the target one is identified in the explanation, which is reasonable but not clear or specific enough to illustrate the	Clear reasons that flow logically and reasonably from an appropriate and relevant aspect to the target one for explaining the relationship between them are given to

			between two aspects.	relationship between two aspects.	support the inference.

Figure 3.74: Fourth and Fifth Criteria in RB3 for Examining Student Work Completed in WQ3

D) Rubric for Student Work in *WQ4*

RB4 was used to examine students' work completed in *WQ4*. Specifically, it was designed to identify the achievement of three learning outcomes: [C6.1], [C7.1a], and [C11.1]. In *RB4* (see Appendix 20d), there were four criteria with four levels of descriptors assessing the report (Word document) completed by each working group in the WebQuest activity (i.e. *WQ4*). Like the rubrics delineated previously, the four levels in *RB4* were also termed beginning (score=1), developing (score=2), accomplished (score=3), and exemplary (score=4).

As reported above, students worked in groups of two in *WQ4*. Therefore, like *WQ3*, there were 50 working groups altogether in *WQ4*. Following the development procedure for *RB3*, at the beginning, the rubric designers randomly selected 4 working groups from each of G_a, G_b, G_c, G_d, and G_e and, thus, there were a total of 20 working groups selected as samples. To develop the descriptors for the criteria, the rubric designers examined carefully the reports (Word documents) completed by the 20 working groups. For each of the criteria in the rubric, the designers developed the descriptors to identify the characteristics reflecting the lowest and highest levels of performance followed by filling in those for the middle levels. Throughout the examination of the selected samples, the rubric designers kept revising the descriptors towards better description of the performance levels.

As shown in *Figure 3.75*, the first criterion, named "Selection of Restaurant", was designed to identify the achievement of the learning outcome "[C6.1]: make judgments and draw conclusions from research to solve problems". It looked at the selection of the healthiest restaurant in the report. A score of 1 (beginning level) was given to a restaurant that was selected without making reference to the data gathered. In addition, the selection was

supported by no evidence or reason concerning healthy fast food. For the exemplary level, a score of 4 was given to a restaurant that was selected in best accordance with the data gathered. Besides, the selection was supported by evidence and reasonable argument concerning healthy fast food.

	Beginning (Rating = 1)	Developing (Rating = 2)	Accomplished (Rating = 3)	Exemplary (Rating = 4)
Selection of Restaurant ([C6.1] make judgments and draw conclusions from research to solve problems)	Restaurant is selected without making reference to the data gathered. The selection is supported by no evidence or reason concerning healthy fast food.	Restaurant is selected with little reference to the data gathered. The selection is supported by insufficient evidence and improper explanation concerning healthy fast food.	Restaurant is selected based upon the data gathered. The selection is supported by evidence but somewhat improper explanation concerning healthy fast food.	Restaurant is selected in best accordance with the data gathered. The selection is supported by evidence and reasonable argument concerning healthy fast food.

Figure 3.75: First Criterion in RB4 for Examining Student Work Completed in WQ4

The second criterion, as shown in *Figure 3.76*, named "Correlation between Number of Calories and Grams of Fat", was designed to identify the achievement of the learning outcome "[C7.1a]: draw conclusion from the information collected". It looked at a working group's responses or answers to the second question (Q2) for discussion in the report. A score of 1 (beginning level) was given to some sort of response or answer that there was no reason to support the conclusion, or fallacious, irrelevant or unwarranted reasons were used for the conclusion. In addition, there was no reference to the data gathered. For the exemplary level, a score of 4 was given to a conclusion that was supported by accurate interpretation of the data gathered. Besides, sufficient data was taken into account for drawing the conclusion.

	Beginning (Rating = 1)	Developing (Rating = 2)	Accomplished (Rating = 3)	Exemplary (Rating = 4)
Correlation between Number of	There is no reason to support the conclusion; or	The conclusion is supported by misinterpretation of	The conclusion is supported by accurate	The conclusion is supported by accurate

Calories and Grams of Fat ([C7.1a] draw conclusion from the information collected)	fallacious, irrelevant or unwarranted reasons are used for the conclusion. There is no reference to the data gathered.	the data gathered; or simple reasons with little reference to the data gathered are used to draw the conclusion.	interpretation of the data gathered. The amount of data taken into account is somewhat insufficient for drawing the conclusion.	interpretation of the data gathered. Sufficient data is taken into account for drawing the conclusion.

Figure 3.76: Second Criterion in RB4 for Examining Student Work Completed in WQ4

The next two criteria, named "Question for Discussion (Q1) – Generalization", and "Question for Discussion (Q1) – Reason", were grouped together and they were designed to identify the achievement of the learning outcome "[C11.1]: make inferences and simple generalizations from the evidence collected". In particular, they examined a working group's responses or answers to the first question for discussion in the report.

As shown in *Figure 3.77*, the third criterion looked at the responses or answers (generalization) to the first question (Q1) for discussion. A score of 1 (beginning level) was given to some sort of response or answer that there was no generalization, or fallacious or irrelevant characteristics were generalized that were supported by neither the data gathered nor the information collected for healthy fast food. For the exemplary level, a score of 4 was given to some sort of response or answer, in which specific characteristics of American fast food were derived logically from the data set. Moreover, the generalization was grounded on the data gathered, and the information collected for healthy fast food.

The fourth criterion looked at the responses or answers (reason) to the first question (Q1) for discussion. A score of 1 (beginning level) was given to some sort of response or answer, in which no reason/evidence or irrelevant reason/evidence was given for the generalization. For the exemplary level, a score of 4 was given to some sort of response or answer, in which appropriate evidence was provided to support the generalization. Moreover, the evidence was sufficient to logically establish a connection from the data set to the characteristics derived.

		Beginning (Rating = 1)	Developing (Rating = 2)	Accomplished (Rating = 3)	Exemplary (Rating = 4)
[C11.1] make inferences and simple generalizations from the evidence collected	Question for Discussion (Q1) – Generalization	There is no generalization; or fallacious or irrelevant characteristics are generalized that are supported by neither the data gathered nor the information collected for healthy fast food.	Simple and general characteristics of American fast food are stated. The characteristics are not related to the data set.	Simple characteristics of American fast food are derived from the data set. The characteristics are related to the data gathered, and the information collected for healthy fast food.	Specific characteristics of American fast food are derived logically from the data set. The generalization is grounded on the data gathered, and the information collected for healthy fast food.
	Question for Discussion (Q1) – Reason	No reason/evidence or irrelevant reason/evidence is given for the generalization.	Simple evidence or general reason is given for the generalization. The evidence/reason is basically not related to deriving the characteristics from the data set.	Related evidence is provided to support the generalization. The evidence is somewhat insufficient or not specific enough to derive the characteristics from the data set.	Appropriate evidence is provided to support the generalization. The evidence is sufficient to logically establish a connection from the data set to the characteristics derived.

Figure 3.77: Third and Fourth Criteria in RB4 for Examining Student Work Completed in WQ4

E) Procedure for Handling Discrepancies

As reported above, the four rubrics were designed carefully by the researcher and three experienced teachers based upon a set of sample work completed by the participants. The

rubrics were also tested and piloted by a team of experienced teachers on another set of sample work completed by the participants. Details of the pilot study are reported in the subsequent section of this chapter (see Section 3.5). Despite of that, variations of scoring between raters were still possible.

To facilitate the statistical analysis of rubric scores assigned to students' work, the procedure described below was employed for comparing the three sets of scores given by the three raters, for the same batch of student work, so as to determine a set of final scores for analysis.

The ideal case was that there was no discrepancy among the scores assigned by the three raters on a particular criterion for the same learning product. In such case, the score assigned by the raters was kept in the final set for statistical analysis. For example, as shown in the figure below, a score of 3 is given by all of the three raters on *Criterion X* for the same learning product. As a result, a score of 3 would be kept in the final set for the one given to that learning product on *Criterion X*.

	Score Assigned by Rater A on *Criterion X*	Score Assigned by Rater B on *Criterion X*	Score Assigned by Rater C on *Criterion X*	Score Kept in the Final Set on *Criterion X* (for Statistical Analysis)
A Learning Product Completed by a Working Group	3	3	3	3

Figure 3.78: An Example of No Discrepancy among the Scores Assigned by Three Raters

In case of discrepancies in the scores assigned by the three raters, the one kept in the final set was determined according to the following two cases. For the first case, if two of the three scores were equal, the majority of the three was kept in the final set for statistical analysis. For example, as shown in the figure below, a score of 2 is given by two raters, while a score of 3 is given by another rater on *Criterion X* for the same learning product. As a result, the majority of the three (i.e. a score of 2) would be kept in the final set for the one given to that learning product on *Criterion X*.

	Score Assigned by Rater A on *Criterion X*	Score Assigned by Rater B on *Criterion X*	Score Assigned by Rater C on *Criterion X*	Score Kept in the Final Set on *Criterion X* (for Statistical Analysis)
A Learning Product Completed by a Working Group	2	2	3	2

Figure 3.79: An Example of Discrepancies in the Scores (Two Equal) Assigned by Three Raters

Another case of discrepancies was that the three scores were all different. If that was the case, the raters were required to examine the learning product involved again followed by discussing and negotiating the scores so as to reach a consensus on them. In case of failure in reaching a consensus, the median of the three scores was kept in the final set for statistical analysis. For example, as shown in the figure below, the scores (i.e. 4, 2, and 3) given by the three raters are all different. Therefore, the raters would be required to examine that learning product again, and then discuss and negotiate the scores in order to reach a consensus. If they fail to compromise the scores, the median of the original three scores (i.e. a score of 3) would be kept in the final set for the one given to that learning product on *Criterion X*.

	Score Assigned by Rater A on *Criterion X*	Score Assigned by Rater B on *Criterion X*	Score Assigned by Rater C on *Criterion X*	Score Kept in the Final Set on *Criterion X* (for Statistical Analysis)
A Learning Product Completed by a Working Group	4	2	3	Discussed and negotiated by the raters; in case of failure, the median (i.e. 3) was kept.

Figure 3.80: An Example of Discrepancies in the Scores (All Different) Assigned by Three Raters

3.4.2.3 Interview with Five Groups of Students

In addition to employing the tests and the rubrics for measuring the learning effects, as indicated in *Figure 3.1*, an interview would be conducted with five groups of students for gathering information regarding their actual practice and what they had learned throughout the WebQuests. It also served as a means for triangulation of the findings from the pre-test and post-test.

A) Questions regarding Students' Learning Processes in *WQ1*

For *WQ1*, the questions given to the students of a group were first about their learning process during the WebQuest. Then, they were asked about what they had learned through that WebQuest.

First, the students would be asked:

- what they said about the Web materials provided by the WebQuest page, and
- how they recorded the information when they found any useful information for a guiding question, and whether they thought about recording the source of the information.

The above questions sought to understand the students' actual practice towards the achievement of the target learning outcome "[C8.1a]: use multiple keywords or phrases to label information". As stated in Section 3.4.1.5, concerning the explanation for [C8.1], the students were expected to "*use certain means to record or mark the information, as well as its source, so as to answer the guiding questions or facilitate further retrieval once any useful information was found from the Web resources*". In such case, the interview questions could help to understand 1) if the students found the pre-selected Web materials given in the WebQuests too difficult for them, 2) what kind of means that the students actually used for recording the information found, and 3) whether they did record the source of information. Students' responses to the question would be useful in comparing the actual practice done by them with that expected by the WebQuest designers.

Second, the students would be asked:

- whether each of them tried to conclude the findings of his/her research report before joining the group for preparing the presentation,
- whether each of them tried to give an overview of the area that he/she researched to other group members, and
- whether they determined 1) the causes and effects of global warming in the past, and 2)

how human behaviors would affect the global conditions in the future.

The above questions sought to understand the students' actual practice towards the achievement of the target learning outcome "[C6.1] make judgments and draw conclusions from research to solve problems". As stated in Section 3.4.1.5, concerning the explanation for [C6.1], as a consultant in a particular area, each member in a group was expected to "*conclude the findings of that area based upon his/her individual research*". So that, when the four members came together to prepare an informational presentation, he/she could "*contribute to the group by bringing an overview of the area to other members*". Subsequently, using the information brought by the four members, the group was expected to "*determine 1) what were the causes and effects of global warming in the past, and 2) how human behaviors would affect the global conditions in the future*". With respect to the above explanation, the interview questions could help to study whether the opportunities for students to practice the relevant information skill, as expected by the WebQuest designer, did bring into effect.

Third, the students would be asked whether they tried to categorize the information brought by the different roles, and how they combined the information. This question sought to understand the students' actual practice towards the achievement of the target learning outcome "[C8.1b] categorize and connect the concepts derived from information". As stated in Section 3.4.1.5, concerning the explanation for [C8.1], upon completion of individual inquiry, the four members came together to get into a group process, where they were expected to "*not only categorize the information brought by the different roles but also attempt to combine the information so as to prepare their learning product*". In respect of the above explanation, the interview question could help to 1) study whether the opportunities for students to practice the relevant information skill did bring into effect, and 2) understand the ways that the students used for combining the information.

Fourth, the students would be asked whether they varied in the arguments on a particular point regarding global warming, and how they brought the agreement and disagreement from

information sources together. The question sought to study whether the WebQuest did offer opportunities for student to practice the information skill for the target learning outcome "[C8.2] integrate the agreement and disagreement among sources". As discussed in Section 3.4.1.6, concerning the result of the expert review, two of the three experts determined that the design of the four WebQuests could basically help students achieve the target learning outcomes, except the opportunity provided in *WQ1* for achieving [C8.2]. In such case, students' responses to the question would be useful in verifying the opportunity offered by the WebQuest for practicing the relevant information skill.

Subsequent to the questions regarding the students' actual practice, they were asked about what they had learned through the WebQuest. The students would be asked:

- whether they found the information that they acquired in the WebQuest activity useful, especially in helping them study other subjects, and what subjects or topics, and how the information could help them,
- whether they were informed that such a global issue, like global warming, was complicated, and why they should collect information from multiple roles or areas for considering such issue, and
- whether they would apply the above way of handling a real-life problem to other issues with similar nature, and what real-life problems they could think about.

The above questions sought to look at the students' achievement of the target learning outcome "[C7.1b]: apply the knowledge to solve problems of similar nature". As stated in Section 3.4.1.5, concerning the explanation for [C7.1], through individual inquiry, the student could gather information and acquire knowledge in the area of his/her role. The student could also "*apply such information or knowledge, or even the Web resources, to the study of similar topics*". Besides, through the WebQuest activity, the students would be "*informed that a global issue, like the theme of the WebQuest, was complicated*". "*Collecting information from multiple roles and areas was required*" for the consideration of such an issue. As a result, this

way of handling a real-life problem might influence the students that they would "*apply it to other issues or problems with similar nature*". In such case, the interview questions allowed the students to express and elaborate on if they could 1) make use of the information and knowledge acquired in the WebQuest to the study of other subjects or topics, and 2) apply the way of handling a real-life problem, as experienced in the WebQuest, to other issues with similar nature.

B) Questions regarding Students' Learning Processes in *WQ2*

Like *WQ1*, for *WQ2*, the following questions were given to the students of a group. Concerning their learning process during the WebQuest, the students would be asked:

- what they said about the Web materials provided by the WebQuest page, and
- how they recorded the information when they found any useful information for a guiding question, and whether they thought about recording the source of the information.

The rationale for asking the students the above questions has been discussed in the previous sub-section. In addition to the above questions, the students would be asked how they made an informed decision for the given issue. This question sought to understand the students' actual practice towards the achievement of the target learning outcome "[C6.1] make judgments and draw conclusions from research to solve problems". As stated in Section 3.4.1.5, concerning the explanation for [C6.1], the members of a group were expected to "*use their findings from the different viewpoints for making an informed decision for the issue*". In such case, the interview question could help to understand the ways that the students used for making an informed decision.

Next, the students would be asked:

- how they reached a consensus on the answer to the question "Paper of Plastic", and
- how they integrated both agreement and disagreement, which came from different

information sources supporting different viewpoints, for the topic.

The above questions sought to understand the students' actual practice towards the achievement of the target learning outcome "[C8.2] integrate the agreement and disagreement among sources". As stated in Section 3.4.1.5, concerning the explanation for [C8.2], the students were expected to "*use their findings for discussing and debating among the four viewpoints in order to reach a consensus to be presented in their learning product*". Since the four members varied in their viewpoints on the topic, they were expected to "*integrate both agreement and disagreement for the topic, which came from different information sources supporting different viewpoints, in the process of reaching consensus*". In such case, the interview questions could help to study 1) the ways the students used for reaching a consensus on the answer to the given question, and 2) the ways they used for integrating agreement and disagreement.

Last, the students were asked about what they had learned through the WebQuest. They would be asked:

- whether they found the information that they acquired in the WebQuest activity useful, especially in helping them study other subjects, and what subjects or topics, and how the information could help them,
- whether they were informed that people from different background would hold different attitudes and viewpoints towards a real-world issue, and why they should collect information from people with different viewpoints for considering such issue, and
- whether they would make use of the above way of handling a real issue to deal with other real-world issues with similar nature, and what real-world issues they could think about.

Like *WQ1*, the above questions sought to look at the students' achievement of the target learning outcome "[C7.1b]: apply the knowledge to solve problems of similar nature". As stated in Section 3.4.1.5, concerning the explanation for [C7.1], through individual inquiry, the student

could gather information and acquire knowledge in the area of his/her assigned viewpoint. The student could also "*apply such information or knowledge, or even the Web resources, to the study of similar topics*". Besides, through the WebQuest activity, the students would be "*informed that people from different background may hold different attitudes and viewpoints towards a real-world issue*". Thus, "*collecting information from people with different viewpoints was required*" for the consideration of such an issue. As a result, this way of handling a real issue might influence the students that they would "*make use of it to deal with other real-world issues with similar nature*". In such case, the interview questions allowed the students to express and elaborate on if they could 1) make use of the information and knowledge acquired in the WebQuest to the study of other subjects or topics, and 2) apply the way of handling a real issue, as experienced in the WebQuest, to other real-world issues with similar nature.

C) Questions regarding Students' Learning Processes in *WQ3*

For *WQ3*, the questions given to the students of a group were mainly about what they had learned through that WebQuest. First, they would be asked whether they could determine whether living in another country was better upon completion of the WebQuest (i.e. after comparing several aspects of life in four different countries). This question sought to look at the students' achievement of the target learning outcome "[C6.1] make judgments and draw conclusions from research to solve problems". As stated in Section 3.4.1.5, concerning the explanation for [C6.1], through gathering some real, statistical items about the development and living conditions of their home country and three other countries, the students were expected to "*compare several aspects of life in four different countries*". After that, they were expected to "*apply such information (comparison) to determine whether living in another country would be better*". In such case, the interview question could help to determine the students' achievement of the target learning outcome. In other words, students' responses to

the question would be useful in determining the students' learning result as expected by the WebQuest designer.

Second, the students would be asked:

- whether they found the online resources provided in the WebQuest useful, and
- whether they could acquire some basic knowledge or some basic understandings about other countries through exploring in the CIA database, and whether they thought they could apply such knowledge or online resources to the study of other subjects, and what subjects or topics.

The above questions sought to look at the students' achievement of the target learning outcome "[C7.1b]: apply the knowledge to solve problems of similar nature". As stated in Section 3.4.1.5, concerning the explanation for [C7.1], the online resources provided in the WebQuest contained massive real and statistical data about countries and regions in the world. The students were expected to "*acquire some basic knowledge about a country through exploring in these databases*". They were also expected to "*apply such knowledge, or even these Web resources, to the study of other areas and subjects*". With respect to the above explanation, the interview questions allowed the students to express and elaborate on if they could make use of the knowledge acquired or the online resources to the study of other subjects or topics.

Third, the students would be asked:

- (they experienced the use of tables and graphs for facilitating data comparison through the WebQuest activity) whether they would apply such way to perform similar tasks for data analysis,
- (they also experienced the use of graphs for demonstrating points or supporting explanation) whether they would apply such way to perform similar tasks for data explanation,
- (in creating the graphs) whether they found that some graphs demonstrated a better visual aid then others, whether they gained a new understanding in which ways graphs

could demonstrate a point better than words, and whether they would pay attention to these when making use of graphs to deal with problems with similar nature in the future.

Similarly, the above questions sought to look at the students' achievement of the target learning outcome "[C7.1b]: apply the knowledge to solve problems of similar nature". As stated in Section 3.4.1.5, concerning the explanation for [C7.1], through the WebQuest activity, the students could experience "*the use of tables and graphs for facilitating data comparison*" and also "*the use of graphs for demonstrating points or supporting explanation*". As a result, this might influence how they would "*perform other similar tasks for data analysis and explanation*". Besides, in creating the graphs, the students might 1) "*find that some graphs demonstrated a better visual aid than others*", and 2) "*gain a new understanding in which ways graphs could demonstrate a point better than words*". These might also influence how they would "*make use of graphs to deal with problems with similar nature*". In such case, the interview questions allowed the students to self-report if they would apply those experienced in the WebQuest to perform similar tasks or deal with similar problems.

Last, concerning the students' learning process during the WebQuest, they would be asked:

- (the crowdedness of a country could not be found from the CIA database) how they could make an approximation of such item using the existing data items in the data table,
- how they answered the first two questions for discussion, (in other words) how they found the correlation between the data items mentioned in the questions, and
- how they answered the last two questions for discussion as the two items of information required were not provided in the activity.

The first question sought to understand the students' actual practice towards to achievement of the target learning outcome "[C8.1b] categorize and connect the concepts derived from information", while the other two sought to understand that for the target learning outcome "[C11.1] make inferences and simple generalizations from the evidence collected". As stated in

Section 3.4.1.5, concerning the explanation for [C8.1], the crowdedness of a country could not be found from the CIA database. Thus, the students were expected to "*construct an approximation of such item using the population and the area of a country*". In the same section, concerning the explanation for [C11.1], to tell the correlations as required by the first two questions for discussion, the students were expected to 1) "*study the relevant graphs*", 2) "*discover any similar patterns from the graphs*", and 3) "*attempt to arrive at a conclusion based on the limited data set*". For the last two questions for discussion, since the students were not provided with the two items of information required, they were expected to "*make inferences from the relevant items*". In such case, the first interview question could help to understand the way that the students used for constructing an unknown item from existing data items, while the other two could help to understand the ways that they used for finding the correlations and making the inferences. Students' responses to the second and third interview questions would be useful in comparing the actual practice done by them with that expected by the WebQuest designers.

D) Questions regarding Students' Learning Processes in *WQ4*

Like *WQ3*, for *WQ4*, the following questions were given to the students of a group. Concerning what they had learned through the WebQuest, the students would be asked:

- whether they found the online resources provided in the WebQuest useful,
- whether they could acquire some basic knowledge or some basic understandings about healthy fast food, and whether they thought they could apply such knowledge or online resources to looking at other issues with similar nature, and what issues or problems, and
- (they experienced the use of tabular form and chart to represent and analyze data through the WebQuest activity) whether they would apply such way to perform similar tasks for data representation and analysis.

The rationale for asking the students the above questions has been discussed in the

previous sub-section. In addition to the above questions, concerning the students' learning process during the WebQuest, they would be asked:

- how they answered the two questions at the beginning of the *Process* section, and
- how they recorded the information when they found any useful information for the two questions, and whether they thought about recording the source of the information.

The above questions sought to understand the students' actual practice towards the achievement of the target learning outcome "[C8.1a]: use multiple keywords or phrases to label information". As stated in Section 3.4.1.5, concerning the explanation for [C8.1], the students were expected to "*use certain means to record or mark the information, as well as its source, so as to answer the questions or facilitate further retrieval once any useful information was found from the Web resources*". In such case, the interview questions could help to understand 1) what kind of means that the students actually used for recording the information found, and 2) whether they did record the source of information. Students' responses to the question would be useful in comparing the actual practice done by them with that expected by the WebQuest designers.

Besides, the students would be asked:

- how they answered the first question for discussion, (in other words) how they figured out some common characteristics of American fast food items, and
- how they answered the second question for discussion, (in other words) how they found the correlation between the two data items mentioned in the question.

The above questions sought to understand the students' actual practice towards to achievement of the target learning outcome "[C11.1] make inferences and simple generalizations from the evidence collected". As stated in Section 3.4.1.5, concerning the explanation for [C11.1], to answer the first question for discussion, the students were expected to "*derive some common characteristics of American fast food items from the data set that they had collected together with the use of the knowledge or information about healthy fast food that they had*

acquired through the activity". To tell the correlation as required by the second question for discussion, the students were expected to "1) "*study the relevant charts*", 2) "*discover any similar patterns from the charts*", and 3) "*attempt to arrive at a conclusion based on the limited data set*". In such case, the interview questions could help to understand the ways that they used for making the generalizations and finding the correlations. Students' responses to the interview questions would be useful in comparing the actual practice done by them with that expected by the WebQuest designers.

3.5 Pilot Study

Prior to the commencement of the main study, a pilot study was carried out in the same school as that for the main study.

3.5.1 Aim of the Pilot Study

The purpose of conducting the pilot study was to test the two types of instruments developed in the present study by having a trial run of them before the commencement of the main study. As delineated in the previous section, they were 1) the instruments for helping improve information literacy (i.e. the set of WebQuests), and 2) the instruments for measuring the learning effects (i.e. the pre-test, post-test, and rubrics).

Concerning the instruments for helping students improve information literacy, data gathered through the trial implementation helped the WebQuest designers improve the design of each WebQuest.

Regarding the instruments for measuring the learning effects, as discussed in Section 3.4.2, there were two primary tools developed in this study for measuring students' achievement of the target learning outcomes. They were the pre-test and the post-test, and the four rubrics: *RB1*, *RB2*, *RB3*, and *RB4*. Data gathered from the trial helped the test designers and the rubric designers revise the instruments accordingly.

3.5.2 Details of the Pilot Study

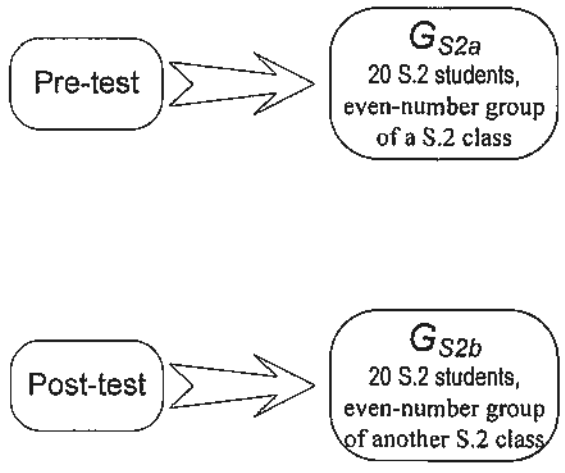
To achieve the above purpose, the pilot study was divided into three parts. One was for testing the pre-test and the post-test. Another one was for testing the four scoring rubrics. The other was for the trial implementation of the WebQuests.

3.5.2.1 Piloting the Two Tests

The pre-test and the post-test were piloted to check if 1) the test items were properly written and easy for students to understand, 2) the items befitted the participants' language level, and 3) sufficient time was given to students to complete each test.

In particular, the two tests were administered to two groups of S.2 students (denoted by G_{S2a} and G_{S2b}), with twenty students per group, in the same school. As mentioned in Section 3.4.2.2, since the five odd-number groups of the S.2 classes (i.e. G_a, G_b, G_c, G_d, and G_e) in the school would take part in the main study, the two groups of S.2 students involved in the pilot study (i.e. G_{S2a} and G_{S2b}) were the even-number groups of two S.2 classes. Details of the procedure of the main study, including the participants, are delineated in Chapter 4.

As shown in *Figure 3.81*, the pre-test was given to G_{S2a}, while the post-test was given to G_{S2b}. Each group was given 50 minutes to complete the test. The procedures for piloting the tests were the same as those for the tests in the main study (see Section 4.3.1.1 in Chapter 4).



- checking if the test items were properly written and easy for students to understand
- checking if the test items befitted the participants' language level
- checking if sufficient time was given to students for completing each test

Figure 3.81: Piloting the Pre-test and Post-test

3.5.2.2 Piloting the Four Rubrics

Besides testing the pre-test and the post-test, another part of the pilot study was to test the four scoring rubrics: *RB1*, *RB2*, *RB3*, and *RB4*. Specifically, it was to clarify the rubrics so as to maintain the consistency of scores assigned by two or more independent raters while using the rubrics.

Prior to examining the participants' work done in the main study, a team of raters was formed to undertake a trial run of the rubrics developed. The team comprised three experienced teachers. One was *Teacher W*, who was one of the rubric designers. The other two were an experienced English teacher and an experienced Science teacher in the school. The table below presents the particulars of the pilot study for the four rubrics.

Scoring Rubric	Samples of Student Work Examined by Each Rater	Team of Raters
RB1 (for *WQ1*)	• presentation (PowerPoint) documents completed by 10 working groups	• *Teacher W* • *An Experienced English Teacher* • *An Experienced Science Teacher*
RB2 (for *WQ2*)	• presentation (PowerPoint) documents completed by 10 working groups	• *Teacher W* • *An Experienced English Teacher* • *An Experienced Science Teacher*
RB3 (for *WQ3*)	• reports (Word documents) completed by 20 working groups	• *Teacher W* • *An Experienced English Teacher* • *An Experienced Science Teacher*
RB4 (for *WQ4*)	• reports (Word documents) completed by 20 working groups	• *Teacher W* • *An Experienced English Teacher* • *An Experienced Science Teacher*

Table 3.16: Particulars of Trial Run of the Four Rubrics

For the trial run of *RB1*, two working groups (with four students per group) were selected randomly from each of G_a, G_b, G_c, G_d, and G_e as samples.[3] The presentation

[3] G_a, G_b, G_c, G_d, and G_e were the five groups of participants taking part in the main study. Details of the procedure of the research, including the participants, are delineated in Chapter 4.

(PowerPoint) documents completed by these sample groups in *WQ1* were presented to the team of raters. Each rater examined and scored the samples (i.e. 10 presentation documents) on his/her own. Subsequently, the scores given by the raters on the samples were compared. The procedure for the trail run of *RB2* was the same as that for *RB1*.

For the trial run of *RB3*, four working groups (with two students per group) were selected randomly from each of G_a, G_b, G_c, G_d, and G_e as samples. The reports (Word documents with tables and graphs created by Excel) completed by these groups in *WQ3* were presented to the team of raters. Each rater examined and scored the samples (i.e. 20 reports) on his/her own. Subsequently, the scores given by the raters on the samples were compared. The procedure for the trail run of *RB4* was the same as that for *RB3*.

3.5.2.3 Trial Implementation of the Four WebQuests

As stated, the trial implementation of the WebQuests was also an emphasis of the pilot study. For this part, two groups of S.3 students (denoted by G_{S3a} and G_{S3b}) took part in the pilot study. Like the main study, the set of WebQuests was delivered to the two groups through the Computer lessons.[4] Similarly, split class teaching was adopted for the S.3 Computer subject in the school. G_{S3a} and G_{S3b} were the even-number groups of two S.3 classes. Each group consisted of twenty students with mixed ability, representing half of a S.3 class in the school. The total number of students in the pilot study was forty and the researcher was their teacher during the Computer lessons.

Unlike the main study, each of G_{S3a} and G_{S3b} received only two WebQuests in the instrument. *WQ1* and *WQ3* were delivered to G_{S3a}, while *WQ2* and *WQ4* were given to G_{S3b}. The number of class periods assigned to each WebQuest in the pilot study was the same as the assignment for the main study. Details of the implementation of the WebQuests are reported in the subsequent chapter (see Section 4.2). The only difference was that, for each

[4] Details of the procedure of the main study, including the implementation of the WebQuests, are delineated in Chapter 4.

S.2 class, one double lesson (35+35 minutes) was allocated to the Computer subject in one school cycle, while each S.3 class in the school had two single lessons (35 minutes and 35 minutes) for the Computer subject. Thus, in the pilot study, each of *WQ1* and *WQ2* had six 35-minute lessons for its classroom-based implementation, and each of *WQ3* and *WQ4* was assigned with two 35-minute lessons.

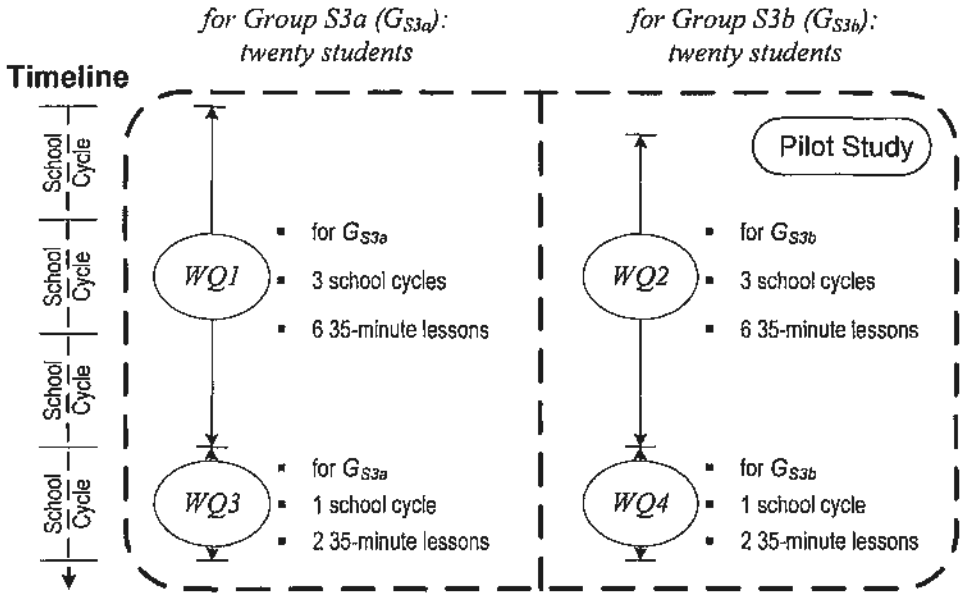


Figure 3.82: Overall Arrangement and Timeline of Trial Implementation of the WebQuests

Furthermore, in order to minimize the disturbance to the two groups of S.3 students, there was no video recording and screen recording during the trial implementation. As stated above, the purpose of such trial implementation was to allow the researcher to practically experience the implementation of the four WebQuests, so as to help the WebQuest designers improve the design of each WebQuest. *Figure 3.82* presents an overall arrangement of the trail implementation in a graphical way.

3.5.3 Contributions to the Main Study

The findings from the pilot study 1) suggested a minor modification to the pre-test and the post-test, and 2) highlighted three points towards better facilitation of student learning for the design and implementation of the WebQuests.

3.5.3.1 Extension of Time Allowed for the Tests

Upon completion of piloting the two tests, a minor modification was made to them. First, from G_{S2a}, it was found that the students did not encounter difficulty in understanding the test items and the information given in the pre-test. All students in the group were able to complete the six tasks in the test according to the given instructions. However, six out of the twenty students in the group could not complete the test within the given period of time (i.e. 50 minutes). Therefore, during the pilot study, the test session was extended by 10 minutes. In other words, G_{S2a} was given 60 minutes to complete the pre-test in the pilot study. With the extra 10 minutes, it was found that all students in G_{S2a} could complete all the test items in the pre-test.

Similarly, from G_{S2b}, it was found that no student encountered difficulty in understanding the test items and the information given in the post-test. All students in the group were able to complete the six tasks in the test according to the given instructions. Nevertheless, like the pre-test, seven out of the twenty students in the group could not complete the test within the given period of time (i.e. 50 minutes). Therefore, like the arrangement made for the pre-test, the test session was extended by 10 minutes. In other words, G_{S2b} was given 60 minutes to complete the post-test in the pilot study. With the extra 10 minutes, it was found that all students in G_{S2b} could complete all the test items in the post-test.

Based upon the above finding, in the main study, the time allowed for the pre-test and the time allowed for the post-test were both adjusted to 60 minutes.

3.5.3.2 Consistent Scoring by Raters Based on the Rubrics

Concerning the trial run of the four rubrics, it was found that, for each of them, the consistency of scores that were assigned by the three raters on the sample student work was basically maintained. Numerical results obtained from the pilot study (i.e. discrepancies in

rubric scores assigned by the raters on the sample student work) are summarized as follows.

A) Consistency of Rubric Scores for *RB1* Maintained

As reported in Section 3.4.2.2, there were two criteria in *RB1*, while each rater was given 10 samples for piloting the rubric. Thus, there were 10 scores assigned by a rater on a particular criterion for the samples and there were altogether 20 scores assigned by a rater on the samples based upon *RB1*. It was found that there were no discrepancies among the 20 scores assigned by each rater on the two criteria. According to the results of piloting *RB1*, *RB1* was regarded as a useful rubric to be used in the main study.

B) Consistency of Rubric Scores for *RB2* Basically Maintained

As reported, there were also two criteria in *RB2*, while each rater was given 10 samples for piloting the rubric. Thus, there were also 10 scores assigned by a rater on a particular criterion for the samples and there were altogether 20 scores assigned by a rater on the samples based upon *RB2*. It was found that, among the 20 scores, discrepancies occurred in only a few of them (4 scores).

The table below summarizes the discrepancies of scores assigned by the three raters on the sample student work for the trial run of *RB2*. The procedure for handling discrepancies in the rubric scores has been reported in Section 3.4.2.2 of this chapter.

Sample Student Work: • 10 presentation documents	Criteria in *RB2*	
	Appropriateness of Choice	Explanation of Choice
	(for identifying the achievement of the learning outcome [C6.1])	
Scores with Discrepancies:	2/10	2/10

Table 3.17: Discrepancies in Rubric Scores Assigned by Three Raters for Trial Run of RB2

As shown in *Table 3.17*, there were discrepancies in 2 of the 10 scores assigned by each rater on the criterion "Appropriateness of Choice", where 1) for one sample, a score of 3 was given by one rater and a score of 2 was given by the other two, and 2) for another sample, a score of 2 was given by one rater and a score of 3 was given by the other two.

There were also discrepancies in 2 of the 10 scores assigned by each rater on the criterion "Explanation of Choice", where 1) for one sample, a score of 1 was given by one rater and a score of 2 was given by the other two, and 2) for another two samples, a score of 3 was given by one rater and a score of 2 was given by the other two.

As a common practice, an interrater agreement of 80% or better is normally expected and considered acceptable (Moskal, 2000). According to the results of piloting *RB2*, since discrepancies occurred in only a few (4 scores) of the 20 scores, *RB2* was regarded as a useful rubric to be used in the main study.

C) Consistency of Rubric Scores for *RB3* and *RB4* Maintained

For *RB3* and *RB4*, there were five criteria in the former and four in the latter. Thus, there were 100 scores (5 criteria × 20 samples) assigned by a rater on the 20 samples, from *WQ3*, based upon *RB3* and there were 80 scores (4 criteria × 20 samples) assigned by a rater on the 20 samples, from *WQ4*, based upon *RB4*. It was found that there were no discrepancies among the 100 scores related to *RB3* and the 80 scores related to *RB4*. Therefore, *RB3* and *RB4* were also regarded as useful rubrics to be used in the main study.

3.5.3.3 Improvement of the WebQuests

Other than piloting the two tests and the four rubrics, the trial implementation of the WebQuests was also an emphasis of the pilot study. As mentioned previously (see Section 3.5.2.3), in order to minimize the disturbance to the students, there was no video recording and screen recording during the trial implementation. The findings discussed below were based on the class observation done by the researcher.

Upon completion of the trail implementation of the four WebQuests, three points towards better facilitation of student learning were highlighted based upon the findings from the class observation.

A) Removal of Links to Wikipedia

First, like the main study, the first two lessons for the trial implementation of *WQ1* were for each student to carry out individual research according to his/her assigned role. Each role was provided with a set of pre-selected Web resources for answering the role-specific guiding questions. Therefore, each student was expected to look for relevant information from the pre-selected Web materials for the guiding questions. However, it was observed that, instead of browsing and reading the pre-selected Web materials, a number of students in G_{S3a} clicked the link to Wikipedia directly and merely searched for required information at Wikipedia with no apparent intention to using the pre-selected Web materials. The link to Wikipedia was available at the left frame of the WebQuest page. The teacher had to stop those students from looking for information at Wikipedia and suggested them to make use of the set of specific Web materials for answering the guiding questions. Similar situation was also found during the first two lessons for the trial implementation of *WQ2*.

Based upon such finding, the links to Wikipedia were removed from the WebQuest pages of *WQ1* and *WQ2* subsequent to the trial implementation, so as to 1) encourage students to focus on using the pre-selected Web materials, and 2) promote the use of authentic Web resources.

B) Common Storage Space for Collaborative Work

Second, during the trial implementation of the four WebQuests, it was found that students encountered difficulties in exchanging information among group members and sharing the work done by different members. The major problem was that the members of a working group lacked a common storage space to store the useful materials found by the others or to share the work done by the others.

To overcome the above difficulties encountered by students and also to facilitate the collaborative work among the members of a working group, a common storage space was

provided to each working group during the implementation of the four WebQuests in the main study. Particulars of the common storage space for students' group work are given in the subsequent chapter (see Section 4.2.4).

C) Templates for Completion of Learning Products

Third, like the main study, the last two lessons for the trial implementation of *WQ1* were for each working group to 1) have final preparation of the presentation and 2) conduct oral presentation of their learning product to the class. It was found from the work (i.e. PowerPoint documents) completed by the five working groups of G_{3a} that students failed to clearly and logically organize the contents to be presented in their learning products even if a few guidelines on preparing the presentation were provided in the *Process* section. Each working group was expected to 1) extract some key points from the individual research reports completed by the four members, and then 2) combine and organize the key points to be presented in their group learning product. However, it was found that the five working groups of G_{3a} simply put the contents of the individual research reports together in their group products without selection and extraction of key information. The learning products completed by two working groups are shown in Appendix 26.

Based upon such finding, in the main study, the teacher provided students a presentation template (see Appendix 10) during the implementation of *WQ1*. It severed as a kind of production scaffolds, as discussed by Dodge (2001), for providing a basic structure of a presentation to students in order to help them organize their presentation contents. The template was a PowerPoint document, in which there were nine slides, and it was delivered to students via the folder, named "WebQuest 1", created on the network drive that was accessible to all participants.

The first slide in the template was a cover slide. It was for a working group to enter the topic of the presentation and the basic information of the group members, like names, class,

and class numbers. The second slide contained a table of contents for the following slides. There were seven titles typed on the content slide, which was designed to remind a working group the major subject of each of the following slides. Seven corresponding slides were created next to the content slide. They were all blank slides. A relevant title was typed on the top of each slide so that students were reminded again what contents should be presented on that slide.

On the contrary, for the trial implementation of *WQ2*, it was found that students could basically organize the presentation contents in a clear and logical manner. It was probably due to the outline of the presentation given in the *Process* section that reminded a working group the required elements to be included in the presentation. In such case, in the main study, it was not necessary to provide another presentation template to students for the implementation of *WQ2*. In addition, concerning the implementation sequence of the four WebQuests in the main study, *WQ2* was delivered to the five groups of participants (i.e. G_a, G_b, G_c, G_d, and G_e) subsequent to *WQ1*.[5] With such sequence, students were expected to gain some ideas about how to plan and organize their presentation contents from the learning experience they had gone through in the previous WebQuest activity (i.e. making use of the presentation template provided in *WQ1* to complete the learning product). As a result, there was no extra presentation template provided in *WQ2*.

Other than a presentation template provided in *WQ1*, a report template and a spreadsheet template were also provided in each of *WQ3* and *WQ4*. Based upon the trial implementation of *WQ3* and *WQ4*, it was found that, at the beginning of the lesson, most students spent quite a lot of time creating a spreadsheet according to the format, rows, and columns suggested in the WebQuest page. Some of them also spent quite a lot of time creating and designing a Word document for the report. As a result, they had relatively less class time for analyzing

[5] Details of the procedure of the main study, including the implementation sequence of the WebQuests and the participants, are delineated in Chapter 4.

data, drawing conclusion, and making inferences. As students were given limited class time (two 35-minute lessons in the pilot study) for the WebQuest activity, most working groups failed to complete the learning task within the lesson. In order to reduce the time spent on technical operations, like creating and formatting a Word document or a spreadsheet, the teacher provided students a report template (see Appendix 11) together with a spreadsheet template (see Appendix 12) during the implementation of *WQ3* in the main study. Similarly, the teacher also provided students such two templates (see Appendix 13 and Appendix 14) for the implementation of *WQ4* in the main study.

The spreadsheet template served as a kind of reception scaffolds, as discussed by Dodge (2001), for providing a table structure to students in order to help them 1) organize the input data into a tabular form, and 2) save the class time on creating the data tables. The report template severed as a kind of production scaffolds, as discussed by Dodge (2001), for providing a basic structure of the report to students in order to help them complete the learning product with ease. The spreadsheet template was an Excel document, while the report template was a Word document. They were delivered to students via the folders, named "WebQuest 3" (for *WQ3*) and "WebQuest 4" (for *WQ4*), created on the network drive that was accessible to all participants.

In the spreadsheet template for *WQ3*, a table, which followed the format as suggested in the *Process* section, with five columns and four rows were created. Each column was named with a suitable label being related to a required data item. Students could fill the table by entering the country names and other required data in the corresponding cells, and then used it for further analysis, like making comparisons or graphing. The report template allowed and guided students to complete the learning product by 1) locating the required elements, such as the data table, graphs, and descriptions of graphs, at the appropriate space provided, and 2) writing their inferences and reasons in the boxes provided.

For *WQ4*, five tables were created in the spreadsheet template. The first four tables

helped students organize the fast food data from four selected restaurants. Each of them allowed and guided students to enter the required data for one restaurant, including food items, calories of each food item, grams of fats of each food item, and total calories and total grams of fats of all food items. The fifth table helped students organize the total calories and the total grams of fats of each of the four restaurants. Like *WQ3*, the report template for *WQ4* allowed and guided students to complete the learning product by 1) locating the required elements, such as the restaurant names, data tables, and charts, at the appropriate space provided, and 2) writing their answers to guiding questions, their conclusion, inferences and reasons in the boxes provided.

3.6 Summary

In this chapter, the design of the study has been delineated. The study was built on a major research question, which was to study whether using a set of WebQuests could yield significant improvement in developing students' information skills, so as to help junior secondary students achieve a set of learning outcomes for information literacy. Four WebQuests were involved in the study as an instrument for helping students improve information literacy. Afterwards, the effects of using the WebQuests on students' improvement of information literacy were measured, so as to answer the research question.

Among the four WebQuests, three of them were selected by the researcher together with three experienced teachers from five online WebQuest collections, while the other was designed by the same group of people. There were two rounds in the selection of the WebQuests. In the first round, the researcher examined five hundred and thirteen WebQuests hosted by the five online collections and selected thirteen of them according to a broad theme "human and environment" and some general principles for good WebQuests. In the second round, the researcher and the group of experienced teachers examined the thirteen WebQuests carefully and selected three of them to be used in the study. The three selected WebQuests

were further adapted and modified in order to 1) fit the local context of the intended participants, and 2) better facilitate and scaffold student learning.

The four WebQuests employed in the study were adapted and designed in best accordance with the six characteristics, identified by March (2003), for a real WebQuest. They were also rated by a group of WebQuest experts as well-designed ones in order to ensure the quality of the instrument. Besides, they were designed to help students achieve five specific learning outcomes defined in the Information Literacy Framework for Hong Kong Students (EMB, 2005). *WQ1* and *WQ2* aimed at four of them, while the other two, *WQ3* and *WQ4*, also aimed at four of the target learning outcomes. The two pairs of WebQuests shared three target learning outcomes in common. The results of the expert review also addressed the appropriateness of the four WebQuests for helping students achieve the target learning outcomes for information literacy.

To further enhance the design of the instrument, a trial implementation of the WebQuests was carried out in the case school prior to the main study. Based upon the findings from class observation, three points towards better facilitation of student learning in the main study were highlighted. First, the links to Wikipedia available on the WebQuest page of *WQ1* and *WQ2* were removed. Second, a specific folder on a network drive was provided to each working group during the implementation of each WebQuest. The folder served as a common storage space for the collaborative work of a working group. Third, a presentation template was provided in *WQ1* for helping students organize the presentation contents. A report template and a spreadsheet template were provided in each of *WQ3* and *WQ4* to help students complete the learning products with ease.

The instrument for measuring the learning effects of using the WebQuests primarily comprised a pre-test and a post-test. Such instrument studied the participants' overall achievement of the expected learning outcomes for information literacy.

The pre-test and post-test were developed by the researcher together with three

experienced teachers, and reviewed and commented by three academics. The two tests shared similar types of questions, equal number of tasks, and equivalent format but differed in their themes. They were designed to minimize the assessment of content knowledge and to limit the amount and difficulty of reading required.

There were six tasks assessing the five learning outcomes in each test. Task 1 required students to use key words to record the key information of two given Websites. Task 2 required students to categorize a set of information items using a mind map, while Task 3 required students to give simple illustration and conclusion on the given items. Task 4 required students to answer a series of true/false test items according to a given set of facts and findings. Task 5 required students to make decisions on some questions posed in a given situation. Task 6 required students to answer four short-answer test items concerning their learning experience in the WebQuests. The marking scheme of each task in the tests was developed by the test designers together with two experienced language teachers and two academics. The two tests were piloted to check if the test items were properly written, the items befitted the participants' language level, and sufficient time was given to students.

Other than the tests, the work completed by students during the four WebQuest activities would be analyzed, based on four specially designed rubrics, to serve as a reference to part of the findings from the tests. There were several criteria with four levels of descriptors in each rubric. The rubrics were developed and revised by the researcher together with three experienced teachers based upon a set of sample work completed by the participants. They were piloted by involving a team of raters in undertaking a trial run on another set of sample work. The results of the pilot study suggested that, for each of the four rubrics, the consistency of scores that were assigned by the team of raters on the sample student work was basically maintained. Thus, the four rubrics were useful to be used in the main study.

In addition to employing the tests and the rubrics for measuring the learning effects, an interview would be conducted with five groups of students for gathering information

regarding their actual practice and what they had learned throughout the WebQuests. It also served as a means for triangulation of the findings from the pre-test and post-test.

CHAPTER 4

PROCEDURE

4.1 Introduction

This chapter delineates the procedure of carrying out the main study, including the implementation of the WebQuests and the procedure for data collection and preparation.

The present study took place in a co-educational secondary school in Hong Kong. The school had about 1,110 students from Secondary 1 to Secondary 7 levels and adopted a 6-day cycle system. One hundred junior students, from five S.2 classes, in the school took part in the study as the participants. The pre-test was administered to all participants a few days before the implementation of the WebQuests, which lasted for 8 school cycles. The WebQuests were implemented in the S.2 Computer lessons. During the lessons, the physical activities and the computer screens of five groups of students were video recorded. The post-test was administered to all participants and the five groups were interviewed a few days subsequent to the implementation.

Following this introductory section, Section 4.2 gives particulars of the implementation of the WebQuests, including the participants. Subsequently, Section 4.3 details the procedure for data collection and preparation.

4.2 Implementation of the WebQuests

Henri et al. (2006) discuss three options for the implementation of the Information Literacy Framework for Hong Kong Students (EMB, 2005) in schools. They are 1) *coordination with IT/library lesson*, 2) *curriculum infusion*, and 3) *coordination by PBL* (EMB, 2005; Henri, Kong, Lee & Li, 2006).

4.2.1 Coordination with Computer Lessons

By making reference to the above options, the first one was adopted in this study. That was using the existing Computer lessons in the school, as a coordinating subject, for implementing the WebQuests. It was considered as an appropriate way to suit the context and the situation of the school.

4.2.1.1 Arrangement of Computer Lessons

Practically, as mentioned in the previous chapter (see Section 3.4.1.2), the set of WebQuests was designed as part of the S.2 Computer curriculum, which lasted for 8 school cycles. They were delivered to all S.2 students through the Computer lessons.

In the school, there were 200 students at Secondary 2 level and they were divided evenly into 5 mixed ability classes. Each class consisted of 40 students. Each student in a class was assigned a class number, from 1 to 40. The assignment of the class numbers was done according to the alphabetical order of student names.

In each school cycle, a double lesson (35+35 minutes) was allocated to each S.2 class for the Computer subject. Split class teaching was adopted for the subject. During the Computer lessons, students in each class were divided evenly into two groups, namely odd-number group (20 students) and even-number group (20 students), according to their class numbers. Students with odd class numbers belonged to the odd-number group and those with even class numbers belonged to the even-number group. The two groups were taught by two different teachers for conducting the lessons simultaneously in two different computer rooms, where each student was provided with a computer workstation for his/her own practice.

In the school, the odd-number groups of the five S.2 classes were taught by the researcher, while the five even-number groups were taught by another four teachers, namely *Teacher L*, *Teacher T*, *Teacher C*, and *Teacher W*. Among the four teachers, three of them

(*Teacher L*, *Teacher T*, and *Teacher W*) were also involved in designing and adapting the WebQuests. The following figure provides an overview of the arrangement of the Computer lessons for the S.2 classes.

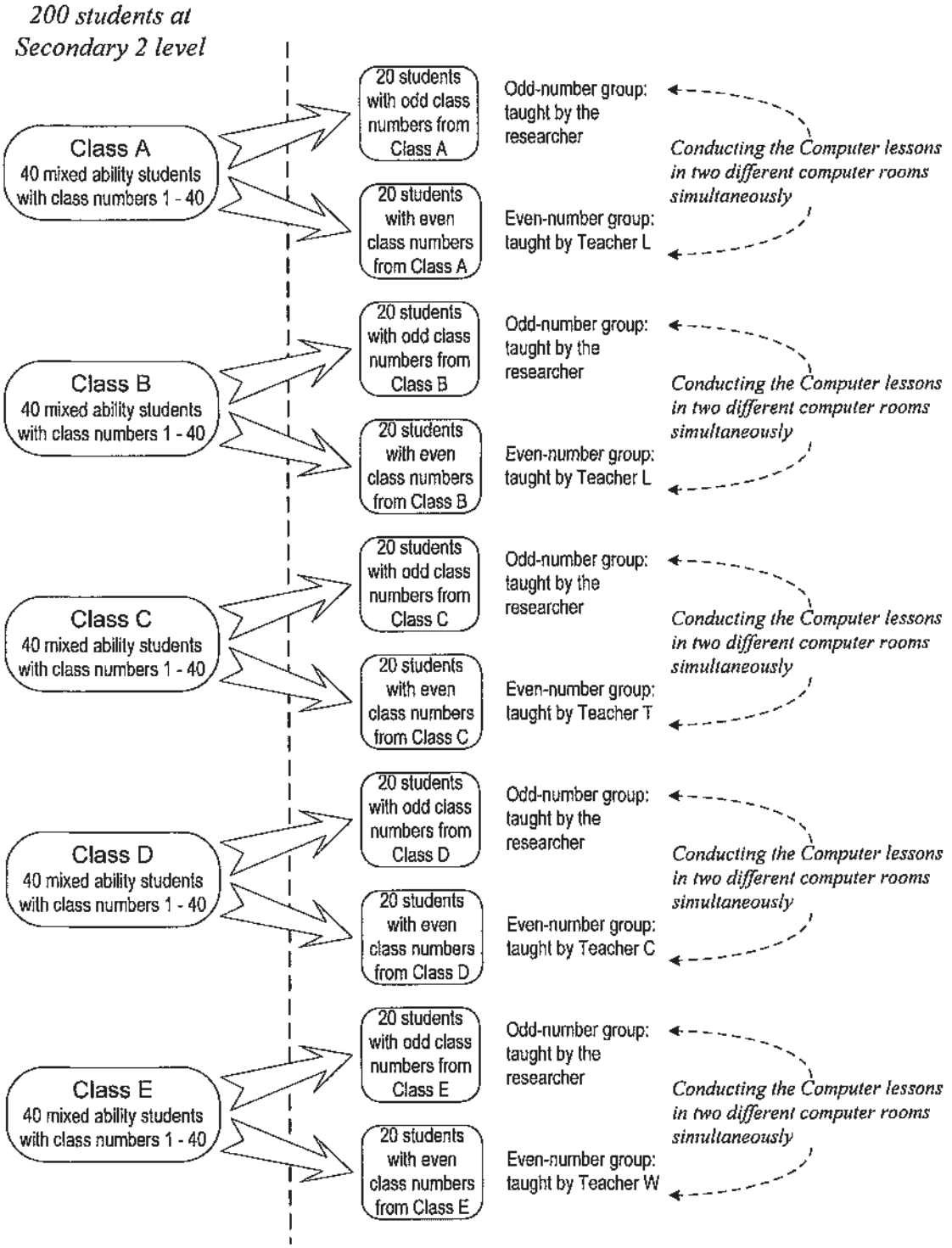


Figure 4.1: Arrangement of Computer Lessons for S.2 Classes

4.2.1.2 Groups of Participants

As reported previously, the set of WebQuests was part of the S.2 Computer curriculum. In regard to the concerns of equity and school administration, the four WebQuests were delivered to all the S.2 classes, in which students of the odd-number groups (i.e. those taught by the researcher) were the participants of the research. In other words, there were five groups of Secondary 2 students (denoted by G_a, G_b, G_c, G_d, and G_e) involved in this study. Each group consisted of 20 students with mixed ability, representing half of a S.2 class in the school. The total number of participants was 100 (N=100) and the researcher was their teacher during the Computer lessons.

4.2.2 Implementation Period and Sequence

It has been mentioned in the previous paragraphs that the school adopted a 6-day cycle system and a double lesson (70 minutes) was allocated to each S.2 class for the Computer subject in one school cycle. In considering the amount of time required for completing the tasks, the four WebQuests differed in their implementation periods. To allow adequate time for students' inquiry and practice, the researcher and *Teacher T* decided that three 70-minute lessons were allotted to each of *WQ1* and *WQ2*, while each of *WQ3* and *WQ4* was assigned with one 70-minute lesson for its implementation.

Among the three 70-minute lessons for *WQ1* or *WQ2*, the first one was used to 1) allow the teacher to illustrate the WebQuest activity to students, for the first few minutes, and 2) let each group member carry out individual research according to his/her assigned role/viewpoint. The second lesson was dedicated to students' group work. For the implementation of *WQ1*, the lesson was for each group to combine the findings brought by the members in the first lesson, so as to allow the group to create the learning product. For the implementation of *WQ2*, the lesson was for each group to 1) discuss and debate based upon the four perspectives, and 2) reach a consensus subsequently, so as to allow the group to

create the learning product. The third lesson was for each group to 1) have final preparation of the presentation and 2) conduct oral presentation of their learning product to the class.

The single lesson for *WQ3* or *WQ4* was used to 1) allow the teacher to introduce the WebQuest to students, at the beginning, and 2) let each group gather the data required for analysis and complete their learning product.

Concerning the implementation sequence, the five groups of participants (i.e. G_a, G_b, G_c, G_d, and G_e) differed in the order of receiving the four WebQuests. G_a and G_b received the WebQuests in the order of *WQ1*→*WQ2*→*WQ3*→*WQ4*, while the WebQuests was given to G_c and G_d in another order that was *WQ3*→*WQ4*→*WQ1*→*WQ2*. For the remaining group, the set of WebQuests was delivered to G_e in the order of *WQ1*→*WQ3*→*WQ2*→*WQ4*. All lessons were held in a computer room, where each student was provided with a workstation connected to the Internet and equipped with necessary software packages. Altogether, the entire implementation period lasted for 8 school cycles. *Figure 4.2* presents an overall arrangement of the implementation in a graphical way.

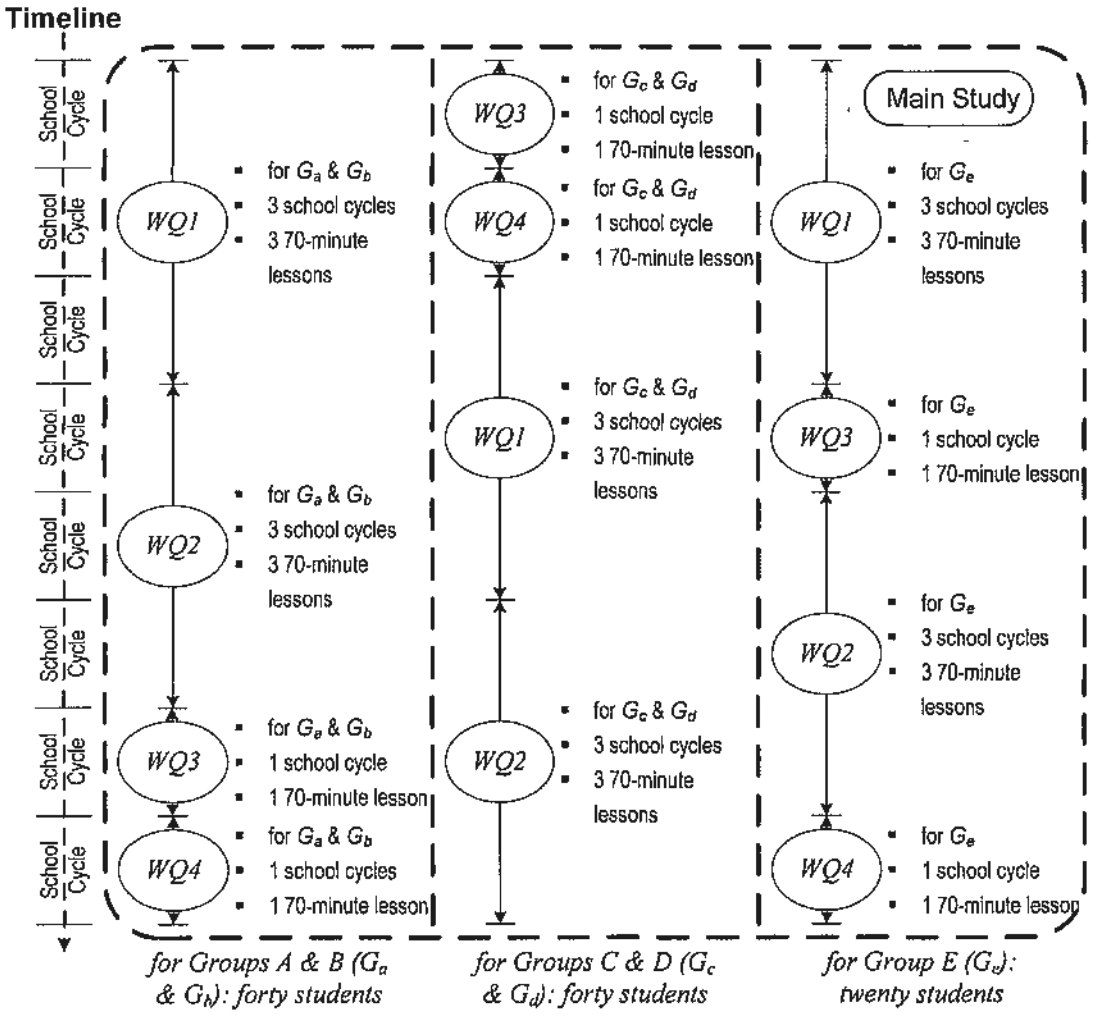


Figure 4.2: Overall Arrangement and Timeline of Implementation

4.2.3 Video Recording

During the lessons for the implementation of the WebQuests, students' physical activities and their computer operations were both recorded and captured. It was done by video recording together with screen recording. As mentioned in the previous chapter (see Section 3.3.2), the recording was not a primary part of the data collection. It only served as a kind of supplementary data source for corroborating part of students' interview responses.

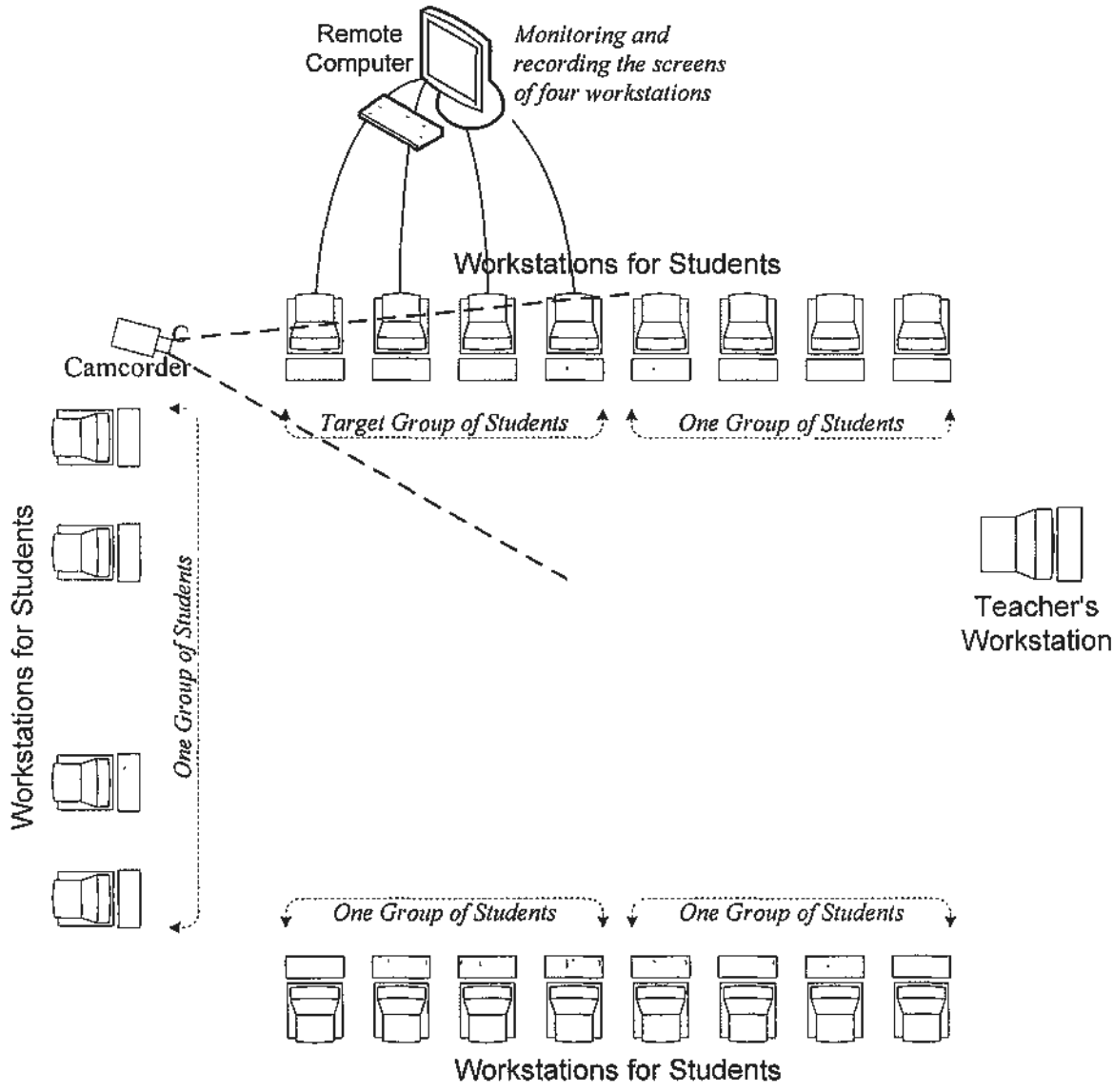


Figure 4.3: Computer Room Layout for WebQuest Implementation

As shown in *Figure 4.3*, since the computer workstations were widely dispersed in the Computer Room, it was difficult to set a camcorder at an appropriate position to cover all students' activities. Therefore, the camcorder was placed next to a working group (four students), by random selection, to record the entire learning process of the group, whatever working on computers, discussing, or conducting presentation. The figures below show two snapshots of the video clips recording the physical activities of a working group. *Figure 4.4* reveals the working group's discussion, while *Figure 4.5* reveals the group's presentation.

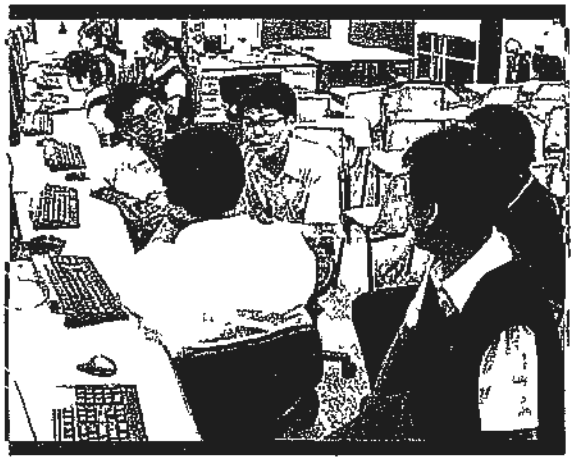


Figure 4 4 Snapshot of Video Recording of a Working Group's Physical Activities (Discussion)

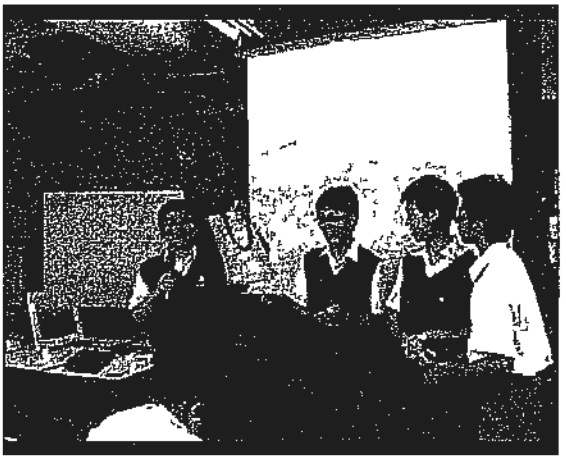


Figure 4 5 Snapshot of Video Recording of a Working Group's Physical Activities (Presentation)

Besides, as the WebQuests were designed for the students to carry out inquiry activities on their own, they would spend most of the class time on the computers for completing the given tasks. In such case, recording the students' activities on the computer screens would be useful for understanding their learning processes.

In addition to recording the working group's physical activities in the lessons, the computer screens of the group (four computers) were monitored and recorded using some dedicated software for remote computer monitoring and screen recording. Specifically, as illustrated in *Figure 4 3*, a remote computer was reserved for monitoring and recording purposes. It monitored the screens of four computer workstations (for the working group) simultaneously. Furthermore, a screen recording software was installed on the remote computer for recording its screen activities. As the remote computer monitored the screens of four workstations for students, recording the screen of the remote computer could function as recording the screens of the four workstations for students. The figure below shows a snapshot of the video clips recording the screen activities of a working group.

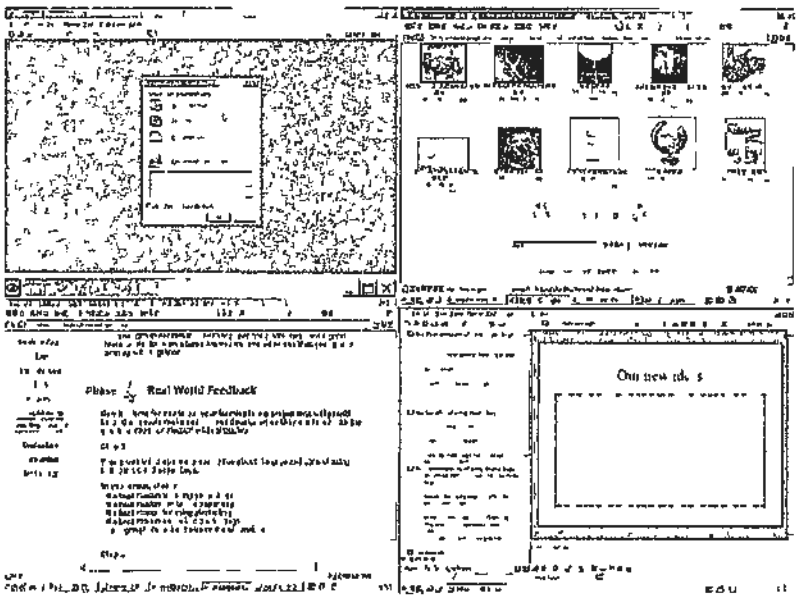


Figure 4 6 Snapshot of Video Recording of a Working Group's Screen Activities

4.2 3.1 Recording of Students' Physical Activities

Upon completion of the implementation of a WebQuest, the video clips, which recorded a working group's physical activities, were summarized and transcribed into text.

Appendix 21 presents the details of the videos clips recorded in the lessons for the implementation of the WebQuests. In summary, there were 40 video clips recording the physical activities of five working groups during the implementation of the WebQuests, 15 of them were for each of *WQ1* and *WQ2*, and 5 were for each of *WQ3* and *WQ4*. Quality of the video recording was satisfactory. Nevertheless, owing to the location of the camcorder (see *Figure 4 3*), which was considered by the researcher and *Teacher T* the most appropriate position for capturing a group's activities based upon the layout of the computer room, students' dialogues were basically inaudible.

The 40 video clips were summarized and transcribed into text by the researcher. Each lesson transcript was further reviewed by the researcher together with a research assistant to check the accuracy of the transcription, in which students' actions, such as gestures, motions, moves, etc, were mainly laid out The lesson transcripts (students' physical activities) are summarized and reported in Appendix 24a, Appendix 24b, Appendix 24c, and Appendix 24d

according to the four WebQuests.

4.2.3.2 Recording of Students' Screen Activities

In addition to the video clips mentioned above, there were another 40 video clips recording the screen activities of the five working groups during the implementation of the WebQuests. Appendix 22 presents the details of these videos clips.

In summary, there were 40 video clips recording the screen activities of five working groups during the implementation of the WebQuests, 15 of them were for each of *WQ1* and *WQ2*, and 5 were for each of *WQ3* and *WQ4*. Quality of the screen recording was satisfactory.

Following the procedure for transcribing the video clips mentioned in the above section, the 40 video clips for screen recording were also summarized and transcribed into text by the researcher. Each lesson transcript was further reviewed by the researcher together with a research assistant to check the accuracy of the transcription, in which students' major tasks performed on computers, such as browsing pre-selected materials, copying and pasting text, retouching photos, typing on PowerPoint slides, plotting graphs in spreadsheet, etc, were laid out. The lesson transcripts (students' screen activities) are summarized and reported in Appendix 25a, Appendix 25b, Appendix 25c, and Appendix 25d according to the four WebQuests.

4.2.4 Common Storage Space for Group Work

As mentioned, all lessons for implementing the WebQuests were held in a computer room. In addition to providing each student a computer workstation with Internet connection and necessary software packages, common storage space on the school network was provided to the students for facilitating their group work, especially in assisting a group in exchanging information found by different members and helping the group complete the learning product with ease.

Appendix 15 presents the technical details of the common storage space, as well as its usage, for facilitating students' group work. In short, during the implementation of each WebQuest, a specific folder was created on a network drive for each working group in G_a, G_b, G_c, G_d, and G_e. The network drive was accessible to all students, while the specific folder for a working group was accessible to the members of that working group only. Therefore, the four members of a working group were able to share and exchange the findings brought by each other. They could also make use of the specific folder, as a common storage space, to store related and useful materials for their group product, such as data files, spreadsheets, reports, or presentation documents. All files stored in the specific folder could be retrieved by any members of the working group.

4.3 Procedure for Data Collection

It has been reported in Chapter 3 that there were two major instruments developed in the present study for measuring the learning effects of using the WebQuests (see Section 3.4.2). They were a pre-test and a post-test, and four rubrics for analysis of student work. In addition to the two assessment tasks, an interview would be conducted with five groups of students for gathering information regarding their actual practice and what they had learned. The rest of this section describes minutely the procedure of applying these instruments for data collection.

4.3.1 Measuring Learning Effects by Pre-test and Post-test

First, it is about the pre-test and the post-test. As mentioned above, there were five groups of participants (denoted by G_a, G_b, G_c, G_d, and G_e) involved in the study.

4.3.1.1 Administering Two Tests

The pre-test was administered to each group through a regular Computer lesson a few days before the implementation of the WebQuests, while the post-test was administered to each group through another regular Computer lesson a few days after the implementation of

the WebQuests.

The two tests were administered to the five groups with the same procedure. First, the researcher distributed hardcopies of the test, together with hardcopies of the two Websites for Task 1, to all students in a group (i.e. 20 students in the odd-number group of a S.2 class). To avoid cheating, students were required to follow a seating arrangement that no two students sat next to each other. Before the commencement of the test, the researcher explained clearly the instructions of the test to all students in order to make sure that they understood the requirements of the test. To allow sufficient time for students, they were given sixty minutes to complete all the test items. During the test, students were not allowed to chat or discuss with others. The researcher also walked around in the classroom to enforce the regulation and respond to any inquiries or questions raised by students. When time was up, the researcher collected the test papers and the printed copies of two Websites from all students.

4.3.1.2 Compensation for Absence of Control Group

Normally, to compare the results of the pre-test and post-test, there should be a control group taking the two tests during the same period as that taken by the experimental group (see Bezzi, 1999; Derry, Levin, Osana, Jones & Peterson, 2000; Kuhn, Shaw & Felton, 1997; Siegel, 2000; Siegel, Derry, Steinkuehler, Kim & Seymour, 2001; Slater, 1997).

Owing to a limitation of the study, a control group was absent in the research setting. As reported in Section 4.2.2, there were five S.2 classes in the school. In regard to the concerns of equity and school administration, the school granted permission to this study under the condition that all the S.2 classes would receive the four WebQuest activities, for information literacy instruction, as part of the school curriculum. As a result, the WebQuests were delivered to the five classes at the same period. In such case, it was not possible to find another group of students at the same level to be a control group.

To compensate the above limitation, a special arrangement was made in the study. As

mentioned, the set of WebQuests was part of the S.2 Computer curriculum of the school (see Section 4.2.2). It lasted for about eight school cycles, which were in the second term of a school year. Since the WebQuests were delivered to all the S.2 classes at the same period, it was not possible to arrange more S.2 students to be a control group in the same school year. Thus, a group of forty S.2 students in the next school year were invited to be a control group for taking the pre-test and post-test, so as to 1) compensate the limitation of the study, and 2) make the comparison of the pre-test and post-test results possible. The figure below illustrates the arrangement in a graphical way.

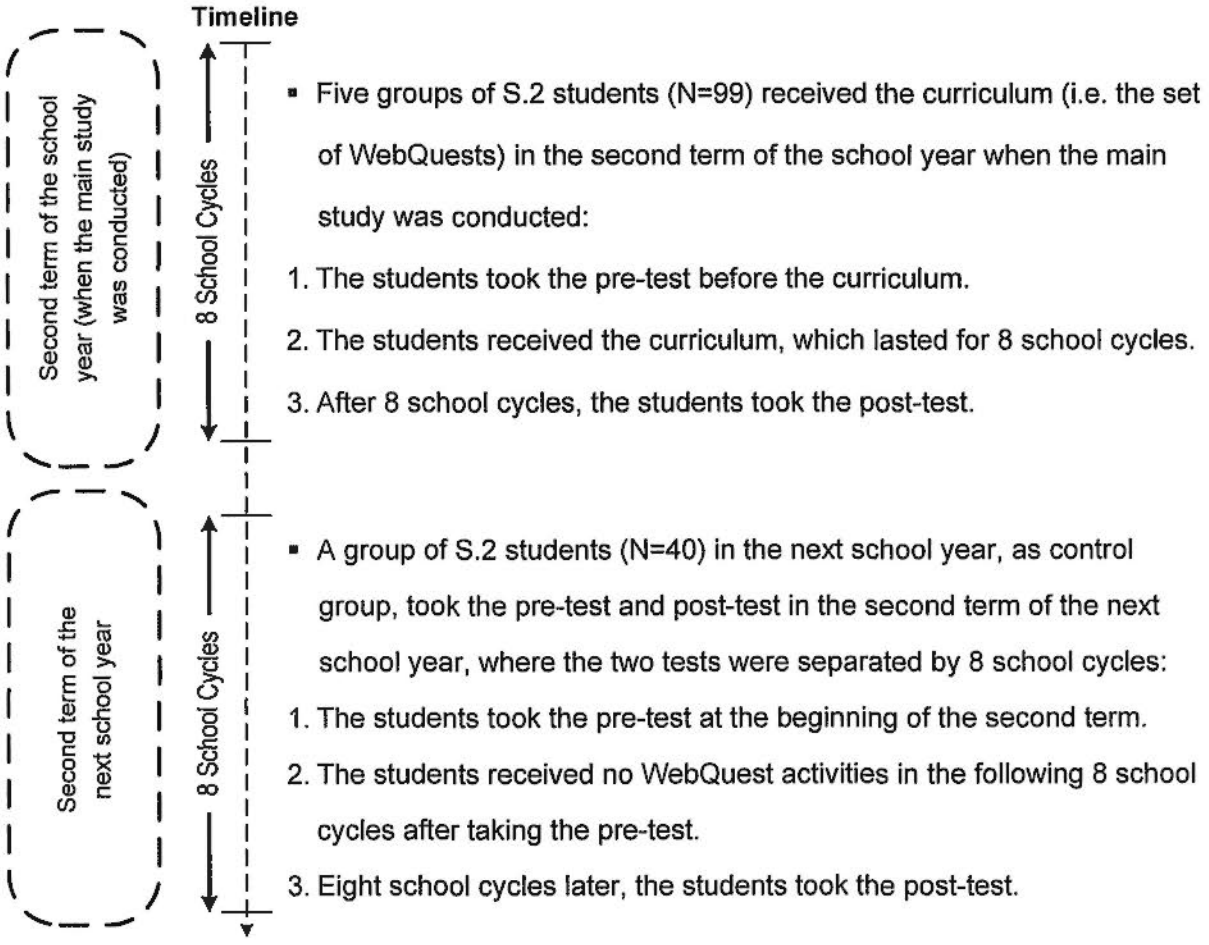


Figure 4.7: Arrangement for Compensation of Absence of Control Group

As presented in *Figure 4.7*, the group of forty S.2 students of the next school year, as control group, took the pre-test and post-test in the second term of the next school year. Since the implementation of the four WebQuests lasted for 8 school cycles in the main study, the

control group took the two tests that were separated by the same period of time. At the beginning of the second term of the next school year, the control group took the pre-test. They took the original subject curriculum during the Computer lessons and received no WebQuest activities in the subsequent 8 school cycles after taking the pre-test. As reported in Section 3.4.1.2 of Chapter 3, prior to the introduction of WebQuests, the original subject curriculum for that period was about teaching two application software packages: presentation software and electronic spreadsheet. Afterwards (i.e. 8 school cycles later), the control group took the post-test. With such setting, the control group might yield a useful reference for comparing the test results obtained in the main study.

4.3.1.3 Data Entry

The pre-test was administered to 100 participants before the implementation of the WebQuests. As one student in G_a quitted the school in the middle of the implementation, the post-test was administrated to 99 participants after the WebQuests.

For the ease of filing and retrieval, all the collected test papers (i.e. 100 pre-test papers collected and 99 post-test papers collected) were scanned into electronic copies, and saved as PDF documents, by a research assistant. Subsequently, students' responses and answers to all test items, except those for Task 2 and Task 3, in the collected test papers were coded and entered into two spreadsheets by the research assistant. Data from the collected pre-test papers were entered into one spreadsheet, while those from the collected post-test papers were entered into another spreadsheet. All data in the two spreadsheets were double checked by another research assistant for the purpose of verification. The coding scheme of students' responses to the test items and the format of the spreadsheets are presented in Appendix 27.

4.3.1.4 Marking Process

It has been reported in the previous chapter that, prior to marking the collected test papers, the test designers (i.e. the researcher, *Teacher T*, *Teacher W*, and *Teacher L*)

collaborated with some experienced teachers and academics to work out a scheme for scoring the test items (see Section 3.4.2.1). Owing to the nature of the marking schemes, the marking processes of the six tasks in the tests were different from each other. They are described below.

A) Task 1 of the Tests

Concerning the marking process of Task 1, it was done in two rounds. Initially, students' answers to Task 1 of all the collected test papers (i.e. 100 pre-test papers and 99 post-test papers) were marked by a research assistant. She checked against the key words and phrases jotted by each student according to the lists of key words and phrases defined in the marking scheme (see *Tables 3.12*, *3.13*, *3.14* and *3.15* in Chapter 3) and entered the scores into the corresponding cells in the two spreadsheets. Once the research assistant encountered any answers that she found difficulty for scoring, such answers were marked and highlighted in the spreadsheets. They were kept for further review and scoring by the researcher and the language teachers.

At a later time, in the second round of marking, the researcher together with the two experienced language teachers reviewed all the scores assigned by the research assistant and also determined the scores that should be given to those unmarked and highlighted by the research assistant. The researcher worked with the Chinese teacher for checking the scores related to the first Websites (i.e. the ones in Chinese) given in both tests, while he worked with the English teacher for checking those related to the second Websites (i.e. the ones in English) given in the two tests. Numerical results of Task 1 in both tests are presented in Appendix 28.

B) Task 2 of the Tests

Concerning the marking process of Task 2, it was done by involving a team of raters (*Teacher W*, *Teacher L*, and the researcher) in scoring the mind maps completed by the

students in all the collected test papers (i.e. 100 pre-test papers and 99 post-test papers). Each of the raters was given two PDF documents. One contained 100 pages indicating the mind maps extracted from the 100 pre-test papers collected. Another PDF document contained 99 pages indicating the mind maps extracted from the 99 post-test papers collected. Each rater examined and scored all the mind maps (i.e. 100 mind maps from the pre-test papers collected and 99 mind maps from the post-test papers collected) individually. The procedure for comparing the three sets of scores given by the three raters was the same as that employed in the analysis of student work, which is described in Section 3.4.2.2(E) in Chapter 3. Numerical results of Task 2 in both tests are presented in Appendix 28.

C) Task 3 of the Tests

Concerning the marking process of Task 3, it was done by involving another team of raters (i.e. *Teacher L*, an experienced English teacher, and the researcher) in scoring the participants' writings for Task 3 in all the collected test papers (i.e. 100 pre-test papers and 99 post-test papers). Each of the raters was given two PDF documents. One contained 100 pages indicating the writings extracted from the 100 pre-test papers collected. Another PDF document contained 99 pages indicating the writings extracted from the 99 post-test papers collected. Each rater examined and scored all the writings (i.e. 100 pieces from the pre-test papers collected and 99 pieces from the post-test papers collected) individually. The procedure for comparing the three sets of scores given by the three raters was the same as that employed in the analysis of student work, which is described in Section 3.4.2.2(E) in Chapter 3. Numerical results of Task 3 in both tests are presented in Appendix 28.

D) Task 5 of the Tests

Concerning the marking process of Task 5, it was done by involving the researcher and *Teacher T* in scoring students' responses to the items of Task 5 in all the collected test papers (i.e. 100 pre-test papers and 99 post-test papers). The researcher and *Teacher T* scored

students' responses individually. Each of them examined students' choices and reasons, and scored them based upon the marking scheme, as described in Section 3.4.2.1 in Chapter 3. To maintain the consistency of scores given by a marker, the researcher and *Teacher T* marked students' responses choice by choice. In other words, they examined and scored the reasons given by students for the same choice in one time. In practice, this was achieved with ease by the filtering function as all students' choices and reasons were entered into a spreadsheet. Numerical results of Task 5 in both tests are presented in Appendix 28.

E) Task 6 of the Tests

Concerning the marking process of Task 6, it was done by involving the researcher and *Teacher W* in scoring students' responses to the items of Task 6 in all the collected test papers (i.e. 100 pre-test papers and 99 post-test papers). The researcher and *Teacher W* scored students' responses individually. Each of them examined students' answers to each question in Task 6, and scored them based upon the marking schemes, as described in Section 3.4.2.1 in Chapter 3. To maintain the consistency of scoring by a marker, the researcher and *Teacher W* marked all the answers twice. In other words, after examining and scoring all the answers to Task 6 in the collected test papers, each of them conducted the same marking process again. In practice, this was achieved with ease since students' answers to Task 6 were all typed and entered into a spreadsheet. Numerical results of Task 6 in both tests are presented in Appendix 28.

4.3.2 Analysis of Student Work

Second, as mentioned, the analysis of student work was done by involving a group of experienced teachers, as a team of raters, in scoring students' work based upon four specially designed rubrics (i.e. *RB1*, *RB2*, *RB3*, and *RB4*). *Table 4.2* summarizes the particulars of scoring students' work completed in the four WebQuest activities.

As presented in *Table 4.2*, *RB1* was used to assess the work completed by the

participants in *WQ1* that included the presentation (PowerPoint) documents completed by 25 working groups. The team of raters comprised *Teacher W*, *Teacher L*, and the researcher. Each of them examined and scored all the presentation documents individually.

RB2 was used to assess the work completed by the participants in *WQ2*. Like *WQ1*, that included 25 presentation (PowerPoint) documents completed by 25 working groups. The team of raters and the scoring procedure were the same as those for *WQ1*, that is, each of *Teacher W*, *Teacher L*, and the researcher examined and scored all the presentation documents on his own.

RB3 was used to assess the work completed by the participants in *WQ3* that referred to the reports (Word documents with tables and graphs created by Excel) completed by 50 working groups. The team of raters comprised *Teacher T*, *Teacher W*, and the researcher. Each of them examined and scored all the reports individually. Likewise, *RB4* was used to assess the work completed by the participants in *WQ4* that were 50 reports (Word documents) completed by 50 working groups. The team of raters and the scoring procedure were the same as those for *WQ3*, that is, each of *Teacher T*, *Teacher W*, and the researcher examined and scored all the reports on his own.

Scoring Rubric	Student Work Assessed by Raters	Quality of Student Work Assessed by Each Rater	Team of Raters
RB1 (for *WQ1*)	• presentation (PowerPoint) document completed by a working group of 4 students in *WQ1*	• presentation (PowerPoint) documents completed by 25 working groups	• *Teacher W* • *Teacher L* • researcher
RB2 (for *WQ2*)	• presentation (PowerPoint) document completed by a working group of 4 students in *WQ2*	• presentation (PowerPoint) documents completed by 25 working groups	• *Teacher W* • *Teacher L* • researcher
RB3 (for *WQ3*)	• report (Word document with tables and graphs created by Excel) completed by a working group of 2 students in *WQ3*	• reports (Word documents) completed by 50 working groups	• *Teacher T* • *Teacher W* • researcher

RB4 (for *WQ4*)	• report (Word document with tables and graphs created by Excel) completed by a working group of 2 students in *WQ4*	• reports (Word documents) completed by 50 working groups	• *Teacher T* • *Teacher W* • researcher

Table 4.1: Particulars of Scoring Students' Work Completed in the WebQuest Activities

4.3.3 Understanding Students' Actual Practice

Third, it concerns the interview with five groups of students, which were the five working groups being video recorded during the lessons.

4.3.3.1 Conducting Interviews

The interviews were conducted a few days after the implementation of the WebQuests. As reported in Section 4.2.4, a working group (with four students) was selected from each of G_a, G_b, G_c, G_d, and G_e for video recording. There were five working groups altogether in the study. During the implementation of the WebQuests, a camcorder was placed next to a working group to record the entire learning process of the group. In addition, the computer screens of the working group were monitored and recorded. Upon completion of the WebQuests, the researcher interviewed each of the five working groups. Each interview lasted about one and half hour and was conducted in Cantonese, which was the mother tongue of the students.

During the interview, the researcher chatted casually with the four students in a working group so as to let them feel comfortable with it. In order to help the students recall their memory of what they did in the WebQuest activities, the researcher also showed the students the video clips recording the physical activities and the computer operations of the working group in each WebQuest activity. The questions given to the students in the interview were grouped according to the WebQuests. First, the students were asked questions regarding their learning processes and what they had learned in *WQ1*. Then, they were asked those related to *WQ2*, and so on.

4.3.3.2 Interview Transcripts

The interviews with the five working groups were transcribed into text that was done by the researcher.

The interview transcripts served to triangulate the findings from the two assessment tasks (i.e. pre-test and post-test, and analysis of student work), so as to understand more about 1) what happened to the working groups and what they actually did during the WebQuests, and 2) what the working groups had learned through the WebQuests.

The transcripts were organized according to the four WebQuests. In other words, questions and responses related to *WQ1* were grouped together (see Appendix 30a for full interview transcripts, which were related to *WQ1*, with the five working groups), while those related to *WQ2* were grouped into another set (see Appendix 30b for full interview transcripts, which were related to *WQ2*, with the five working groups), and so on (see Appendix 30c for full interview transcripts, which were related to *WQ3*, with the five working groups; Appendix 30d for full interview transcripts, which were related to *WQ4*, with the five working groups).

4.4 Summary

In this chapter, particulars of the implementation of the WebQuests and the procedure of applying the instruments for data collection have been delineated.

The WebQuests was implemented in a co-educational secondary school through the Computer lessons. The four WebQuests were delivered to five groups of S.2 students in different sequence. Each group consisted of 20 students with mixed ability, representing half of a S.2 class in the school. The researcher was their teacher during the Computer lessons. The four WebQuests differed in their implementation periods. Each of *WQ1* and *WQ2* took three 70-minute lessons, while each of *WQ3* and *WQ4* took one 70-minute lesson. All lessons were held in a computer room.

Video recording together with screen recording were taken in all lessons. During the implementation of the WebQuests, the physical activities of five working groups were video recorded. The computer screens of the groups were also monitored and recorded. The video clips, for both physical activities and screen activities, were summarized and transcribed into text by the researcher.

There were two major instruments developed in the present study for measuring the learning effects of using the WebQuests, including a pre-test and a post-test, and four rubrics for analysis of student work. Students' responses and answers to all test items in the collected test papers were coded and entered into two spreadsheets. The collected test papers were marked by the researcher and three experienced teachers collaboratively or individually according to the marking scheme. The analysis of student work was done by involving a group of experienced teachers and the researcher in analyzing students' work based on four specially designed rubrics (*RB1*, *RB2*, *RB3* and *RB4*). A team of three raters was form to examine and score students' work completed in each WebQuest activity. The three sets of scores given by the raters for the same batch of student work were compared prior to analysis.

After the implementation of the WebQuests, the five working groups were interviewed to gather information regarding their actual learning processes and what they had learned throughout the WebQuests. The interviews were transcribed into text by the researcher. The interview transcripts served to triangulate the findings from the two assessment tasks.

CHAPTER 5

RESULTS AND FINDINGS

5.1 Introduction

This chapter presents the results and findings from the data collected in the main study. As reported in the previous chapter, the instrument for measuring the learning effects of using the WebQuests primarily comprised a pre-test and a post-test, which were designed to study the participants' overall achievement of five learning outcomes for information literacy (see Section 3.4.2 in Chapter 3). Besides the tests, the work completed by the participants during the four WebQuest activities was analyzed, based on four specially designed rubrics, to serve as a reference to looking at their achievement of three learning outcomes.

Subsequent to this introductory section, the chapter presents the learning effects by reporting and comparing the results of the two tests. Next, it presents the qualities of students' work according to the rubric scores. Afterwards, based upon the learning effects, the chapter presents some findings from the qualitative part of the main study in order to look at students' practice during the WebQuest activities.

5.2 Learning Effects

Concerning the learning effects, this section begins with providing a simple summary and overview of students' performance on the tests by presenting the descriptive statistics of the test results, such as mean, maximum, and minimum. Then, it tests and reports if a significant treatment effect was produced through looking at the results from the analysis of covariance (ANCOVA) (Bonate, 2000). The section ends with indicating how effective the treatment was by presenting the results from the effect size analysis.

In the main study, there were 199 test papers collected. One student in G_a quitted the

case school in the middle of the implementation of the WebQuests.[1] As a result, there were 100 pre-test papers and 99 post-test papers completed by the students. To facilitate the comparison of the pre-test and post-test results, the pre-test paper completed by the student who quitted the school in the middle of the WebQuests was ignored. Therefore, there were 99 pre-test papers and 99 post-test papers involved in the main study, together with 40 pre-test papers and 40 post-test papers completed by the control group, for analysis.

5.2.1 Students' Overall Performance on the Tests

As delineated in Chapter 3, there were 6 tasks in each test. According to the marking scheme of the two tests (see Section 3.4.2.1), the full marks of the six tasks were 10, 8, 8, 20, 4, and 14 respectively. That is, a student might be awarded a maximum score of 10 in Task 1, a maximum score of 8 in Task 2, and so on.

Tables 5.1 and *5.2* present the descriptive statistics of the results of each task. The former shows the scores obtained by the main participants, while the latter shows those obtained by the control group. To facilitate the reporting of the test scores, in the tables below, the scores of each task were divided by the full mark of the task, so as to have the scores lie between 0 and 1. For example, students' scores of Task 2 were all divided by 8, which was the full mark of the task. The original scores of each task, including the scores of the items in the task, are presented in Appendix 28 (see *Table 28.1* in the appendix). The row marked by 'Average' in the following tables represents the average of the six tasks.

[1] G_a, G_b, G_c, G_d, and G_e were the five groups of participants taking part in the main study. Details of the five groups are delineated in Chapter 4.

Pre-test	N	Min.	Max.	Mean	Std. D.	Post-test	N	Min.	Max.	Mean	Std. D.
Task1	99	.0	.7	.260	.154	Task 1	99	.05	.75	.428	.151
Task 2	99	.0	1.0	.610	.139	Task 2	99	.38	1.0	.701	.144
Task 3	99	.0	1.0	.558	.177	Task 3	99	.25	1.0	.623	.148
Task 4	99	.2	.8	.545	.123	Task 4	99	.3	.8	.575	.105
Task 5	99	.13	1.0	.698	.219	Task 5	99	.0	1.0	.600	.278
Task 6	99	.0	.64	.323	.147	Task 6	99	.04	.68	.411	.105
Average	99	.29	.65	.499	.082	Average	99	.36	.74	.556	.081

Table 5.1: Students' Overall Performance on the Six Tasks in Pre-test and Post-test (Main Participants)

Pre-test	N	Min.	Max.	Mean	Std. D.	Post-test	N	Min.	Max.	Mean	Std. D.
Task1	40	.0	.7	.250	.148	Task 1	40	.05	.70	.424	.162
Task 2	40	0	1	.590	.152	Task 2	40	.38	1.00	.616	.143
Task 3	40	.25	1.00	.544	.151	Task 3	40	.250	.750	.541	.137
Task 4	40	.3	.8	.520	.122	Task 4	40	.3	.7	.524	.097
Task 5	40	.00	1.00	.628	.282	Task 5	40	.000	1.000	.606	.281
Task 6	40	.00	.54	.285	.133	Task 6	40	.00	.43	.260	.106
Average	40	.31	.68	.470	.097	Average	40	.31	.61	.495	.072

Table 5.2: Students' Overall Performance on the Six Tasks in Pre-test and Post-test (Control Group)

As indicated in *Table 5.1*, concerning the main participants, the mean scores of the six tasks in the pre-test were 0.260, 0.610, 0.558, 0.545, 0.698, and 0.323 respectively, while those of the post-test were 0.428, 0.701, 0.623, 0,575, 0.600, and 0.411 respectively. The average of the six tasks in the pre-test was 0.499, while that of the post-test was 0.556. Merely from the above figures, the mean score of each of Tasks 1, 2, 3, 4, and 6 in the post-test was higher than that of the pre-test. The average of the six tasks in the post-test was also higher than that of the pre-test. Accordingly, testing whether the difference was significant is required and that will be done in the next section.

The distribution of the average of the six tasks in the pre-test is shown in *Figure 5.1*, while that of the post-test is shown in *Figure 5.2*. The distribution of the scores of each task in the two tests is also shown in Appendix 28 (see *Figures 28.1* and *28.2* in the appendix). The two figures below show that the standard deviations of the two tests (0.082 & 0.081) were almost equal. That means the variation of the pre-test scores (average of the six tasks)

and that of the post-test scores were very similar to each other. In addition, both the pre-test scores and the post-test scores showed a bi-modal distribution. This indicates that, the participants might contain at least two sub-groups of students with respect to their ability in completing the tasks in the tests. One group was with relatively higher ability in completing the tasks and the other group with relatively lower ability.

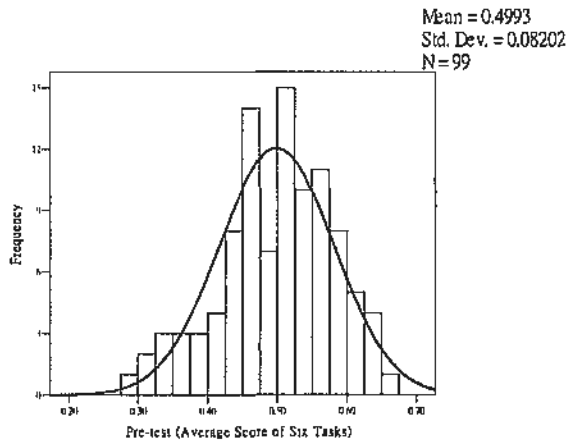


Figure 5.1: Distribution of the Average of the Six Tasks in Pre-test

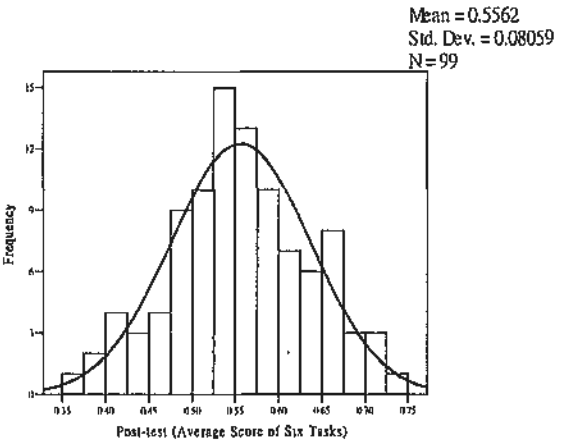


Figure 5.2: Distribution of the Average of the Six Tasks in Post-test

5.2.2 Treatment Effect

After providing a brief summary of students' performance on the tests, this section presents the results from the analysis of covariance (ANCOVA), which is to test if a significant treatment effect is produced (Bonate, 2000). In other words, it is to study if there is a significant difference between the two groups (the main participants and the control group) when the pre-test scores are held constant. As Girden (1992) notes, in this study, the analysis of covariance on the post-test scores was performed using the pre-test scores as covariate control.

5.2.2.1 Testing the Equivalent Slopes Assumption

The ANCOVA model assumes that the slopes of the regression lines are the same for each group. That is, the slopes should be parallel. Thus, Rutherford (2001) notes that a statistical test for equality of the slopes of the regression lines should be performed prior to

running an ANCOVA. Following Rutherford's (2001) suggestion, the test scores of the two groups were used for testing the equality of regression slopes, with the post-test scores as the dependent variable, assignment to group as the independent variable and the pre-test scores as the covariate. The test of interest is the interaction between the covariate and the treatment conditions, which refers to the interaction between the pre-test scores and assignment of groups. It tests whether the slope of the regression line is the same for both treatment conditions. According to Rutherford (2001), this interaction should be non-significant (i.e. $p > 0.05$). If the interaction is significant, the slopes for the two groups are not the same and the ANCOVA assumption is violated.

Table 5.3 shows the testing results based upon the overall pre-test and post-test scores (i.e. the average of the six tasks). The testing results for individual tasks in the pre-test and the post-test are shown in Appendix 28 (see *Table 28.2* in the appendix). As mentioned, the only effect of interest is the interaction between the independent variable (assignment of groups) and the covariate (pre-test scores). This interaction is shown in the source row labeled 'Group * Pretest' in *Table 5.3*. As it is expected from looking at the regression lines, the interaction is not significant, $p = 0.461 > 0.05$. The slope in the treatment group is not significantly different from the slope in the control group. The corresponding p values in the testing results for individual tasks are extracted and presented in *Table 5.4*. All of them are also not significant, $p = 0.383, 0.335, 0.485, 0.550, 0.892, 0.620 > 0.05$. This allows proceeding to running the ANCOVA.

Tests of Between-Subjects Effects (Dependent Variable: Post-test)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.185	3	.062	10.966	.000
Intercept	.880	1	.880	156.797	.000
Pretest	.010	1	.010	1.718	.192
Group	.026	1	.026	4.710	.032
Group * Pretest	.049	1	.049	8.804	.461
Error	.758	135	.006		
Total	41.257	139			
Corrected Total	.943	138			

Table 5.3: Results of Testing the Equivalent Slopes Assumption for Pre-test and Post-test Scores

Significance value of testing equivalent slopes for Task 1:	$p = 0.383 > 0.05$
Significance value of testing equivalent slopes for Task 2:	$p = 0.335 > 0.05$
Significance value of testing equivalent slopes for Task 3:	$p = 0.485 > 0.05$
Significance value of testing equivalent slopes for Task 4:	$p = 0.550 > 0.05$
Significance value of testing equivalent slopes for Task 5:	$p = 0.892 > 0.05$
Significance value of testing equivalent slopes for Task 6:	$p = 0.620 > 0.05$

Table 5.4: Significance Values in Testing Equivalent Slopes for Individual Tasks in Pre-test & Post-test

5.2.2.2 Significant Treatment Effect

To run an ANCOVA, the General Linear Model (GLM) was used with the post-test scores (the average of the six tasks) as the dependent variable, assignment to group as the independent variable, and the pre-test scores (the average of the six tasks) as the covariate. *Table 5.5* shows the ANCOVA source table produced by SPSS based upon the overall pre-test and post-test scores (i.e. the average of the six tasks).

Tests of Between-Subjects Effects (Dependent Variable: Post-test)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.135	2	.068	11.394	.000
Intercept	.831	1	.831	140.009	.000
Pretest	.029	1	.029	4.822	.030
Group	.088	1	.088	14.804	.000
Error	.807	136	.006		
Total	41.257	139			
Corrected Total	.943	138			

Table 5.5: ANCOVA Source Table for Pre-test and Post-test Scores

In the above table, the 'Corrected Model' and 'Intercept' are not generally of interest. The 'Group' is the main effect of treatment condition after removing the effects of the covariate. It is the effect due to treatment after holding constant any pre-treatment differences between the two groups (i.e. the main participants and the control group). According to the above result, it is significant, $p = 0.000 < 0.05$. The analysis of covariance reveals significant treatment effect. It reflects that there is significant difference between the two groups' (i.e. the main participants and the control group) overall achievement of the learning outcomes assessed by the tests.

As a result, the results of the ANCOVA reveal positive response to the research question that the instrument employed in the present study (i.e. the set of WebQuests) produced significant treatment effect on the participants' development of information skills in respect of helping them achieve the target learning outcomes for information literacy.

5.2.2.3 Treatment Effect on Individual Tasks

After looking at the participants' overall achievement of the target learning outcomes, their achievement of the learning outcomes assessed by individual tasks in the tests is concerned. It has been reported in Chapter 3 that the six tasks in each test were designed to assess different learning outcomes (see *Table 3.10* in Section 3.4.2.1). The ANCOVA source tables, which are similar to *Table 5.5* in this chapter, based upon the scores of individual tasks

in the two tests are presented in Appendix 28 (see *Table 28.3* in the appendix). The significance values of the treatment effect in those tables are extracted and shown in the table below. *Table 5.6* summarizes the significance values of the treatment effect on individual tasks in the two tests.

Task in the Tests	Learning Outcomes Assessed by Each Task	Significance Value of Treatment Effect (ANCOVA) on Each Task:
Task 1	[C8.1a]	$p = 0.963 > 0.05$
Task 2	[C8.1b]	$p = 0.002 < 0.05$
Task 3	[C7.1a] and [C8.2]	$p = 0.004 < 0.05$
Task 4	[C11.1]	$p = 0.014 < 0.05$
Task 5	[C6.1]	$p = 0.796 > 0.05$
Task 6	[C7.1b]	$p = 0.000 < 0.05$

Table 5.6: Significance Values of ANCOVA for Scores of Individual Tasks in Pre-test and Post-test

As indicated above, the significance values of the treatment effect on Task 1 ($p = 0.963$) and Task 5 ($p = 0.796$) are not significant. Those on Task 2 ($p = 0.002$), Task 3 ($p = 0.004$), Task 4 ($p = 0.014$), and Task 6 ($p = 0.000$) in the two tests are significant. Regarding the responses to the research question, the analysis of covariance reveals that the instrument employed in the present study (i.e. the set of WebQuests) produced significant treatment effect on the participants' development of information skills in respect of helping them achieve the learning outcomes assessed by Task 2, Task 3, Task 4, and Task 6 in the tests (i.e. [C7.1a], [C7.1b], [C8.1b], [C8.2], and [C11.1]). On the contrary, the ANCOVA results reflect that the treatment effect on the learning outcomes assessed by Task 1 and Task 5 (i.e. [C6.1] and [C8.1a]) is not significant. The possible reasons for that will be discussed in the subsequent section through exploring the qualitative data.

5.2.3 How Effective is the Treatment?

Subsequent to reporting the results from the ANCOVA, this section presents those from

the effect size analysis, which aims at indicating the magnitude of the treatment effect. The American Psychological Association suggests the reporting of effect sizes for any research reports, in which ANOVA or ANCOVA results are involved (APA, 1994; Lipsey & Wilson, 1993).

There are two major groups of effect size measures. They are 1) effect size coefficients based on percent of variance explained, such as partial eta-squared, omega-squared, and Herzberg's R^2, and 2) effect size coefficients based on standardized mean differences, including Cohen's *d*, Glass's delta, and Hedge's *g* (Garson, 2009). For the former group, partial eta-squared is most widely-used effect size measures, while Cohen's *d* is a standard measure of effect size in the latter group (Mackey & Gass, 2008). Concerning Cohen's *d*, a value of 0.2 is generally considered a small effect size, 0.5 a medium effect size, and 0.8 or more a large effect size (Cohen, 1988). A useful reference relating Cohen's *d* and partial eta-squared (Wilkinson et al., 1999) is shown in the table below.

Cohen's Standard	Cohen's *d*	Partial Eta Squared	Cohen's Standard	Cohen's *d*	Partial Eta Squared
	1.5	.360		0.7	.109
	1.4	.329		0.6	.083
	1.3	.297	MEDIUM	0.5	.059
	1.2	.265		0.4	.038
	1.1	.232		0.3	.022
	1.0	.200	SMALL	0.2	.010
	0.9	.168		0.1	.002
LARGE	0.8	.138		0.0	.000

Table 5.7: A Reference Relating Cohen's d and Partial Eta-Squared (Wilkinson et al., 1999)

The table below presents the Cohen's *d* coefficients together with the partial eta-squared coefficients for the six tasks, as well as the average of the six tasks, in the pre-test and the post-test.

Task in Pre-test and Post-test	Cohen's *d*	Partial Eta-Squared
Task 1	0.026	0.000
Task 2	0.592	0.066
Task 3	0.575	0.061
Task 4	0.505	0.044
Task 5	-0.021	0.000
Task 6	1.431	0.291
Average of Six Tasks	0.796	0.098

Table 5.8: Cohen's d and Partial Eta-Squared Coefficients for Tasks in Pre-test and Post-test

As indicated in the above table, the Cohen's *d* coefficients for Task 2, Task 3, and Task 4 are 0.592, 0.575, and 0.505 respectively, while the partial eta-squared coefficients for those tasks are 0.066, 0.061, and 0.044 respectively. According to the reference shown in *Table 5.7*, these values indicate medium effect size on Task 2, Task 3, and Task 4 in the two tests. In addition, the two coefficients for Task 6 are 1.431 and 0.291 respectively. The values indicate a large effect size on Task 6 in the two tests.

However, the two coefficients for Task 1 are 0.026 and 0.000 respectively, while those for Task 5 are -0.021 and 0.000 respectively. These values indicate very small effect size on Task 1 and Task 5. This is also consistent with the ANCOVA results of these two tasks.

Lastly, the Cohen's *d* coefficient and the partial eta-squared coefficient for the average of the six tasks are 0.796 and 0.098 respectively. These values indicate again a medium effect size, as a whole, on the two tests.

5.2.4 Summary of Learning Effects

In summary, this section presents the pre-test and post-test results. The table below provides an overview of the test results presented in this section that includes the results from the analysis of covariance and the results from the effect size analysis.

Task in Pre-test and Post-test	Learning Outcomes Assessed by Each Task	Treatment Effect (ANCOVA)	Effect Size
Task 1	• [C8.1a]: use multiple keywords or phrases to label information	Not Significant $p = 0.963 > 0.05$ (Without Improvement)	Very Small Effect Size • Cohen's $d = .026$ • Partial Eta-Squared = .000
Task 2	• [C8.1b]: categorize and connect the concepts derived from information	Significant (With Improvement) $p = 0.002 < 0.05$	Medium Effect Size • Cohen's $d = .592$ • Partial Eta-Squared = .066
Task 3	• [C8.2]: integrate the agreement and disagreement among sources • [C7.1a]: draw conclusion from the information collected	Significant $p = 0.004 < 0.05$ (With Improvement)	Medium Effect Size • Cohen's $d = .575$ • Partial Eta-Squared = .061
Task 4	• [C11.1]: make inferences and simple generalizations from the evidence collected	Significant $p = 0.014 < 0.05$ (With Improvement)	Medium Effect Size • Cohen's $d = .505$ • Partial Eta-Squared = .044
Task 5	• [C6.1]: make judgments and draw conclusions from research to solve problems	Not Significant $p = 0.796 > 0.05$ (Without Improvement)	Very Small Effect Size • Cohen's $d = -.021$ • Partial Eta-Squared = .000
Task 6	• [C7.1b]: apply the knowledge to solve problems of similar nature	Significant $p = 0.000 < 0.05$ (With Improvement)	Large Effect Size • Cohen's $d = 1.431$ • Partial Eta-Squared = .291
Overall Test Scores	• Overall Achievement of the Target Learning Outcomes	Significant $p = 0.000 < 0.05$ (With Improvement)	Medium Effect Size • Cohen's $d = .796$ • Partial Eta-Squared = .098

Table 5.9: Overview of ANCOVA and Effect Size Results

The test results reveal significant treatment effect on the overall achievement of the target learning outcomes. Individually, the test results indicate significant treatment effect on five learning outcomes. Notwithstanding, there is no significant treatment effect on the other two. The possible reasons for the failure will be discussed in the subsequent section. The table below summarizes the participants' achievement of individual learning outcomes, as revealed by the results of individual tasks in the tests.

Target Learning Outcome	Task Assessing Each Learning Outcome	Participants' Achievement (Test Results)
[C6.1]: make judgments and draw conclusions from research to solve problems	Task 5	No Significant Treatment Effect
[C7.1a]: draw conclusion from the information collected	Task 3 (Score 2)	Significant Treatment Effect
[C7.1b]: apply the knowledge to solve problems of similar nature	Task 6	Significant Treatment Effect
[C8.1a]: use multiple keywords or phrases to label information	Task 1	No Significant Treatment Effect
[C8.1b]: categorize and connect the concepts derived from information	Task 2	Significant Treatment Effect
[C8.2]: integrate the agreement and disagreement among sources	Task 3 (Score 1)	Significant Treatment Effect
[C11.1]: make inferences and simple generalizations from the evidence collected	Task 4	Significant Treatment Effect

Table 5.10: Summary of Participants' Achievement of Individual Learning Outcomes

5.3 Qualities of Students' Work

Concerning the analysis of student work, like the previous section, this section begins with providing an overview of students' general performance by presenting the descriptive statistics, such as the number of working groups ranked at each performance level of a criterion, the mean scores on individual criteria in a rubric, etc. Afterwards, it presents the results of the rubric scores with respect to the achievement of the three learning outcomes ([C6.1], [C7.1a], and [C11.1]) to be identified by the four rubrics (*RB1*, *RB2*, *RB3*, and *RB4*).

5.3.1 General Performance

As reported in the previous chapter, *RB1* was used to assess 25 presentation documents completed by 25 working groups during *WQ1*, while *RB2* was used to assess similar student work completed by those groups during *WQ2*. *RB3* was used to assess 50 reports completed by 50 working groups during *WQ3*, while *RB4* was used to assess similar student work completed by the groups during *WQ4* (see Section 4.3.2). There were two criteria in each of

RB1 and *RB2*, five criteria in *RB3* and four criteria in *RB4* for identifying the achievement of three learning outcomes (see Section 3.4.2.2).

Table 5.11 presents the descriptive statistics of the scores assigned by the raters to the student work done in the four WebQuests that include:

- the number of working groups ranked at each performance level of each criterion, and
- the number of scores with discrepancies on each criterion.

	Criteria in *RB1*		Criteria in *RB2*		Criteria in *RB3*					Criteria in *RB4*			
	Conclusion on Global Warming	Suggestions for Improvement	Appropriateness of Choice	Explanation of Choice	Explanation or Description of Graphs	Q1 & Q2 Inference	Q1 & Q2 Reason	Q3 & Q4 Inference	Q3 & Q4 Reason	Selection of Restaurant	Correlation Calories & Fat	Q1 Generalization	Q1 Reason
	To identify the achievement of [C7 1a]	To identify the achievement of [C6 1]	To identify the achievement of [C6 1]		To identify the achievement of [C7 1a]	To identify the achievement of [C11 1]				To identify the achievement of [C6 1]	To identify the achievement of [C7 1a]	To identify the achievement of [C11 1]	
No of Groups Ranked at Beginning Level (score = 1)	4 (16%)	0 (0%)	0 (0%)	1 (4%)	0 (0%)	0 (0%)	1 (2%)	2 (4%)	5 (10%)	0 (0%)	0 (0%)	0 (0%)	1 (2%)
No of Groups Ranked at Developing Level (score = 2)	13 (52%)	6 (24%)	5 (20%)	9 (36%)	0 (0%)	6 (12%)	27 (54%)	3 (6%)	12 (24%)	0 (0%)	9 (18%)	15 (30%)	2 (4%)
No of Groups Ranked at Accomplished Level (score = 3)	6 (24%)	17 (68%)	19 (76%)	11 (44%)	40 (80%)	13 (26%)	18 (36%)	3 (6%)	22 (44%)	15 (30%)	9 (18%)	15 (30%)	22 (44%)
No of Groups Ranked at Exemplary Level (score = 4)	2 (8%)	2 (8%)	1 (4%)	4 (16%)	10 (20%)	31 (62%)	4 (8%)	42 (84%)	11 (22%)	35 (70%)	32 (64%)	20 (40%)	25 (50%)
Number of Scores on the Criterion	25	25	25	25	50	50	50	50	50	50	50	50	50
Number of Scores with Discrepancies on the Criterion	1	0	3	6	0	0	0	0	0	0	0	0	0

Table 5 11 Descriptive Statistics of Rubric Scores Given to Students' Work for WQ1, WQ2, WQ3 and WQ4

As indicated in *Table 5.11*, there were discrepancies in some scores assigned by the raters on three criteria in *RB1* and *RB2*. Taking the criterion "Conclusion on Global Warming" in *RB1* as an example, there were 25 sets of scores on that criterion. Each set contained 3 scores assigned individually by three raters to the presentation document completed by a working group. As shown, there was discrepancy in one set of scores. Consistent scoring was found in the other 24 sets, where the three scores in each set were all equal. All the discrepancies reported in the above table were solved by taking the majority of the three scores given by the raters as the final one (see Section 3.4.2.2 for the procedure of handling discrepancies). In addition, none of these discrepancies differed by more than one performance level.

5.3.2 Scores with Respect to Individual Learning Outcomes

As delineated in Chapter 3, the four rubrics were designed and adopted to examine the participants' work completed in the WebQuests, so as to identify their achievement of three learning outcomes, which were [C6.1], [C7.1a], and [C11.1] (see Section 3.4.2.2 in Chapter 3). After providing an overview of the rubric scores assigned to their work, this section presents the results with respect to each of the three learning outcomes. In other words, it presents an overall summary of the scores on the criteria for assessing each learning outcome.

To initiate the illustration of such results, one of the learning outcomes ([C6.1]) is taken as an example. It has been described in Chapter 3 that, among the four rubrics, three of them (*RB1*, *RB2*, and *RB4*) included the assessment of the learning outcome [C6.1]. *Table 5.12* presents the rubric scores assigned to all the working groups (5 working groups in each of G_a, G_b, G_c, G_d, and G_e) on the criteria, which were designed for identifying the achievement of the learning outcome [C6.1], in the four rubrics.

Working Group	Rubric Score on the Criterion for Assessing [C6 1] in *RB1*	Rubric Score on the Criteria for Assessing [C6 1] in *RB2*[2]		Rubric Score on the Criterion for Assessing [C6 1] in *RB4*[3]	Mean Score on the Criteria for Assessing [C6 1] in *RB1*, *RB2* and *RB4*
	Identification Achievement of [C6 1] in *WQ1*	Identification Achievement of [C6 1] in *WQ2*		Identification Achievement of [C6 1] in *WQ4*	Identification Overall Achievement of [C6 1] in the WebQuests
Group 1 in G_a	3	2	2	3 5	2 63
Group 2 in G_a	3	3	3	3 5	3 13
Group 3 in G_a	3	3	2	4	3 00
Group 4 in G_a	3	3	4	4	3 50
Group 5 in G_a	3	3	2	4	3 00
Group 1 in G_b	3	2	2	3	2 50
Group 2 in G_b	3	2	3	4	3 00
Group 3 in G_b	2	3	3	3 5	2 88
Group 4 in G_b	3	4	3	3 5	3 38
Group 5 in G_b	3	3	3	3 5	3 13
Group 1 in G_c	3	3	3	4	3 25
Group 2 in G_c	3	3	2	3 5	2 88
Group 3 in G_c	3	3	2	3 5	2 88
Group 4 in G_c	4	3	4	3 5	3 63
Group 5 in G_c	2	3	1	3	2 25
Group 1 in G_d	2	3	2	4	2 75
Group 2 in G_d	4	2	4	4	3 50
Group 3 in G_d	3	3	3	3 5	3 13
Group 4 in G_d	2	3	3	4	3 00
Group 5 in G_d	2	3	4	4	3 25
Group 1 in G_e	3	3	2	4	3 00
Group 2 in G_e	3	3	2	3 5	2 88
Group 3 in G_e	2	3	3	4	3 00
Group 4 in G_e	3	3	3	4	3 25
Group 5 in G_e	3	2	3	3 5	2 88
					Mean 3 03 SD 0 31

Table 5 12 Rubric Scores Assigned to All Working Groups on the Criteria for Assessing [C6 1]

[2] As shown in *Table 5 11*, there were two criteria for identifying the achievement of the learning outcome [C6 1] in *RB2*

[3] Students worked in groups of four during *WQ1* and *WQ2*, and thus there were five working groups in each of G_a, G_b, G_c, G_d, and G_e. They worked in groups of two during *WQ3* and *WQ4*. Therefore, each working group was further divided in two sub-groups. The rubric score presented in this column represents the mean of the scores assigned to the two sub-groups

In the above table, the row marked by 'Group 1 in G_a' indicates the rubric scores assigned to that working group on the criteria, for identifying the achievement of the learning outcome [C6.1], in the four rubrics. The first score reflects the group's achievement of the learning outcome in *WQ1*. In this case, the score is 3, which refers to the accomplish level stated in the rubric. The second and third scores reflect the groups' achievement of the learning outcome in *WQ2*, and so on. The last one is the mean of the rubric scores assigned to that working group. It reflects the group's overall achievement of the learning outcome in the four WebQuests. The last box in the above table (i.e. Mean: 3.03, SD: 0.31) indicates the average of the mean scores of all the working groups.

As mentioned, to facilitate the illustration of the results, *Table 5.12* is presented in this section. The corresponding results for another two learning outcomes (i.e. the tables showing the rubric scores assigned to all working groups on the criteria for identifying the achievement of the learning outcomes [C7.1a] and [C11.1] respectively) are presented in Appendix 29 (see *Tables 29.2* and *29.3* in the appendix). The average of the mean scores of all the working groups, like the last box above, in those tables are extracted and shown in the table below.

	Identification	Mean	Std. D.
Mean Scores of All Working Groups on the Criteria for Assessing [C6.1]	Overall Achievement of [C6.1] Reflected in the WebQuests	3.03	0.31
Mean Scores of All Working Groups on the Criteria for Assessing [C7.1a]	Overall Achievement of [C7.1a] Reflected in the WebQuests	2.97	0.41
Mean Scores of All Working Groups on the Criteria for Assessing [11.1]	Overall Achievement of [C11.1] Reflected in the WebQuests	3.19	0.37

Table 5.13: Students' Overall Achievement of Three Learning Outcomes Reflected by Rubric Scores

As shown above, the average of the mean scores of all the working groups on the criteria for assessing [C6.1] and that for assessing [C11.1] are 3.03 and 3.19 respectively. Both values are greater than 3. Such results indicate that students' overall achievement of these two learning outcomes, reflected in their work, could reach the accomplished level defined in the

rubrics. The mean value for the learning outcome [C7.1a] is 2.97, which is smaller than 3. The result indicates that students' overall achievement of this learning outcome could nearly reach the accomplished level defined in the rubrics.

5.4 Possible Reasons for Failure

Generally, the learning effects of using the WebQuests found in the present study give positive response to the research question. Overall, the test results suggest that the WebQuests employed in the present study produced significant treatment effect on the participants' development of information skills, especially in helping them achieve the target learning outcomes for information literacy. *Figure 5.3* presents an overview of the learning effects in a graphical way.

In particular, while looking at students' achievement of individual learning outcomes, the test results indicate significant treatment effect on five out of the seven learning outcomes. Among the five, large effect size was found for the achievement of one learning outcome ([C7.1b]) and medium effect size was found for the other four ([C7.1a], [C8.1b], [C8.2], and [C11.1]).

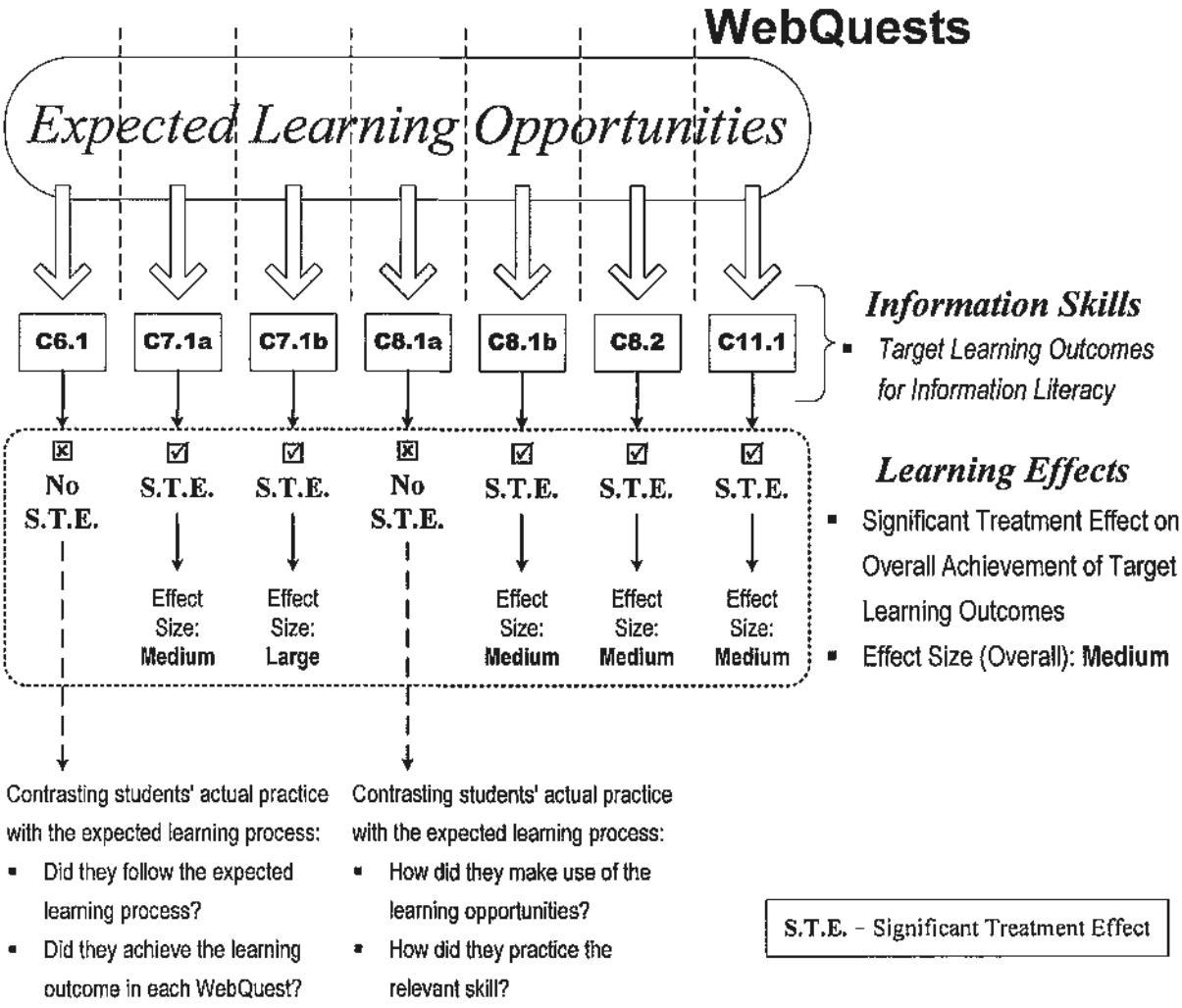


Figure 5.3: Graphical Overview of the Leaning Effects of the WebQuests

Subsequent to presenting the learning effects of using the WebQuests, this section presents some findings from the qualitative part of the main study in order to explore the possible reasons for no significant treatment effect on the achievement of the two learning outcomes mentioned above. As presented in *Figure 5.3*, through contrasting students' actual practice during the WebQuests with the expected learning process (see Section 3.4.1.5 in Chapter 3 for the expected learning processes in individual WebQuests), the following findings are made. To facilitate the presentation of the findings, details of examining the interview data and the screen recording that leads to the findings below are presented in Appendix 31. The interpretation of the interview data was double checked and corroborated by an experienced English teacher.

Regarding the learning outcome "[C6.1] make judgments and draw conclusions from research to solve problems", it was found that students' practice in three of the four WebQuests was basically in line with that expected by the WebQuest designers (see Sections 31.1.2 & 31.1.3 in Appendix 31). Among the three, students could achieve the learning outcome, as expected, through the learning opportunities provided in two WebQuests (*WQ3* & *WQ4*) (see Section 31.1.3 in Appendix 31), and they did take the learning opportunity provided in another WebQuest (*WQ2*) to practice the relevant skill by following the expected learning process (see Section 31.1.2 in Appendix 31).

Learning opportunities were not made explicit to students

Notwithstanding, the remaining WebQuest (*WQ1*) did not yield the expected learning effect. The two learning opportunities provided in the WebQuest did not let most students have practice for the learning outcome concerned. It was possibly because the learning opportunities were not made explicit to students that might fail to let them practice the relevant skill (see Section 31.1.1 in Appendix 31).

Design of guiding questions restricted students' means

Concerning another learning outcome, "[C8.1a] use multiple keywords or phrases to label information", it was found that students did not practice the relevant information skill, as expected. In two WebQuests (*WQ1* & *WQ2*), most students failed to practice labeling information by keywords or phrases as they merely copied and pasted the information, found from the given Web materials, for the guiding questions (see Section 31.2.1 in Appendix 31).

Subsequent to examining the WebQuest design again, it was found that the design of the guiding questions might restrict the means they used for recording information (see Section 31.2.1.1 in Appendix 31).

Given Web material hindered students' practice

In addition, through examining students' comments on the given Web materials, the

following was found. Students, who found the given Web materials difficult for understanding, tended to copy and paste relevant information found at Websites to their reports and, thus, the Web materials might hinder their practice of the information skill concerned (see Section 31.2.1.2 in Appendix 31).

Students were provided with templates

In another two WebQuests (*WQ3* & *WQ4*), students also had no practice on labeling the statistical items in a spreadsheet by relevant keywords as they were provided by the teacher with two templates, in which the data tables were pre-created and the columns were also named with suitable labels (see Section 31.2.2 in Appendix 31).

Concluding Remarks

In summary of the above findings, the primary reason for no significant treatment effect on the achievement of the learning outcomes [C6.1] and [C8.1a] was basically about the absence of practicing the relevant information skills.

For [C6.1], the absence of practice was possibly due to that the learning opportunities provided in the WebQuest were not made explicit to students. In other words, students were not explicitly required or reminded to practice the skill concerned. For another learning outcome, the lack of practice was mainly caused by the guiding questions and the given Web materials for individual inquiry, and the templates provided by the teacher. The guiding questions and the templates were some sort of supports given to students for facilitating their inquiry and completion of learning products respectively, but also restricted students' practice of the skill for labeling information. Moreover, students encountered difficulty in understanding the given Web materials, which also hindered their practice of the skill concerned.

5.5 Summary

This chapter has presented the results and findings of the main study that include the

learning effects of using the WebQuests, the qualities of students' work completed during the WebQuest activities, and students' actual practice of several information skills as compared with the expected learning process.

About the learning effects, the test results suggest that the instrument employed in the present study produced significant treatment effect on the participants' overall achievement of the target learning outcomes for information literacy. For individual learning outcomes, the test results indicate significant treatment effect on five of them. Among the five, large effect size was found for one, and medium effect size was found for the other four.

Besides the tests, the rubric scores assigned to students' work indicate that students' overall achievement of two learning outcomes could reach the accomplished level defined in the rubrics, while that of another one could nearly reach the accomplished level.

Nevertheless, the test results also indicate no significant treatment effect on students' achievement of two learning outcomes. Through examining the qualitative data, it was found that the primary reason for the failure was about the absence of practice for the information skills concerned owing to some sort of supports given to students, the Web materials given in the WebQuests, and the implicit learning opportunities provided in the WebQuest.

CHAPTER 6

CONCLUSION AND DISCUSSION

6.1 Introduction

The previous chapter has presented all the results and findings of the main study. The last chapter concludes and discusses the whole study. The chapter first reviews the aim, process, and findings of the study in order to conclude in response to the research question. Next, it discusses several issues regarding the findings of the present study. Lastly, the significance and limitations of the study together with recommendations for further research are discussed and suggested.

6.2 Conclusion of the Study

To conclude the whole study, an outline of the study is first given below. Afterwards, a summary of the findings is presented, followed by the concluding remarks to the research question.

6.2.1 Outline of the Study

This study set out to investigate whether WebQuest activities supported the improvement of information literacy. In line with its primary purpose, the following research question was formulated to form the basis of the study.

> *Do WebQuests yield significant improvement in developing students' information skills?*

Specifically, the study sought to investigate whether using a set of WebQuests could yield significant improvement in students' learning outcomes defined in the Information

Literacy Framework for Hong Kong Students (EMB, 2005).

There were two types of instruments developed in the present study. One was for helping students improve information literacy. Another one was for measuring the learning effects.

Four self-designed and adapted WebQuests were involved in the study as the instruments to help students develop and practice their information skills in order to achieve seven learning outcomes for information literacy (Tsui & Lee, 2008). To ensure the quality of these instruments, a group of WebQuest experts were invited to review the design of the WebQuests. The results of the expert review showed that the WebQuests employed in the study were well-designed ones and also addressed the target learning outcomes.

To further enhance the design of the instruments, a trial implementation of the WebQuests was carried out in the case school prior to the main study. Based upon the findings from class observation, the WebQuests were slightly modified for better facilitation of student learning. First, the links to an encyclopedia Website (Wikipedia) available on the pages of two WebQuests (*WQ1* & *WQ2*) were removed. The removal of the links was to help students focus on using the pre-selected materials instead of searching at encyclopedia Website. Second, a common storage space was provided to each working group for facilitating the collaborative work between group members. Third, a presentation template was provided in *WQ1* for helping students organize the presentation contents. A report template and a spreadsheet template were provided in each of *WQ3* and *WQ4* to help students complete the learning products with ease.

Concerning the instruments for assessment, a pre-test/post-test approach was employed in the study to measure the learning effects of the use of WebQuests. The tests were developed to assess the participants' overall achievement on the seven learning outcomes required. They were piloted to check if the test items were properly written, the items befitted the participants' language level, and sufficient time was given to students. Besides, the

different pieces of work completed by students during the learning processes were evaluated by using four specially designed rubrics, which were piloted prior to the main study. The results of the pilot study suggested that the rubrics were useful to be used in the main study based upon the consistency of scores assigned by multiple raters on a sample set of student work.

The sample of the research consisted of one hundred and forty junior students from a co-educational secondary school in Hong Kong, with one hundred of them participated in the experiment and the others participated in the control group. Before implementation of the WebQuests, the pre-test was administered to all the participants. The WebQuests was implemented through the Computer lessons in the school. They were delivered to five groups of S.2 students, with 20 mixed ability students in each group. The researcher was their teacher during the lessons.

Video recording together with screen recording were taken in all lessons. The recording was not a primary part of the data collection and served as a kind of supplementary data source only.

After the implementation, the post-test was administered to all the participants and the five working groups were interviewed to gather information regarding their actual learning processes and what they had learned throughout the WebQuests. The interview data was used to explore the possible reasons that led to the test results, whatever good or bad learning effects were produced.

6.2.2 Did the use of WebQuest help develop information skills?

By contrasting the pre-test/post-test results between the experimental group and the control group, it was quite clear that the use of WebQuest did help the participants in developing better information skills. Concerning individual learning outcomes, the test results indicated significant treatment effect on the following five, in which medium effect size was

found for the first four and large effect size for the last one:

- *categorizing and connecting the concepts derived from information*,
- *integrating the agreement and disagreement among sources*,
- *drawing conclusion from the information collected*,
- *making inferences and simple generalizations from the evidence collected*, and
- *applying the knowledge to solve problems of similar nature*.

Notwithstanding, there was no significant treatment effect on the following two:

- *using multiple keywords or phrases to label information*, and
- *making judgments and drawing conclusions from research to solve problems*.

The primary reason for the failure of achieving the above two was about the absence of practice for the information skills concerned, and the absence of practice was caused by 1) some sort of supports given to students, 2) the Web materials given in two WebQuests, and 3) the implicit learning opportunities provided in a WebQuest.

6.2.3 Concluding Remarks

Subsequent to reviewing the study process, this section draws on the findings to answer the research question – *Do WebQuests yield significant improvement in developing students' information skills?*

In general terms, the results of the present study showed positive response to the research question. As pointed out by Blummer (2007), WebQuests offer students a hands-on approach to practice their information skills on seemingly real-world problems. Results of this study show that such practice could actually yield significant improvement in the required information skills.

Despite this, some unexpected results were found. During the study, students were given the opportunities to practice the relevant information skills in order to achieve the other two learning outcomes, [C6.1] and [C8.1a]. Nevertheless, it turned out that there was no significant

treatment effect on these two, which were later found this was because of the absence of practice. Some possible causes, regarding the design of the WebQuests, for the absence of practice were identified and reported in the previous chapter (see Section 5.4). Further research on how this can be avoided is suggested in Section 6.7.

To conclude in response to the research question, bounded by the current research setting, the four WebQuests employed in the study revealed significant treatment effect, with medium effect size at least, on helping junior secondary students develop five particular information skills, including:

- *drawing conclusion from the information collected,*
- *applying the knowledge to solve problems of similar nature,*
- *categorizing and connecting the concepts derived from information,*
- *integrating the agreement and disagreement among sources*, and
- *making inferences and simple generalizations from the evidence collected.*

The WebQuests in the present study were therefore found helping junior secondary students improve part of the skills for three IL standards (see Appendix 1 for classification of information skills and IL standards in the Information Literacy Framework for Hong Kong Students).

6.3 Discussion of Findings

As described in Chapter 2, Blummer (2007) noted that the structured format of WebQuests appeared suited for scaffolding students' practice of information skills. Basically, the design of the present study was in line with Blummer's notion. The WebQuest designers identified how relevant information skills were expected to be trained in the four WebQuests (see Section 3.4.1.5 in Chapter 3). In addition, the WebQuest experts supported the identification and explanation given by the WebQuest designers (see Section 3.4.1.6 in Chapter 3).

Though the students had significant improvement in developing several information skills, the findings of the study showed that they did not go through certain practice expected by the WebQuest designers owing to several specific issues related to the design of the WebQuests (see Section 5.4 in Chapter 5). These issues are discussed below so as to further our understanding of designing effective WebQuests for facilitating students' practice of the relevant information skills. Subsequently, by taking the four WebQuests as a whole into account, a curriculum innovation for information literacy training is discussed.

6.3.1 Influence of Two Features of WebQuests on Students' Hands-on Practice

To begin the discussion, March's (2003) characterization is concerned again. To distinguish WebQuests from "WebQuest-like activities", March (2003) identifies six features that should be embraced in the design of a WebQuest. For that reason, the WebQuests employed in the present study were adapted and designed in best accordance with the six characteristics identified by March (see Section 3.4.1.4 in Chapter 3). While integrating the results and findings of the study, two of the six features appear to have influence on students' practice of the information skills. According to March (2003), the six features are as follows:

1. authentic tasks that motivate,
2. open-ended questions,
3. individual expertise,
4. use of essential Web resources,
5. a scaffolded learning structure, and
6. transformative group process.

Among the six, the first two basically have no direct influence on students' practice of information skills. Instead, they serve to set the stage for a meaningful research and learning activity. Specifically, the authentic task serves to frame an activity for investigation, while the

open-ended question acts as the center of the investigation. During the investigation or inquiry, students might go through the development of individual expertise and also a transformative group process, which would provide opportunities for them to practice certain information skills. After all, the remaining two features, use of essential Web resources and scaffolded learning structure, might have direct influence on students' hands-on practice.

6.3.2 Junior Students with Difficulties in Reading Authentic Web Resources

First, the use of essential Web resources is concerned. For a WebQuest to be really designed to train students' information processing skills, various authentic resources on the Web should be used for student inquiry (Cohen & Cowen, 2008). Thus, educational sites specifically designed for students or for learning purposes, such as encyclopedic briefs or textbook digests, are not highly desired (March 2003; March, 2006). On the other hand, many of the resources on the Web are for adult readers (Conrad & Donaldson, 2004). Junior students, like the participants of the present study, would encounter difficulties in adjusting their learning stage to cope with the reading level of the Web materials. Consequently, this might result in influencing or weakening students' practice of relevant information skills.

Similar circumstances occurred in the present study. In *WQ1*, 16 out of 20 students interviewed encountered difficulty in reading the pre-selected Web materials, which were mainly in form of English text. A number of them (8 out of 16) needed to use either 1) an online dictionary to check the meaning of quite a number of English words found in the Web materials or 2) an online translator to translate English text into Chinese in order to understand its meaning (see Q1 in Appendix 30a and also Section 31.2.1.2 in Appendix 31). Likewise, in *WQ2*, half of 20 students interviewed encountered difficulty in reading the pre-selected Web materials owing to the amount of English text, in which there were a number of words they did not understand (see Q1 in Appendix 30b and also Section 31.2.1.2

in Appendix 31). Particularly, in each of the five interview groups, the student who took the role of the *Concerned Citizen* considered the given Web materials extremely difficult for understanding as he/she needed to look for the required information at the official Websites of two international companies (see Q1 in Appendix 30b).

Consequently, as presented in the previous chapter, students with difficulty in understanding the given Web materials tended to copy and paste relevant information found at Websites to their reports (see Section 5.4 in Chapter 5). Since they did not understand the contents of the Web materials, they might merely copy and paste the information. Thus, the pre-selected Web materials hindered students' practice of the skill on labeling information by multiple keywords and phrases. Accordingly, a suggestion on the selection of Web resources is given in Section 6.4 to deal with the issue discussed above.

6.3.3 Students' Preference for Graphic Representation of Information

In addition to the above issue, students' opinions about their favorite form of information could be another useful reference to the WebQuest designers. Regarding their comments on the Web materials given in *WQ1* and *WQ2*, 8 out of 20 students interviewed preferred to read information in the form of graphic representation, like pictures or graphs, rather than text. As they mentioned, it was easier for them to understand the information presented by pictures or graphs than that expressed in text. Normally, they would look at the figures or charts, if present, prior to reading the text. Some of them used to look at the pictures in order to guess at the meaning of the paragraphs next to the pictures (see Q1 in Appendices 30a and 30b for students' opinions). Part of the responses given by four students is excerpted below:

> "*For the other Web materials, if there were figures or charts, I usually looked at them since the English information was not easy to understand.*"

"*... it [a given Website] provided many graphs and figures that made me easy to understand the information.*"

"*It would be so good if the Websites contained more pictures.*"

"*Sometimes, if there were pictures, I could look at the pictures and guess the meaning of the paragraphs next to the pictures.*"

6.3.4 Inappropriate Scaffolding Affecting Opportunities for Practice

Subsequent to the discussion on the use of essential Web resources, the following concerns the remaining feature of a WebQuest – a scaffolded learning structure. Both the originators of WebQuest highlight the importance of scaffolding in designing good WebQuests (Dodge, 2001; March, 2003). March (2003) notes that scaffolding is at the heart of the WebQuest model. Dodge (2001) also mentions that a great WebQuest builds scaffolding into the *Process* section so as to help learners complete the task. In relation to this feature, it has been delineated in Chapter 3 how each of the four WebQuests employed in the present study gives a scaffolded learning structure to students (see Section 3.4.1.4). Nevertheless, according to the findings presented in the previous chapter, providing appropriate scaffolding to support students' hands-on practice of information skills could be a challenge to teachers or WebQuest designers. It is discussed as follows.

On one hand, providing students with scaffolding, like guides and supports, could help them carry out the learning activities and complete the task with ease. On the other hand, with such supports, students might lose the opportunities to practice certain skills. It is possible that some sort of supports could facilitate the completion of the task but, at the same time, might also reduce or remove the opportunities for students to have practice of some information skills. To a certain extent, such supports would be inappropriate scaffolding or

over-scaffolding (Venkat et al., 2009) that impedes students' practice of information skills. Two such cases were identified in the present study.

The first case was identified in *WQ1* and *WQ2*. According to the design of the two WebQuests, students worked in groups of four and each group member assumed one of the four given roles. Each role was prompted by a set of guiding questions and also provided with a template (a Word document). The guiding questions served as a kind of reception scaffolds (Dodge, 2001) that helped the student extract information from the role-specific Web resources, so as to develop expertise in a particular field. *Figure 6.1* shows a screenshot of the template.

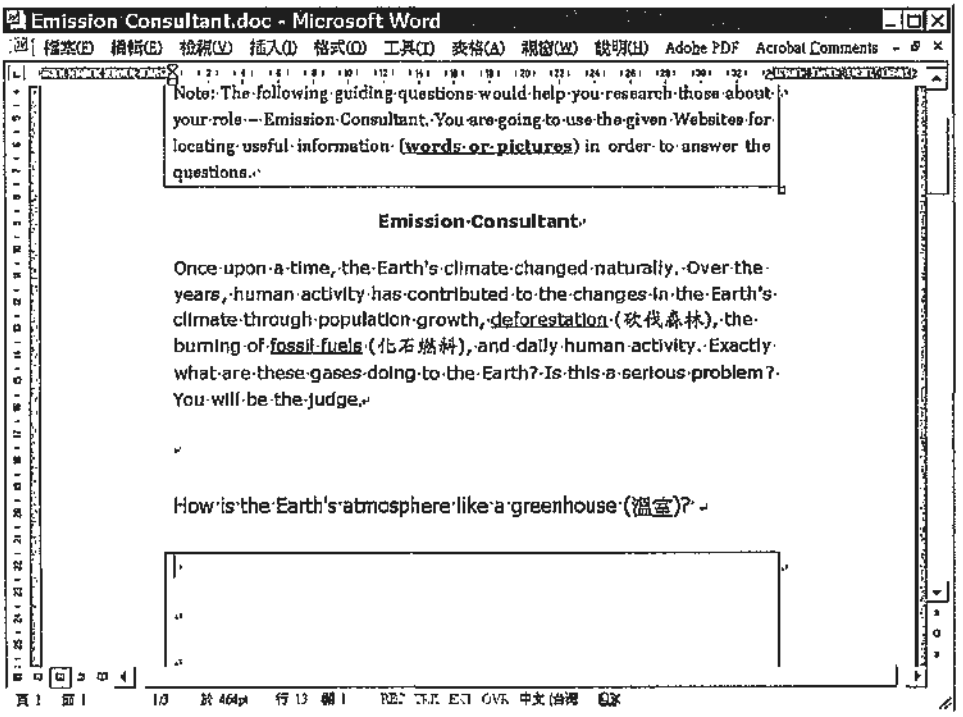


Figure 6.1: Screenshot of Template (Word Document) for a Role in WQ1

The text box under each guiding question was initially designed to 1) let the student jot down the keywords or phrases for useful information, and thus 2) provide opportunities for the practice on *using multiple keywords or phrases to label information*. However, as presented in Appendix 31 (see Section 31.2.1.1), it was found that the guiding questions together with the text boxes would implicitly lead the student to an approach of answering the questions by looking for and recording detailed information for them. As a kind of

scaffolding, the guiding questions assisted the student in garnering information from the given sources. On the other hand, those questions would be an improper design for helping practice information skills. As presented in the previous chapter (see Section 5.4), the guiding questions might restrict the means used by the student for recording information, and thus influence the practice of the information skill concerned.

Another case was found in *WQ3* and *WQ4*. Based upon the trial implementation of both WebQuests, it was found that most students spent quite a lot of time creating a spreadsheet according to the format, rows, and columns suggested in the WebQuest pages. As a result, they had relatively less class time for analyzing data, drawing conclusion, and making inferences (see Section 3.5.3.3 in Chapter 3). Accordingly, the teacher provided them with two spreadsheet templates, in which the data tables were pre-created and the columns were also named with suitable labels.

Again, the spreadsheet templates served as a kind of reception scaffolds (Dodge, 2001), for providing a table structure to students in order to help them 1) organize the input data into tabular form, and 2) save the class time on creating the data tables. Students could simply fill the tables by entering the required data in the corresponding cells, and then used the tables for further analysis. On the other hand, through using the templates, they had no practice on labeling statistical items or numerical data in a spreadsheet by relevant keywords (see Section 5.4 in Chapter 5). Thus, the templates would be over-scaffolding that deprived students of the opportunities to practice an information skill.

6.3.5 Curriculum Innovation for Improvement of Information Literacy

Coming after the discussion on several specific issues related to the design of the WebQuests, the discussion below takes the instrument developed in this study as a whole into account.

As noted by Teclehaimanot and Lamb (2004), WebQuests provide an authentic, technology-rich environment for problem-solving, information processing, and collaboration. In this environment, students are given hands-on opportunities to practice their information skills on real-world problems (Blummer, 2007) using real, rich, relevant Web information (March, 2000). In other words, WebQuest is not an approach that simply drills students in information skills. Instead, like those employed in the present study, students are given opportunities to practice their information skills within the context of a real-life issue or a real-world problem using authentic resources on the Web. As mentioned above, results of this study also show that such practice could actually yield significant improvement in the required information skills.

In this way, the instrument developed in the present study (i.e. the set of WebQuests) could possibly be regarded as a mini curriculum for improving students' information literacy. Particulars of the curriculum design, implementation, and evaluation were delineated and reported in this study. Further adaptation of the curriculum in order to achieve more purpose is possible. Two such possibilities are discussed below. They are also suggested in Section 6.7 for further research.

6.3.5.1 Involving WebQuests with Other Task Formats in Curriculum

First, it is possible to involve WebQuests with other task formats in the curriculum so as to provide hands-on practice for other information skills. The *Task* section is considered the single most important part of a WebQuest (Dodge, 2002b). To facilitate the discussion on WebQuest tasks, Dodge (2002b) develops a taxonomy of common task formats emerged from a variety of WebQuests. The taxonomy describes a dozen categories of those formats, which are listed below, and suggests ways to optimize their use.

1. Retelling Tasks
2. Compilation Tasks
3. Mystery Tasks
4. Journalistic Tasks
5. Design Tasks
6. Creative Product Tasks

7. Consensus Building Tasks
8. Persuasion Tasks
9. Self-knowledge Tasks
10. Analytical Tasks
11. Judgment Tasks
12. Scientific Tasks

Referring to Dodge's (2002b) taxonomy, the current curriculum (i.e. the WebQuests employed in the present study) primarily focus on compilation tasks (e.g. *WQ1*), consensus building tasks (e.g. *WQ2*), and analytical tasks (e.g. *WQ3* & *WQ4*) (see Section 3.4.1.3 for accounts of individual WebQuests). Enriching the curriculum by embracing WebQuests with other task formats, like self-knowledge tasks or scientific tasks, would allow hands-on practice for other information skills.

For example, according to Dodge (2002b), the goal of self-knowledge tasks is a greater understanding of oneself through guided exploration of on-line and off-line resources. Such tasks could be developed around ethical and moral issues, self-improvement, personal responses to literature, etc. Accordingly, WebQuests with such task format would probably provide opportunities to practice information skill like "*recognizing and selecting materials appropriate to personal abilities and interests*", which is related to the learning outcomes [A2.1] and [A2.2] (see Appendix 1 for relevant learning outcomes) defined in the affective dimension of the Information Literacy Framework for Hong Kong Students (EMB, 2005), while these two learning outcomes were not covered in the present study.

Another example concerns scientific tasks. As characterized by Dodge (2002b), in general, scientific tasks include:

1. making hypotheses based on an understanding of background information provided by on-line or off-line sources,
2. testing the hypotheses by gathering data from pre-selected sources,
3. determining whether the hypotheses are supported, and
4. describing the results and their implications.

The above process would provide students with opportunities to practice information

skills like "*critically analyze information collected*" and "*make inferences, connections, and draw conclusions*", which are related to the learning outcomes [C9.1], [C9.2] and [C11.1] (see Appendix 1 for relevant learning outcomes) defined in the cognitive dimension of the Framework, where two of them were not covered in this study.

6.3.5.2 Transferring Current Curriculum to Senior Secondary Level

In addition to the above discussion, there is another possible adaptation of the curriculum. It concerns transferring the curriculum to Senior Secondary level. The current curriculum was designed for students at Junior Secondary level. Through the curriculum, students were expected to achieve seven learning outcomes, for Level III of proficiency, listed in the Information Literacy Framework for Hong Kong Students (EMB, 2005).

According to the Framework, learning outcomes at Levels III and IV describe the proficiency levels in information literacy for Junior Secondary and Senior Secondary respectively. While looking at the seven learning outcomes of the current curriculum, four of them ([C6.1], [C8.1a], [C8.2] and [C11.1]) are also used to describe the proficiency level for Senior Secondary. In such case, with proper adaptation, the curriculum could possibly be transferred to Senior Secondary level for helping students achieve, at least, the four learning outcomes for information literacy.

Furthermore, there is another favorable condition for transferring the curriculum to Senior Secondary level. As discussed above (in Section 6.3.2), junior students, like the participants of the present study, encountered difficulties in adjusting their learning stage to cope with the reading level of authentic Web resources. Senior students would have relatively higher ability in reading and understanding the pre-selected Web materials. Thus, the issue discussed in Section 6.3.2 would have less influence on their practice of information skills that makes transferring of the curriculum more possible.

6.4 Suggestions for WebQuest Designers

Based upon the issues discussed above, there are three suggestions for the WebQuest designers.

6.4.1 Balance between Use of Authentic Web Resources and Students' Ability to Understand

First, it concerns the selection of Web resources. Basically, in a WebQuest activity, the Web resources serve as the information sources for the investigation or inquiry and also act as the starting point for the practice of information skills. For instance, to gather the required information from the given sources, students would have practice of the skills on *recording, categorizing, and managing the information* followed by *drawing conclusion from the information collected.* As discussed above (in Section 6.3.2), once they encountered difficulty in reading and understanding the information sources, that would likely affect their subsequent practice of other information skills, like *analyzing the collected information* or *applying information to problem solving*, etc.

To deal with the issue regarding the use of essential Web resources, teachers or WebQuest designers are suggested to take account of students' ability in reading the selected Web materials. Those, which are too difficult for students to understand, are not desired. March (2003) suggests that good WebQuests should make use of various resources on the Web for student inquiry. As a supplement to March's (2003) advice, the present author further suggests the consideration of whether the selected Web resources are suitable for students to read and comprehend, especially when a WebQuest is designed for junior students.

The above suggestion aims at helping design effective WebQuests for students to practice information skills. Through selecting and providing appropriate Web materials according to students' ability, it is intended to avoid the issue addressed in Section 6.3.2 and

facilitate students' practice of skills like *recording, categorizing, and managing the information* as well as their subsequent practice of other information skills. Practically, such suggestion would require teachers or WebQuest designers to seek a balance between the use of various authentic resources on the Web, which are mostly for adult readers, like official websites of government bodies or international firms, and the consideration of students' ability to read and understand the selected materials.

6.4.2 Selection of Web Materials with Graphic Representation of Information

Second, as discussed in Section 6.3.3, students' opinions about their favorite form of information would provide noteworthy insight into the selection of appropriate Web resources for junior students. As reported, 8 out of 20 students interviewed preferred reading information in the form of graphic representation rather than text. Accordingly, selecting Web resources, in which there is graphic representation of information, for a WebQuest should probably help junior students understand the given information and that would then facilitate their practice of information skills. Thus, teachers or WebQuest designers might also take it into consideration for designing effective WebQuests that help students practice information skills.

6.4.3 Balance between Providing Supports and Allowing Adequate Practice

Third, following the discussion in Section 6.3.4, some sort of scaffolding could help students complete the task with ease. On the other hand, with such supports, they might lose the opportunities to practice certain skills. Therefore, to design effective WebQuests for training information skills, teachers or WebQuest designers might need to carefully look for a balance between providing supports to students and allowing adequate practice for them.

Especially, over-scaffolding is not suggested. Providing appropriate scaffolding could facilitate the completion of the task, while the scaffolding should 1) not lessen the opportunities for students to practice information skills or 2) gradually remove the supports in order to allow more practice for students.

6.5 Significance of the Study

This research highlights the use of WebQuests for developing students' information skills. There are three major contributions of this study to research and practice in the areas of WebQuests and information literacy training.

6.5.1 Verifying Theoretical Assertions with Empirical Evidence

First, as discussed in Chapters 1 and 2, there were discussions and theoretical assertions suggesting WebQuest as a useful tool for helping improve information literacy (see Section 2.4), and the present study was intended to act as an empirical one for verifying those assertions (see Section 1.4).

The findings of the present study provided empirical evidence to support the theoretical assertions to a certain extent. As concluded above concerning the concrete support (in Section 6.2.3), the findings of this research showed that the WebQuests in the present study were useful for helping junior secondary students improve part of the skills for three IL standards. In addition to the one given by Lamb et al. (1997), the present study provides another empirical example regarding using WebQuests for improving information literacy at junior secondary level.

6.5.2 Informing Implementation of the Information Literacy Framework

Following the support to the theoretical assertions, another contribution of this study is for the implementation of the Information Literacy Framework for Hong Kong Students

(EMB, 2005) at Junior Secondary level.

The Framework depicts the anticipated learning outcomes for information literacy. There are a total of sixty four learning outcomes stated under the corresponding IL standards to describe Level III of proficiency (for Junior Secondary) in information literacy. Students are expected to achieve those learning outcomes through their Junior Secondary Studies (i.e. S.1-S.3).

Together with the Framework, a few exemplars for practical implementation of the IL elements in classroom teaching are also suggested (EMB, 2005). One of the suggested exemplars is a WebQuest, which targets for students at junior secondary level and serves as a means of using information technology for training information skills. In spite of that, the real effect of the WebQuest on training students' information skills or that on helping students achieve the learning outcomes defined in the Framework is unknown and unconfirmed. The findings of this study could supplement the exemplar by demonstrating the specific learning outcomes defined in the Framework that some well-designed WebQuests could help to achieve. In addition, several issues that might possibly lead to the failure of achieving some learning outcomes are discussed.

For practical concern, information gained from this study might have significant implications and provide useful reference for implementing the Framework at Junior Secondary level. Schools with similar context can use the findings of this study as a baseline in their effort to carry out WebQuests or learning activities for information literacy in their classrooms. Besides, the study would provide noteworthy insights for schools that are interested in using WebQuests in classroom teaching to help improve information literacy or pursuing a similar path in the future.

6.5.3 Informing Growing Body of WebQuest Research

Third, it concerns the growing body of WebQuest research.

As discussed in Chapter 2 (see Sections 2.5.2 & 2.5.3), while the WebQuest model is well received by teachers and students alike, most evidence of its effectiveness is anecdotal. The WebQuest model suffers from a lack of scholarly research (Abbit & Ophus, 2008; Dodge, 2007; Lamb & Teclehaimanot, 2005; Milson, 2002) which may impede practitioners interested in using this approach to design and deliver effective Web-enhanced instruction (Frazee, 2004). Accordingly, the findings of this study contribute to the effectiveness of the WebQuest model with empirical evidence on students' achievement of particular learning outcomes for information literacy.

As mentioned above, there are also discussions and theoretical assertions suggesting WebQuest as a useful tool for the promotion of information literacy (Blummer, 2007; Lamb, Smith & Johnson, 1997). Regarding the growing body of WebQuest research, in a 10-year retrospective of WebQuests, Lamb and Teclehaimanot (2005) suggest the needs for research on using WebQuests for helping students develop three kinds of skills, including information skills. The present investigation verifies the theoretical assertions and reinforces our understanding of employing WebQuests for promotion of information literacy. In responding to the suggested research noted by Lamb and Teclehaimanot (2005), the findings of this study confirm that well-designed WebQuests could provide students with hands-on opportunities to practice relevant information skills on real-world issues or real-life problems, while such practice could yield significant improvement in developing those skills.

Lastly, Abbit and Ophus (2008), Dodge (2007), and Milson (2002) discuss that there is little in the way of empirical research on the elements that make an effective WebQuest. The present study addresses and discusses several specific issues that are related to the WebQuest design and would further our understanding of developing effective WebQuests for facilitating students' practice of relevant information skills.

6.6 Limitations of the Study

While several useful findings have been obtained, there are also four major limitations of the study. They are discussed individually in the following sub-sections.

6.6.1 Generalizability of Findings

First, it is about the generalizability of the findings. Secondary schools in Hong Kong are commonly divided into three bands according to the academic achievements of the students they admit. The study was conducted in a Band 1 school, which had mostly above average students with learning motivation. Thus, it remains unknown whether applying similar research settings to schools with below average students, or even average students, will yield the same findings.

6.6.2 Culture Context

Second, it concerns the culture context of the WebQuest activities. As reported in Chapter 3 (see Section 3.4.1.2), among the four WebQuests, *WQ1* and *WQ2* were found and selected from the online WebQuest collections, which were hosted by Western universities and institutes. During the first round of selection (see Section 3.4.1.2(B)), although the WebQuest designers avoided choosing those being specific to the local context of a particular foreign country or city, it was inevitable that the selected WebQuests were related to the Western context and also made use of Western content for learning materials. During the adaptation of the selected WebQuests, though the WebQuest designers attempted to modify the *Task* section in order to fit the local context of the participants and add local Websites to the *Resources* section, students might still find the context of the activities far away from them, like being the consultants of the U.S. president (in *WQ1*) and living in a host family running the business of a grocery store (in *WQ2*). Notwithstanding, the central issue addressed in *WQ1* (global warming) was significant to students, while the real-world issue

addressed in *WQ2* ("paper or plastic?") allowed students to go through a process of reaching consensus by integrating both agreement and disagreement from different viewpoints.

6.6.3 Lack of Formal Control Group

Third, it concerns the absence of a formal control group in the study. As reported in Chapter 4 (see Section 4.2.1.1), there were five S.2 classes in the school. In regard to the concerns of equity and school administration, the school management granted permission to this study under the condition that all the S.2 classes would receive the four WebQuest activities, for information literacy instruction, as part of the school curriculum. As a result, the WebQuests were delivered to the five classes at the same period. In such case, it was not possible to find another group of students at the same level to be a control group.

To compensate the above limitation, a special arrangement was made in the study (see Section 4.3.1.2). A group of forty S.2 students in the next school year were invited to be a control group. The control group took the two tests that were separated by the same period of the implementation of the WebQuests and they received no WebQuest activities between the two tests. Such arrangement aimed to compensate the limitation of the study by keeping both the main participants and the control group with the same academic level and similar ability. With such setting, the control group might yield a useful reference for comparing the test results obtained in the main study.

6.6.4 Researcher as Teacher

Lastly, it is about the role of the researcher. As mentioned in Chapter 4 (see Section 4.2.1.1), each S.2 class was divided into the odd-number group and the even-number group. The odd-number groups of the five S.2 classes were taught by the researcher, while the five even-number groups were taught by another four teachers.

In the present study, only the odd-number groups of the S.2 classes were studied. It would be desired if the five even-numbers groups, who were not taught by the researcher,

could also be involved in the study. However, as reported in Chapter 3 (see Section 3.5.2.1), two of them were involved in piloting the pre-test and the post-test. Thus, they were not suitable to be the participants of the main study. Next, it concerned the school administration. In order to cause minimum disturbance to other teachers, the rest of the even-number groups were not involved in this study as their teachers showed the unwillingness to have lesson recording for about three months.

As a result, the researcher became the only teacher being studied during the implementation of the WebQuests. Since the researcher was one of the WebQuest designers and the study was also initiated by him, this would possibly cause teacher effect during the implementation. For example, in order to yield good results for the study, it was possible that the teacher (researcher) might be so enthusiastic to help the students achieve the target learning outcomes.

On the other hand, a teacher, who was familiar with WebQuest, like the researcher, was needed for implementing the WebQuests. In particular, the researcher was one of the designers of the four WebQuests. He understood the design features of the four WebQuests that would allow him to better facilitate students' learning. In addition, the researcher had been the teacher of the five odd-number groups since the beginning of the school year. He had good relation with the students that would be useful for him to understand the students' learning processes. Moreover, the teacher (researcher) gained trust from the students that would also be useful for him to conduct interviews with the students. Despite of a limitation of the study, the researcher was a suitable teacher for delivering the WebQuests to the five odd-number groups.

6.7 Recommendations for Further Research

Although the findings of the present study have provided some useful insights to looking at the relation between WebQuest and information literacy, and also practical reference for

implementing the Information Literacy Framework for Hong Kong Students (EMB, 2005), the investigation of employing the WebQuest model for information literacy instruction is an exciting area in the growing body of WebQuest research. Based upon the findings and limitations of this study, further research exploring the use of WebQuest for promotion of information literacy is suggested.

First, it concerns the unexpected results found in the present study. As the students did not go through the expected practice for the learning outcomes [C6.1] and [C8.1a], it remains uncertain whether the WebQuests could produce significant treatment effect on students' achievement of these two. In other words, no concluding remark regarding the effectiveness of the hands-on practice provided in the WebQuests, for [C6.1] and [C8.1a], could be made. The possible causes, regarding the design of the WebQuests, for the absence of practice have been identified in the previous chapter. Identifying the possible causes would be useful for improving the WebQuests. Subsequently, it would be desired to further revise the design of the WebQuests accordingly followed by conducting similar study again, in order to study the effect of the revised WebQuests on students' achievement of those learning outcomes.

Second, as mentioned in Section 6.6.1, the present study was conduct in a Band 1 school with mostly above average students. Thus, similar research is suggested to be carried out in other secondary schools with mostly average students or below average students. It is also suggested to have some sort of research settings, in which there are experimental group together with control group during the same period.

Third, as mentioned in the above discussion on potential teacher effect (in Section 6.6.4), it would be desired if the five even-numbers groups, who were not taught by the researcher, could also be involved in the study. Therefore, research that focuses on how teachers' instructional approaches for implementing WebQuests might affect students' development of information skills is suggested. Alternatively, research that focuses on how teacher's involvement during the implementation of WebQuests might affect students' development of

information skills is also suggested.

Fourth, the four WebQuests employed in this study were designed to help junior secondary students achieve five learning outcomes (Level III) defined in the cognitive dimension of the Information Literacy Framework for Hong Kong Students (EMB, 2005). Altogether, there are sixty four learning outcomes (for Junior Secondary level) defined under four different dimensions in the Framework (see Section 2.3 in Chapter 2). Following the discussion in Section 6.3.5, research exploring the possibilities of 1) adapting the instrument developed in the present study for helping junior secondary students achieve other learning outcomes, in the same dimension or others, and 2) transferring the instrument to Senior Secondary level is suggested.

Last, Frazee (2004), and Lamb and Teclehaimanot (2005) point out that rich descriptions of students' learning process during a well-developed WebQuest are largely absent from the literature. The present study provides detailed lesson transcripts describing students' physical activities and their computer operations during four well-developed WebQuests (see Appendices 24 and 25) together with detailed interview transcripts recording students' self-expression of their learning processes during the four WebQuests (see Appendix 30). These detailed transcripts, as well as the video recording, contained plenty of information regarding students' activities in the lessons. They could be further used by other research and practice in understanding students' learning process and how they interact during well-developed WebQuests.

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TRAILS: Tool for Real-time Assessment of Information Literacy Skills. Available: <http://www.trails-9.org/>.

The National Forum on Information Literacy. Available: <http://www.infolit.org/>.

Appendix 1: Learning Outcomes (Level III) and Indicators of the IL Standards defined in the Information Literacy Framework for Hong Kong Students

IL Standard (cognitive): an information literate person is able to determine the extent of and locate the information needed. [ILC I]

Indicators	Learning Outcomes
An information literate person is able to frame appropriate questions based on information needs.	• formulate questions for research inquiry [C1.1] • describe and assess the strategies they use for reading, viewing, and listening for various purposes [C1.2] • use questioning, summarizing, skimming or scanning, and graphic organizers to accomplish specific purposes for reading, viewing, and listening [C1.3] • evaluate the purposes and ask the appropriate questions [C1.4]
An information literate person is able to determine the nature and scope of the information needed.	• construct mind-maps to frame research questions [C2.1] • scan to locate and understand self-selected information [C2.2] • skim to identify key concepts and arguments [C2.3]
An information literate person is able to identify a variety of potential sources of information.	• organize the bookmarked websites into a more sophisticated structure, such as a tree structure, etc. [C3.1] • use call number to locate materials [C3.2] • identify differences in purpose and coverage of different periodicals, newspapers and Internet news websites [C3.3] • describe and evaluate a variety of strategies for locating information in print and electronic resources, including mass media [C3.4] • use print and electronic media features [C3.5] • employ a variety of communication tools to seek information from experts [C3.6] • identify how resources are classified within different classification systems [C3.7]
An information literate person is able to develop strategies for locating information.	• use keywords with logical operators to search for information with search engines; sort and rank the information in search engines [C4.1] • use the electronic library catalog system to conduct basic & advanced searching [C4.2] • access on-line library catalogues and electronic resources from other locations [C4.3]
An information literate person is able to collect primary/empirical data to address the research questions.	• conduct simple surveys, short interviews and devise simple questionnaires [C5.1]

IL Standard (cognitive): an information literate person is able to apply information to problem-solving and decision making. [ILC II]

Indicators	Learning Outcomes
An information literate person is able to apply information to inform decisions.	• make judgments and draw conclusions from research to solve problems [C6.1]
An information literate person is able to apply information in critical thinking and problem solving.	• draw conclusion from the information collected and apply the knowledge to solve problems of similar nature [C7.1]

IL Standard (cognitive): an information literate person is able to analyze the collected information and construct new concepts or understandings. [ILC III]

Indicators	Learning Outcomes
An information literate person is able to record, categorize and manage the information and its sources.	• use multiple keywords or phrases to label information; categorize and connect the concepts derived from information [C8.1] • integrate the agreement and disagreement among sources [C8.2] • use efficient note-taking strategies [C8.3]
An information literate person is able to critically analyze information collected.	• use simple graphing and statistical software such as spreadsheet to analyze data [C9.1] • use of spreadsheet to do simple "what-if" analysis [C9.2]
An information literate person is able to derive new concepts or understandings from the information collected.	• use mind-maps to illustrate thoughts and ideas [C10.1]
An information literate person is able to make inferences, connections, and draw conclusions.	• make inferences and simple generalizations from the evidence collected [C11.1]
An information literate person is able to articulate and present their thoughts, ideas and feelings.	• select and use a variety of information technology tools for making the presentation [C12.1] • proficiently use a variety of technologies to facilitate and enhance representation [C12.2] • plan, revise, and deliver written and oral presentations [C12.3]

IL Standard (cognitive): an information literate person is able to critically evaluate information and integrate new concepts with prior knowledge. [ILC IV]

Indicators	Learning Outcomes
An information literate person is able to determine accuracy, relevance, and comprehensiveness of information.	• identify gaps in information obtained [C13.1] • proof-read and revise draft [C13.2] • distinguish primary and secondary sources of information [C13.3] • identify differences in purpose and coverage of different periodicals, newspapers and Internet news websites [C13.4]
An information literate person is able to assimilate new concepts into his or her knowledge base and value system.	• identify and explain connections between new ideas and information and their previous beliefs, values, and experiences [C14.1]

IL Standard (meta-cognitive): an information literate person is able to be aware that information processing is iterative, time-consuming and demands effort. [ILM I]

Indicators	Learning Outcomes
An information literate person is able to recognize that the information seeking process is evolutionary and changes during the course of investigation.	• understand general principles of conducting good research [M1.1]
An information literate person is able to understand that information processing requires time, diligence, and practice.	• relate other people's opinions to solving a problem [M2.1] • recognize the importance of taking time to internalize questions and findings at all stages of the research process [M2.2]

IL Standard (meta-cognitive): an information literate person is able to plan and monitor the process of inquiry. [ILM II]

Indicators	Learning Outcomes
An information literate person is able to decompose a complex task/problem into manageable components.	• identify the key components for the given task [M3.1] • priorities questions for significance, relevance and practicality [M3.2]
An information literate person is able to define a manageable focus and timeline.	• define the timeline for the project work and revise it if necessary; use a variety of planning tools, including outlines, webs, flow charts, and diagrams to formulate plans [M4.1] • complete tracking sheets; articulate the stages of the research process [M4.2]

IL Standard (meta-cognitive): an information literate person is able to reflect upon and regulate the process of inquiry. [ILM III]

Indicators	Learning Outcomes
An information literate person is able to reflect upon the inquiry process and identify areas of improvement.	• know how to identify the flaws of the task [M5.1]
An information literate person is able to devise strategies for revising, improving and updating self-generated knowledge.	• complete self and peer evaluation on the research product and process by identifying strengths and weaknesses; set goals for improvement in the next research activity [M6.1]
An information literate person is able to review the information seeking process and revises search strategies as necessary.	• complete learning logs and response journals [M7.1] • compare information selected and interpreted with information needs and adjust research strategies if necessary [M7.2]

IL Standard (affective): an information literate person is able to recognize that being an independent reader will contribute to personal enjoyment and lifelong learning. [ILA I]

Indicators	Learning Outcomes
An information literate person is able to read information for pleasure.	• appreciate and derive meaning from literature and other sources of information [A1.1]
An information literate person is able to recognize and select materials appropriate to personal abilities and interests.	• identify topics of interest and seek relevant information about them [A2.1] • relate literature and other creative expressions of information to personal experiences [A2.2]

IL Standard (affective): an information literate person is able to recognize that information processing skills and freedom of information access are pivotal to sustaining the development of a knowledge society. [ILA II]

Indicators	Learning Outcomes
An information literate person is able to recognize that accurate and comprehensive information is the basis for intelligent decision making.	• recognize that freedom of information access is essential to sound decisions [A3.1]
An information literate person is able to recognize that being an independent learner will contribute to lifelong learning.	• demonstrate self-motivation for their own learning; enjoy the responsibility and autonomy of being a self-learner [A4.1] • demonstrate willingness to identify topics for independent learning to meet individual learning needs and interests [A4.2]
An information literate person is able to recognize the importance of freedom of information access to a knowledge society.	• recognize that freedom of information access inform decision making and contribute to community-wide knowledge building [A5.1]

IL Standard (affective): an information literate person is able to contribute positively to the learning community in knowledge building. [ILA III]

Indicators	Learning Outcomes
An information literate person is able to shares knowledge and information with others.	• collaborate and share resources with peers/teachers via BBS or discussion forum; manage BBS or discussion forum [A6.1] • share information with others via limited electronic media, such as personal homepages on Internet [A6.2]
An information literate person is able to collaborate effectively in groups to pursue and construct knowledge.	• respect and accept divergent ideas and opinions expressed by classmates and others and able to resolve conflicts [A7.1] • use synchronous mode of communication to facilitate decision-making among group members [A7.2] • use informal debate strategies to explore ideas during the research process [A7.3]

IL Standard (socio-cultural): an information literate person is able to understand and respect the ethical, legal, political and cultural contexts in which information is being used. [ILS]

Indicators	Learning Outcomes
An information literate person is able to recognize that information is underpinned by values and beliefs.	• understand the socio-cultural context in which the opinions are being formulated [S1.1]
An information literate person is able to understand and respect the principles of equitable access to information.	• create rules and regulations for joining electronic communication environments [S2.1]
An information literate person is able to understand and respect for the principle of intellectual freedom.	• understand and respect others' freedom of expression [S3.1]
An information literate person is able to observe laws, regulations, institutional policies, and social etiquette related to the access and use of information resources.	• recognize the potential risks related to Internet activities and be aware of a variety of solutions to protect information such as anti-virus software and encryption technologies [S4.1] • identify unethical information; use information ethically [S4.2] • respect and acknowledge the ownership of the information source and understand different standards of citations; be aware of the laws governing intellectual property rights and privacy [S4.3]

Appendix 2 – Cover Page of Invitation Letter from EDB, HKSAR

21 JAN 2009

Received by TLO

22 JAN 2009

中華人民共和國香港特別行政區政府總部教育統籌局
Education and Manpower Bureau
Government Secretariat, Government of the Hong Kong Special Administrative Region
The People's Republic of China

本局檔號 Our Ref.: EDB(EID/ITE)/IT/PRO/181
來函檔號 Your Ref.:

電話 Telephone: 3698 3607
傳真 Fax Line: 2382 4403

Information Technology in Education Section,
Education Bureau
Room E420, 4th Floor., East Block,
EDB Kowloon Tong Education Services Centre,
19 Suffolk Road, Kowloon Tong, Kowloon

19 January 2009

Prof. Lawrence J. LAU
Vice-Chancellor and President, The Chinese University of Hong Kong
1/F, Rm 101, University Administration Building, CUHK, Shatin, New Territories

Dear Prof. LAU,

Development of Evaluation Tools for Assessing Students' Information Literacy And Promoting Information Literacy among Students

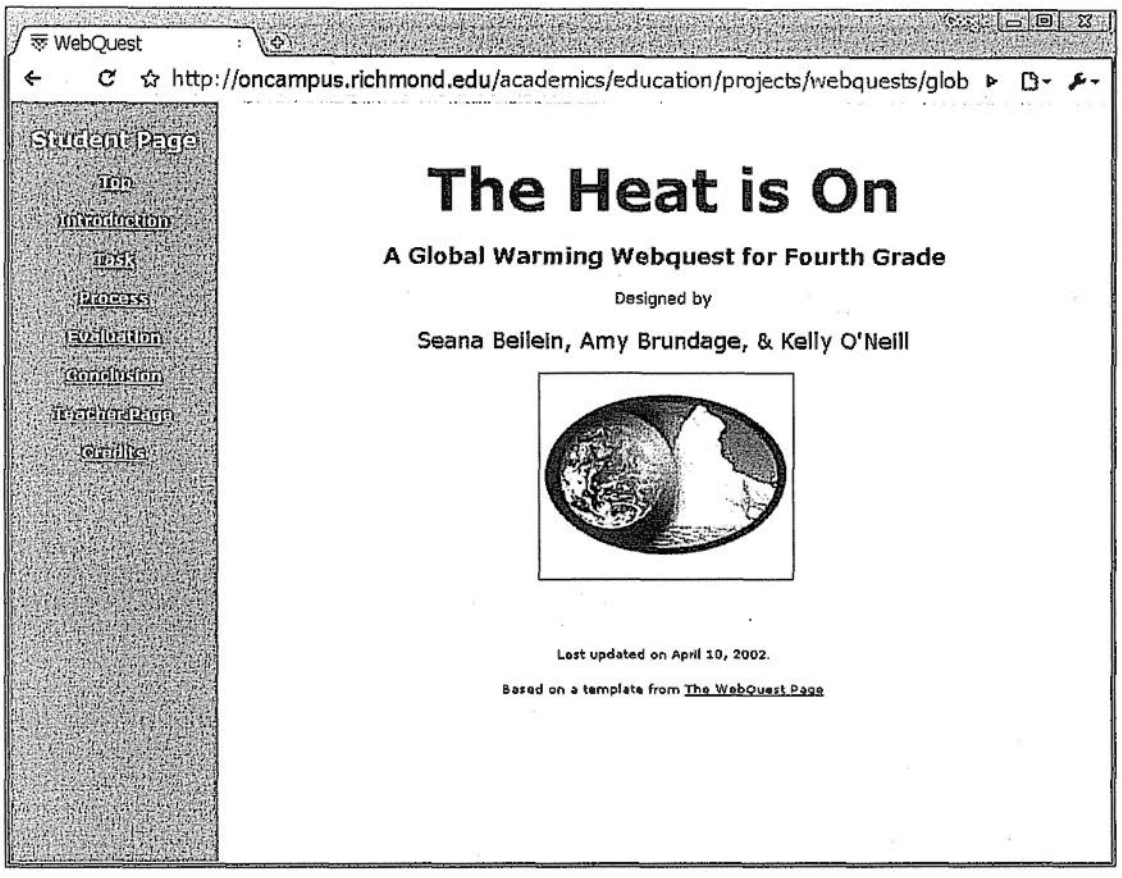
The Education Bureau of HKSAR (EDB) is now inviting quotations for Provision of Services for "Development of Evaluation Tools for Assessing Students' Information Literacy And Promoting Information Literacy among Students". The draft Agreement is attached for your reference.

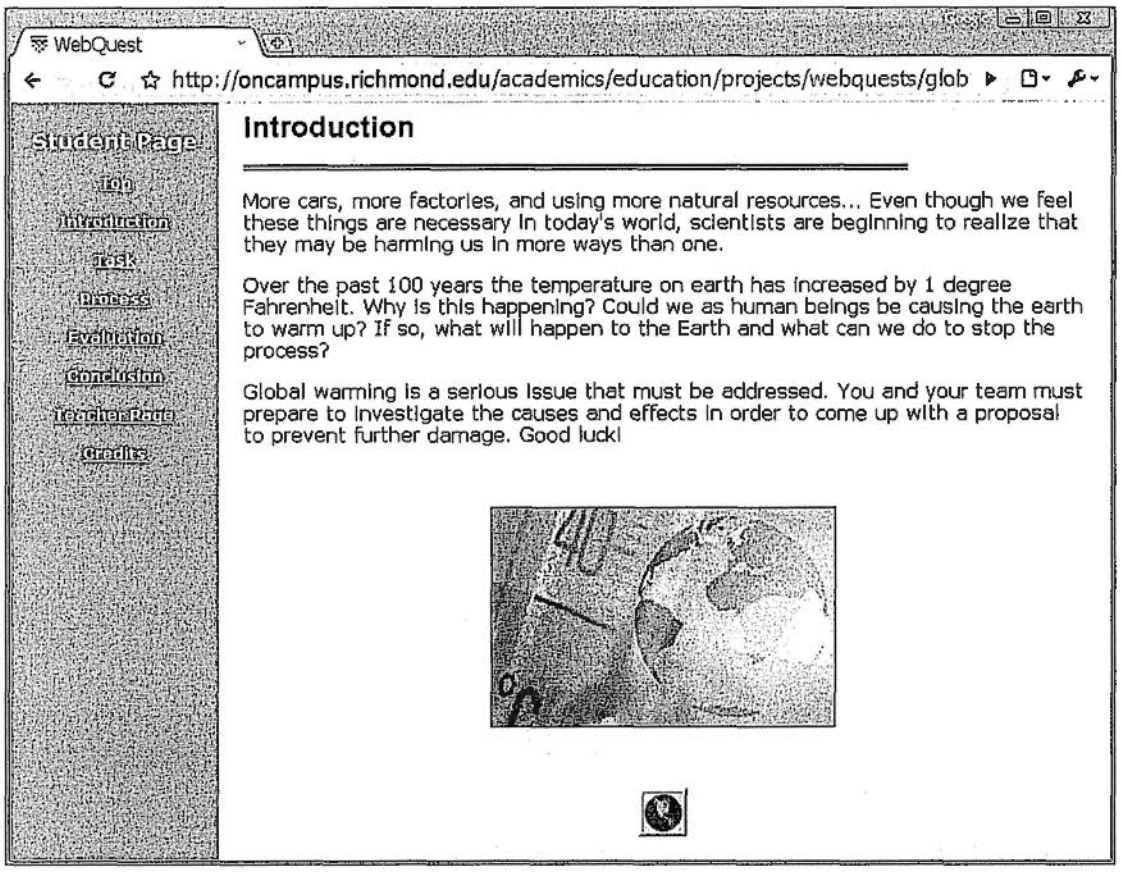
Interested service providers are required to submit a detailed proposal* in hardcopy which should include the information stipulated in Annex B of the draft Agreement.

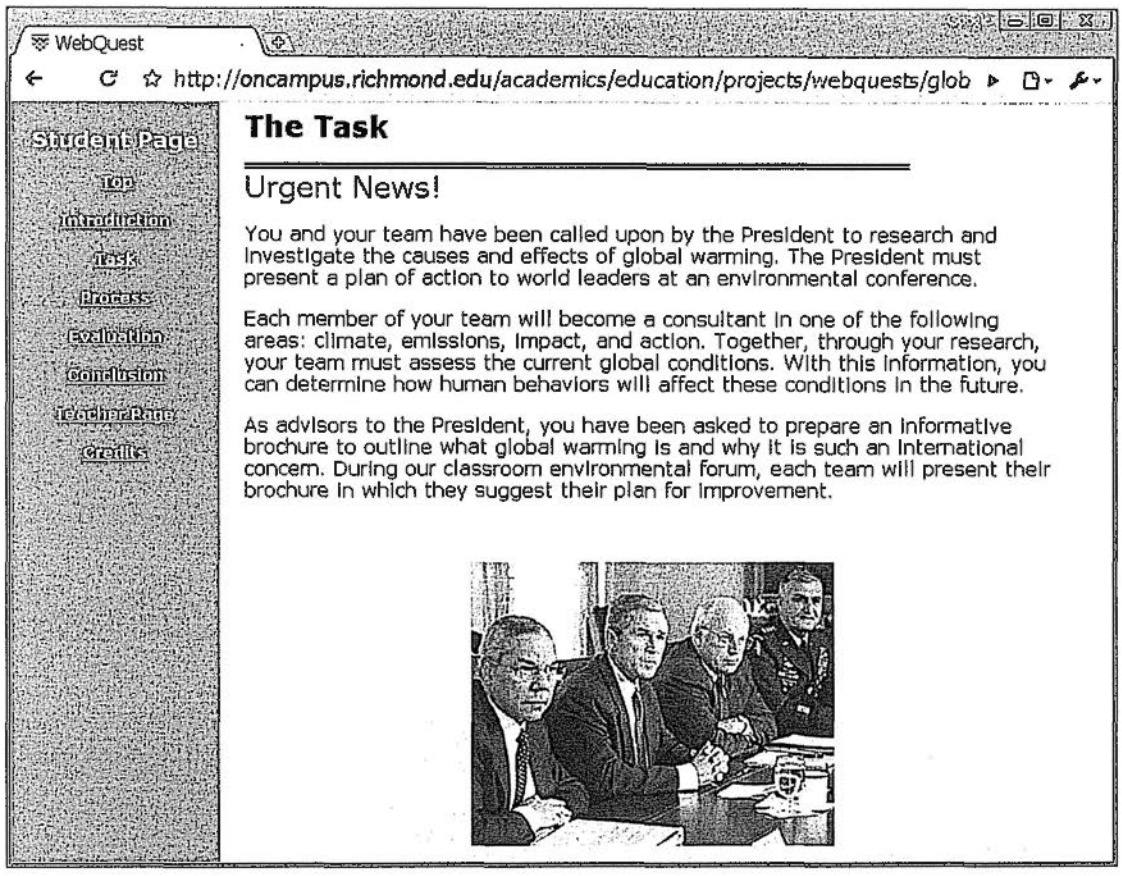
An additional CD/DVD containing a softcopy of the submitted proposal in Word document (.doc) or Rich Text Format (.rtf) should also be submitted.

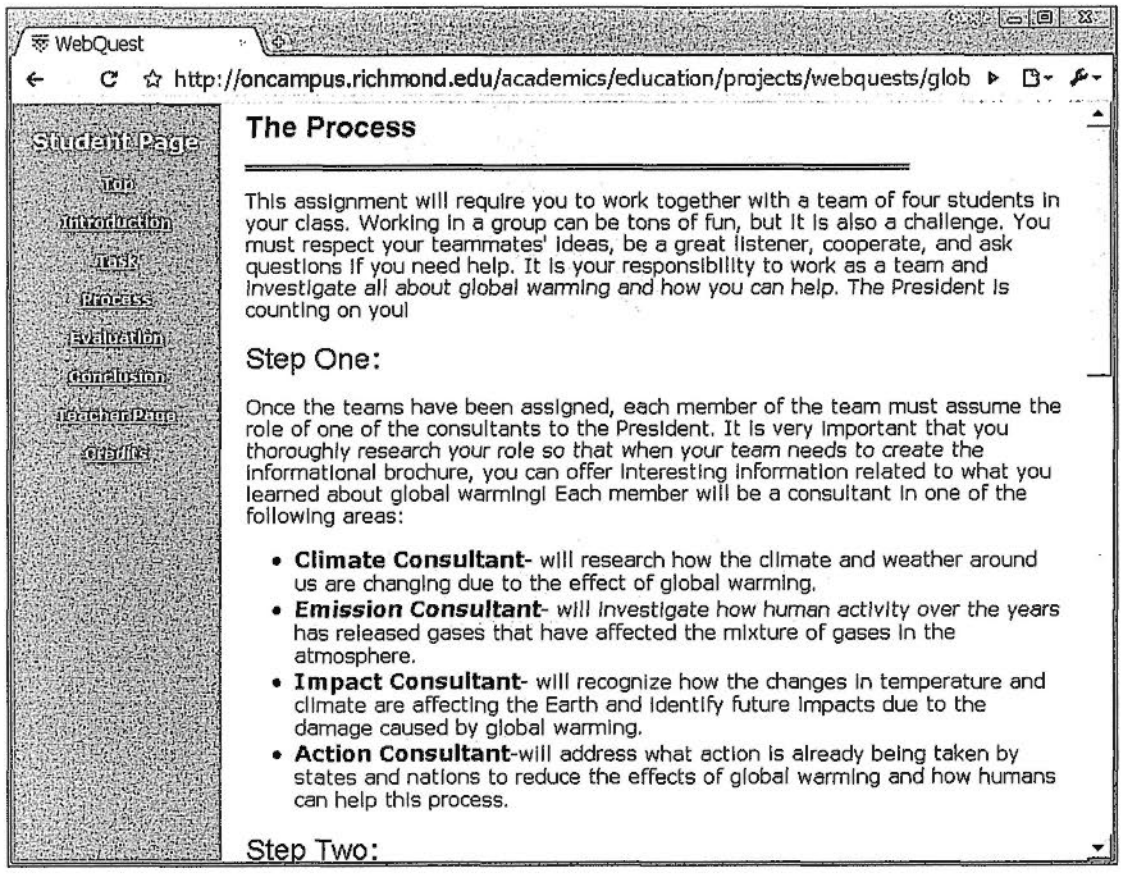
(P.T.O.)

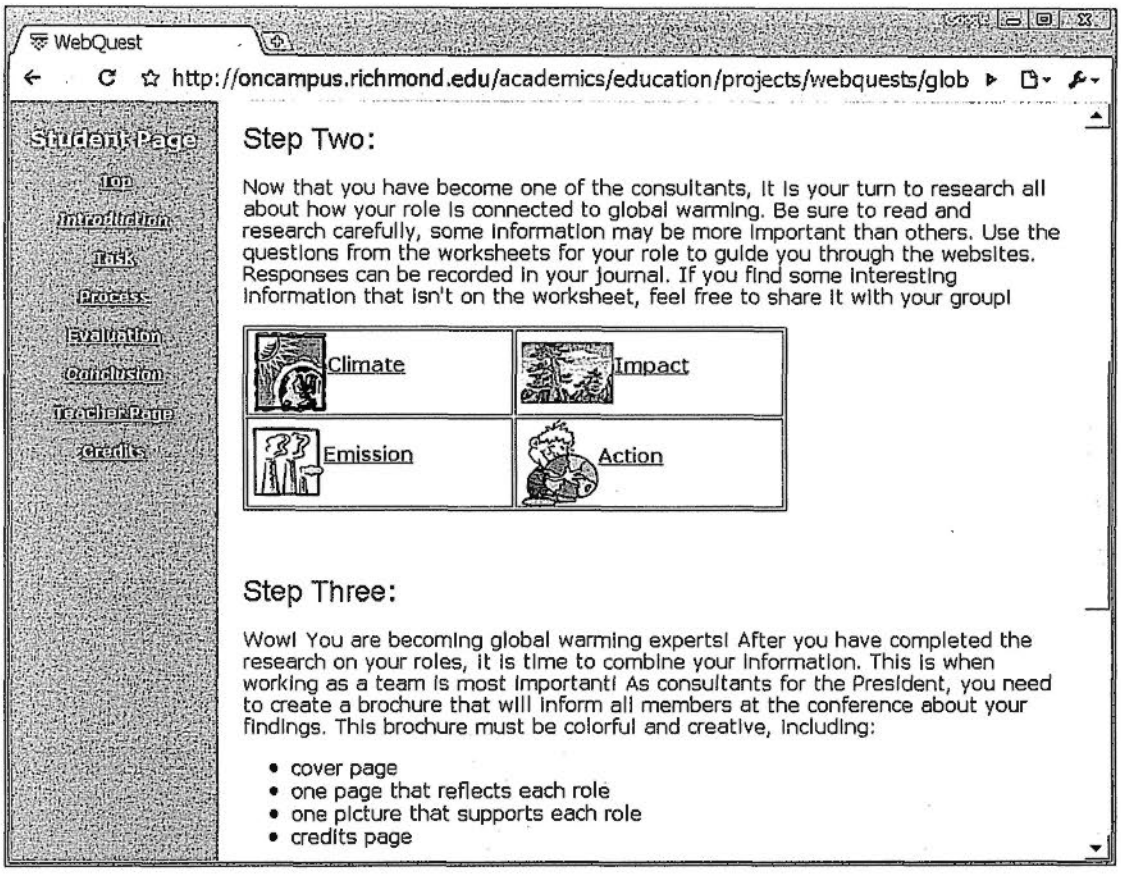
Appendix 3: Screenshots of the Original WebQuest (*WQ1* before Adaptation)

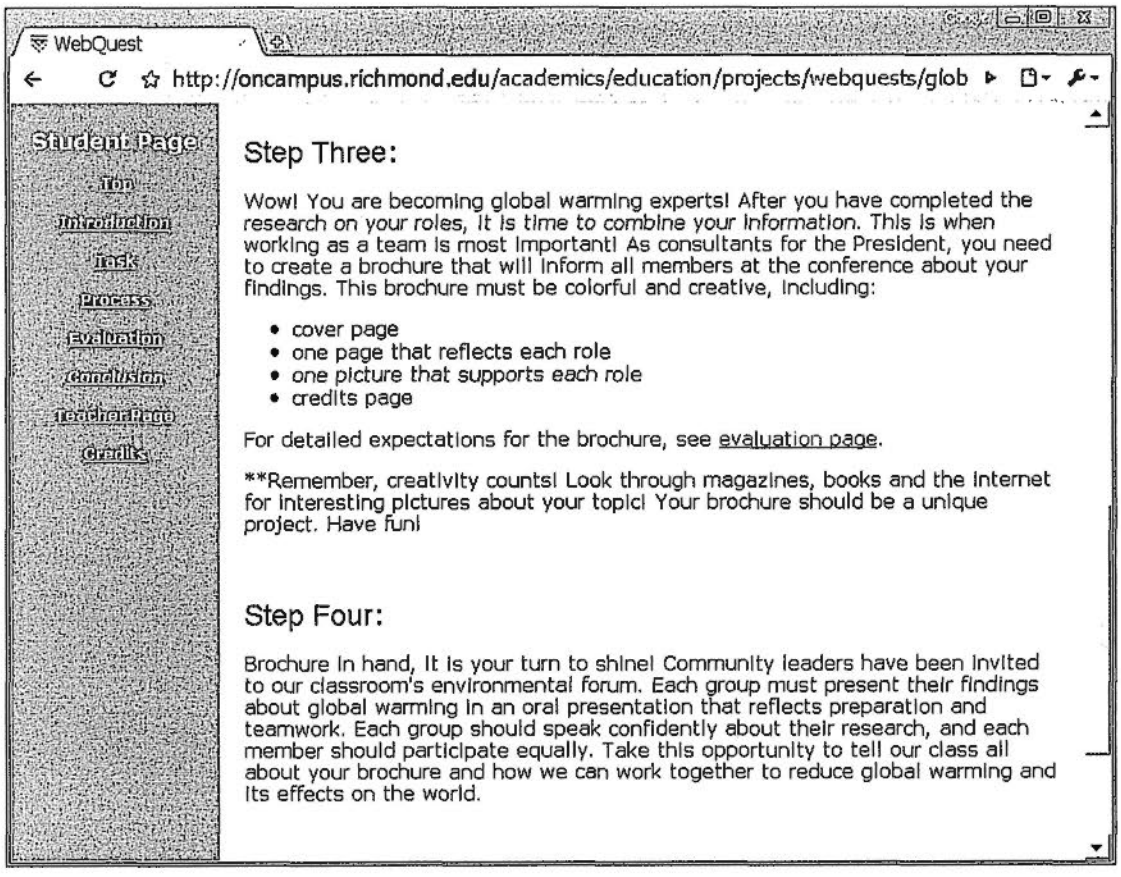





WebQuest
http://oncampus.richmond.edu/academics/education/projects/webquests/glob
Student Page
Top
Introduction
Task
Process
Evaluation
Conclusion
Teacher Page
Credits
The Task
Urgent News!
You and your team have been called upon by the President to research and investigate the causes and effects of global warming. The President must present a plan of action to world leaders at an environmental conference.
Each member of your team will become a consultant in one of the following areas: climate, emissions, impact, and action. Together, through your research, your team must assess the current global conditions. With this information, you can determine how human behaviors will affect these conditions in the future.
As advisors to the President, you have been asked to prepare an informative brochure to outline what global warming is and why it is such an international concern. During our classroom environmental forum, each team will present their brochure in which they suggest their plan for improvement.


WebQuest
http://oncampus.richmond.edu/academics/education/projects/webquests/glob
Student Page
Top
Introduction
Task
Process
Evaluation
Conclusion
Teacher Page
Credits
The Process
This assignment will require you to work together with a team of four students in your class. Working in a group can be tons of fun, but it is also a challenge. You must respect your teammates' ideas, be a great listener, cooperate, and ask questions if you need help. It is your responsibility to work as a team and investigate all about global warming and how you can help. The President is counting on you!
Step One:
Once the teams have been assigned, each member of the team must assume the role of one of the consultants to the President. It is very important that you thoroughly research your role so that when your team needs to create the informational brochure, you can offer interesting information related to what you learned about global warming! Each member will be a consultant in one of the following areas:
Climate Consultant- will research how the climate and weather around us are changing due to the effect of global warming.
Emission Consultant- will investigate how human activity over the years has released gases that have affected the mixture of gases in the atmosphere.
Impact Consultant- will recognize how the changes in temperature and climate are affecting the Earth and identify future impacts due to the damage caused by global warming.
Action Consultant-will address what action is already being taken by states and nations to reduce the effects of global warming and how humans can help this process.
Step Two:


WebQuest
http://oncampus.richmond.edu/academics/education/projects/webquests/glob
Student Page
Top
Introduction
Task
Process
Evaluation
Conclusion
Teacher Page
Credits
Step Two:
Now that you have become one of the consultants, it is your turn to research all about how your role is connected to global warming. Be sure to read and research carefully, some information may be more important than others. Use the questions from the worksheets for your role to guide you through the websites. Responses can be recorded in your journal. If you find some interesting information that isn't on the worksheet, feel free to share it with your group!
Climate
Impact
Emission
Action
Step Three:
Wow! You are becoming global warming experts! After you have completed the research on your roles, it is time to combine your information. This is when working as a team is most important! As consultants for the President, you need to create a brochure that will inform all members at the conference about your findings. This brochure must be colorful and creative, including:
• cover page
• one page that reflects each role
• one picture that supports each role
• credits page


WebQuest
http://oncampus.richmond.edu/academics/education/projects/webquests/glob
Student Page
Top
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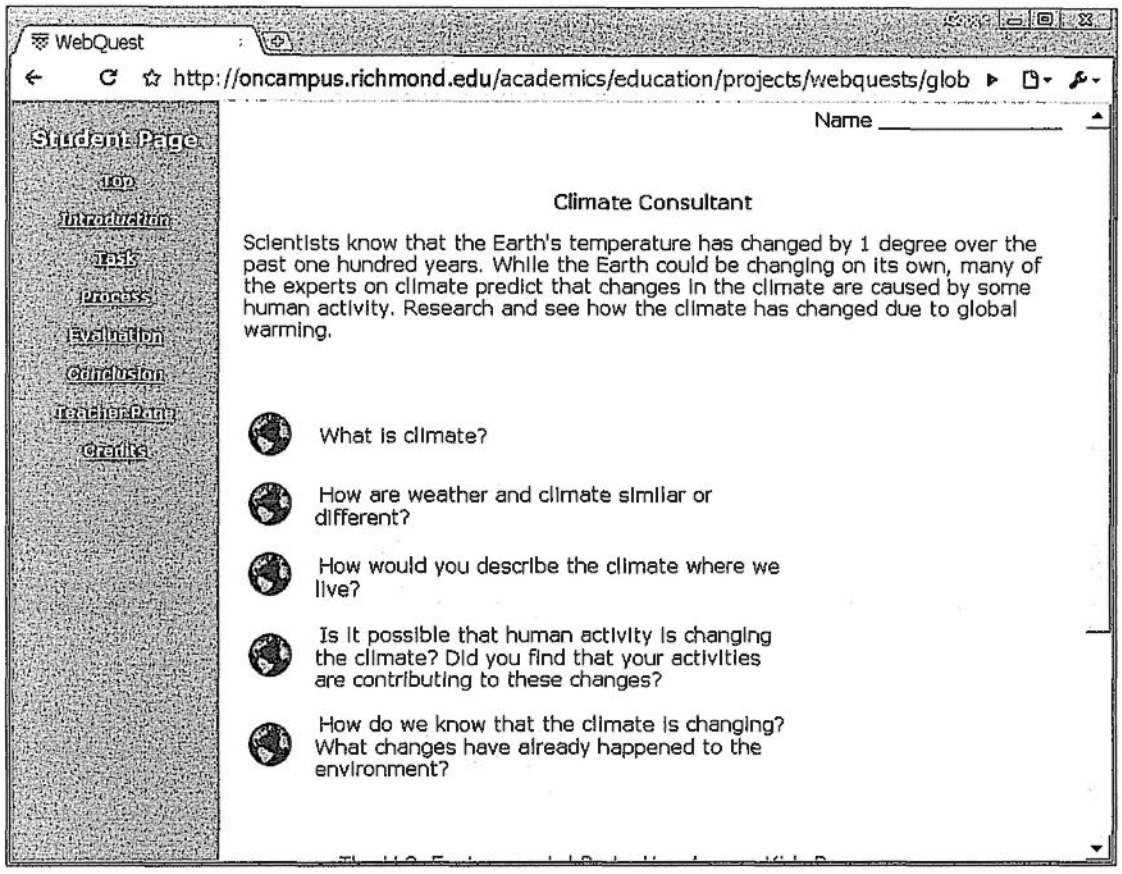
Wow! You are becoming global warming experts! After you have completed the research on your roles, it is time to combine your information. This is when working as a team is most important! As consultants for the President, you need to create a brochure that will inform all members at the conference about your findings. This brochure must be colorful and creative, including:
• cover page
• one page that reflects each role
• one picture that supports each role
• credits page
For detailed expectations for the brochure, see evaluation page.
**Remember, creativity counts! Look through magazines, books and the internet for interesting pictures about your topic! Your brochure should be a unique project. Have fun!
Step Four:
Brochure in hand, it is your turn to shine! Community leaders have been invited to our classroom's environmental forum. Each group must present their findings about global warming in an oral presentation that reflects preparation and teamwork. Each group should speak confidently about their research, and each member should participate equally. Take this opportunity to tell our class all about your brochure and how we can work together to reduce global warming and its effects on the world.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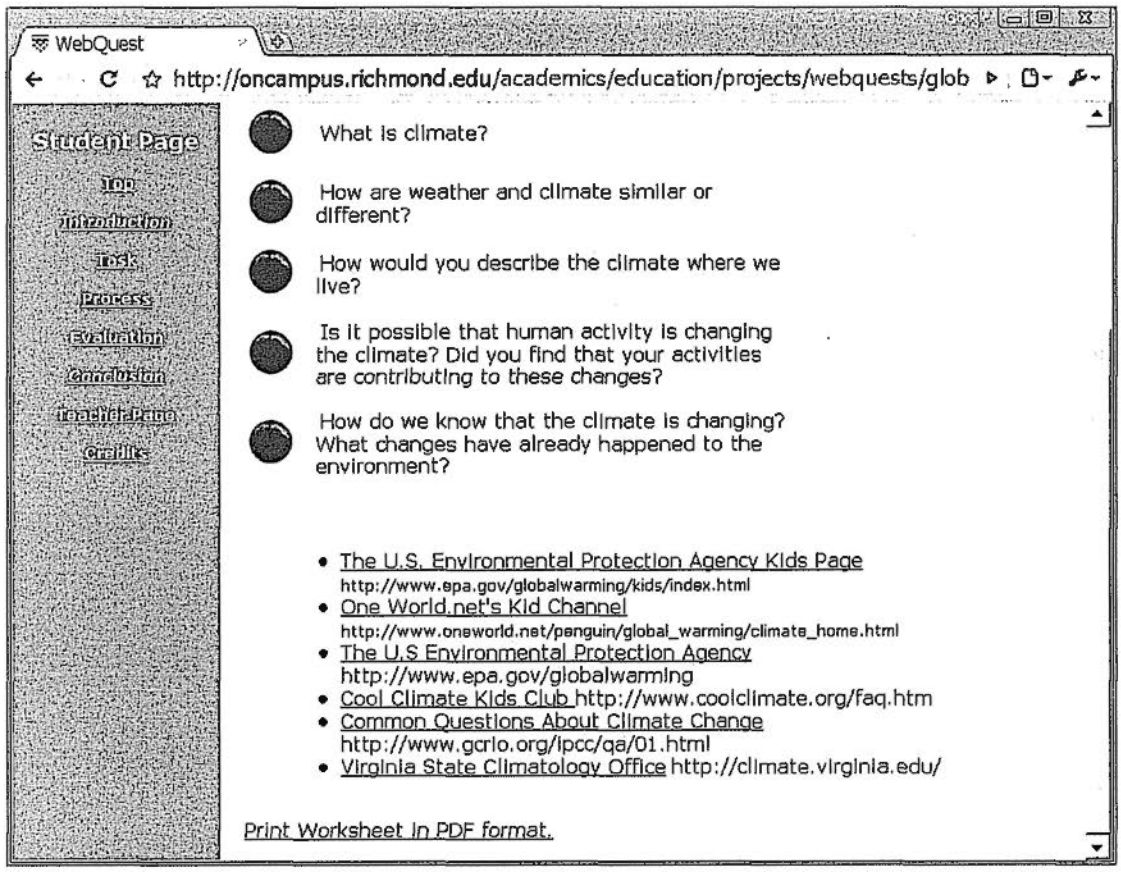
Climate Consultant
Scientists know that the Earth's temperature has changed by 1 degree over the past one hundred years. While the Earth could be changing on its own, many of the experts on climate predict that changes in the climate are caused by some human activity. Research and see how the climate has changed due to global warming.
What is climate?
How are weather and climate similar or different?
How would you describe the climate where we live?
Is it possible that human activity is changing the climate? Did you find that your activities are contributing to these changes?
How do we know that the climate is changing? What changes have already happened to the environment?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http://www.epa.gov/globalwarming/kids/index.html
One World.net's Kid Channel
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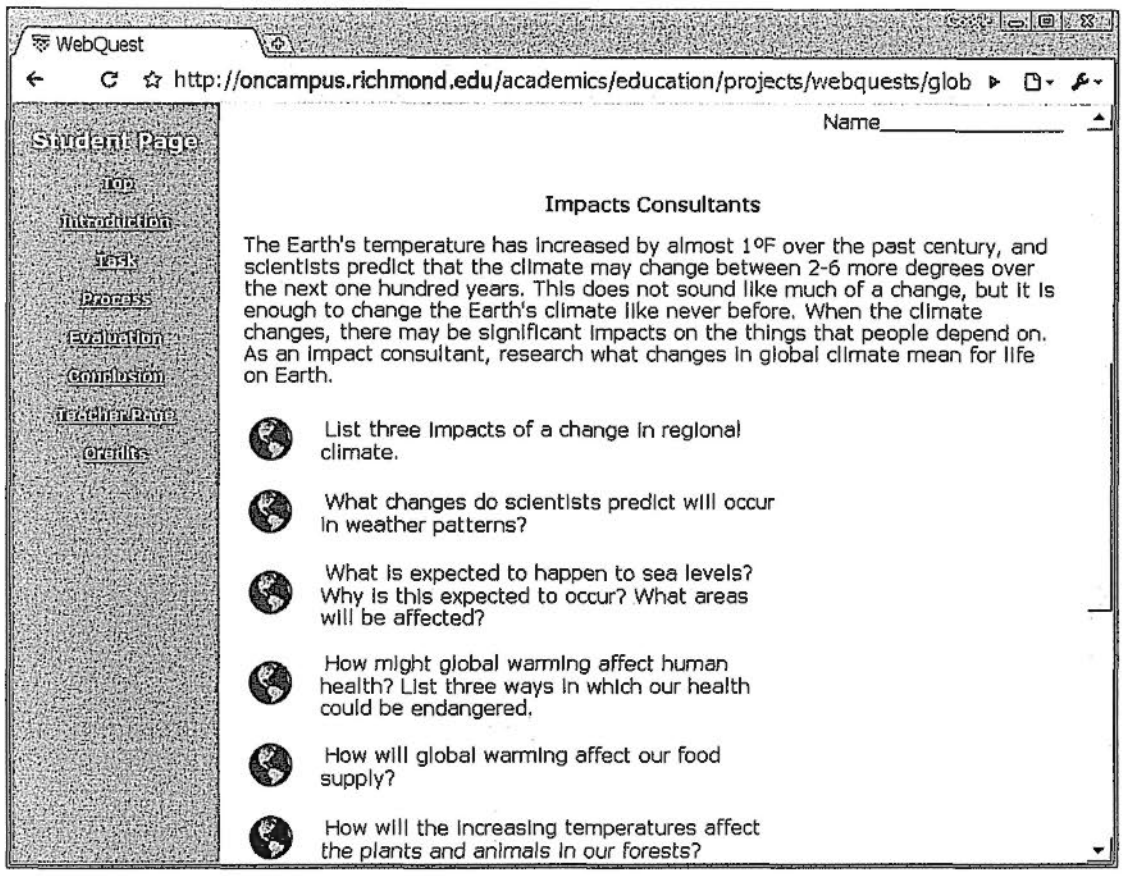
The U.S Environmental Protection Agency
http://www.epa.gov/globalwarming
Cool Climate Kids Club http://www.coolclimate.org/faq.htm
Common Questions About Climate Change
http://www.gcrio.org/ipcc/qa/01.html
Virginia State Climatology Office http://climate.virginia.edu/
Print Worksheet in PDF format.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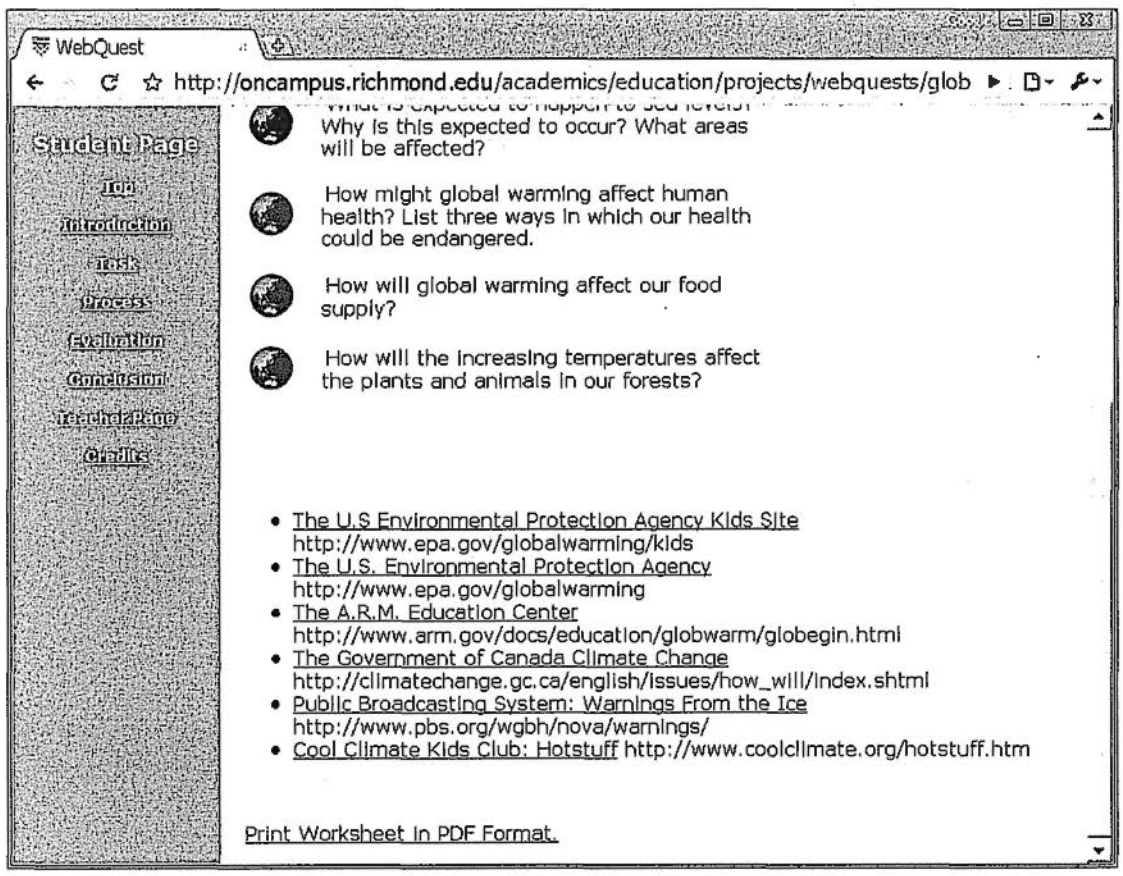
Impacts Consultants
The Earth's temperature has increased by almost 1°F over the past century, and scientists predict that the climate may change between 2-6 more degrees over the next one hundred years. This does not sound like much of a change, but it is enough to change the Earth's climate like never before. When the climate changes, there may be significant impacts on the things that people depend on. As an impact consultant, research what changes in global climate mean for life on Earth.
List three impacts of a change in regional climate.
What changes do scientists predict will occur in weather patterns?
What is expected to happen to sea levels? Why is this expected to occur? What areas will be affected?
How might global warming affect human health? List three ways in which our health could be endangered.
How will global warming affect our food supply?
How will the increasing temperatures affect the plants and animals in our forests?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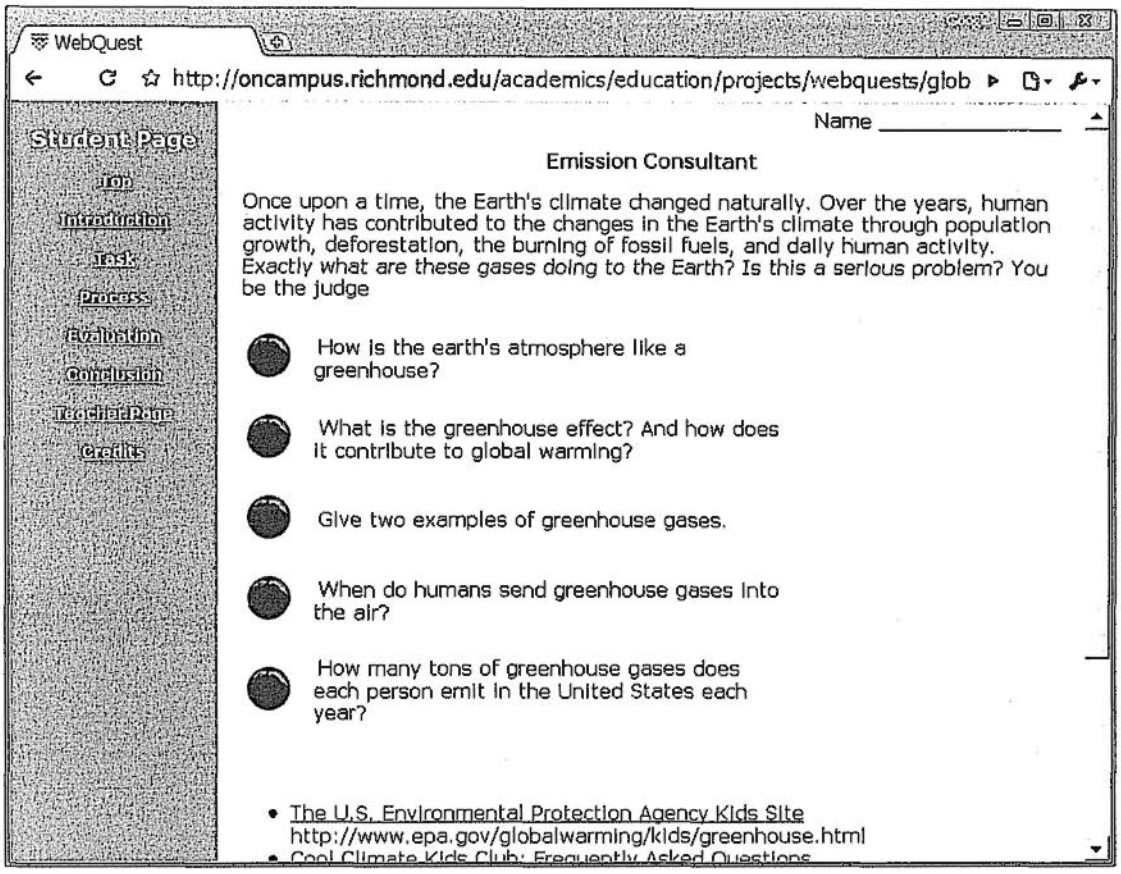
The A.R.M. Education Center http://www.arm.gov/docs/education/globwarm/globegin.html
The Government of Canada Climate Change http://climatechange.gc.ca/english/issues/how_will/index.shtml
Public Broadcasting System: Warnings From the Ice http://www.pbs.org/wgbh/nova/warnings/
Cool Climate Kids Club: Hotstuff http://www.coolclimate.org/hotstuff.htm
Print Worksheet in PDF Format.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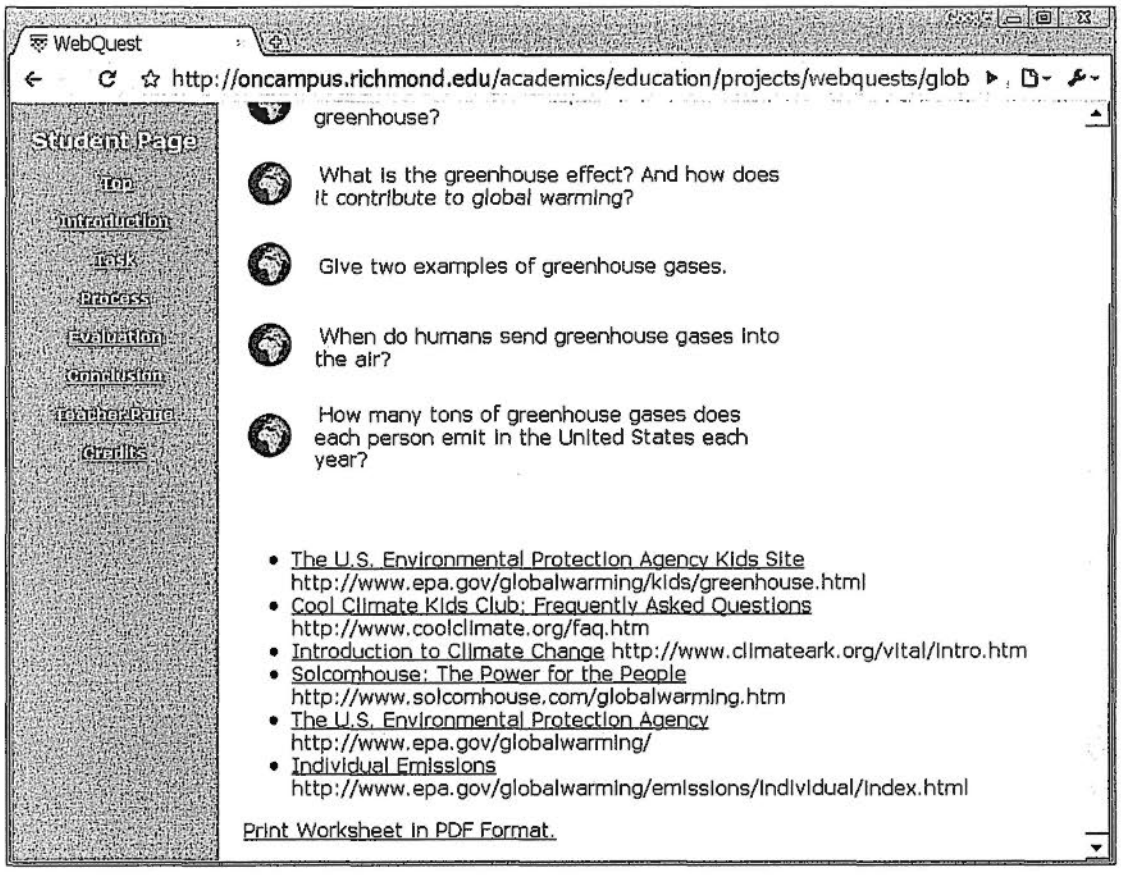
Emission Consultant
Once upon a time, the Earth's climate changed naturally. Over the years, human activity has contributed to the changes in the Earth's climate through population growth, deforestation, the burning of fossil fuels, and daily human activity. Exactly what are these gases doing to the Earth? Is this a serious problem? You be the judge
How is the earth's atmosphere like a greenhouse?
What is the greenhouse effect? And how does it contribute to global warming?
Give two examples of greenhouse gases.
When do humans send greenhouse gases into the air?
How many tons of greenhouse gases does each person emit in the United States each year?
The U.S. Environmental Protection Agency Kids Site
http://www.epa.gov/globalwarming/kids/greenhouse.html
Cool Climate Kids Club: Frequently Asked Questions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Introduction to Climate Change http://www.climateark.org/vital/intro.htm
Solcomhouse: The Power for the People
http://www.solcomhouse.com/globalwarming.htm
The U.S. Environmental Protection Agency
http://www.epa.gov/globalwarming/
Individual Emissions
http://www.epa.gov/globalwarming/emissions/individual/index.html
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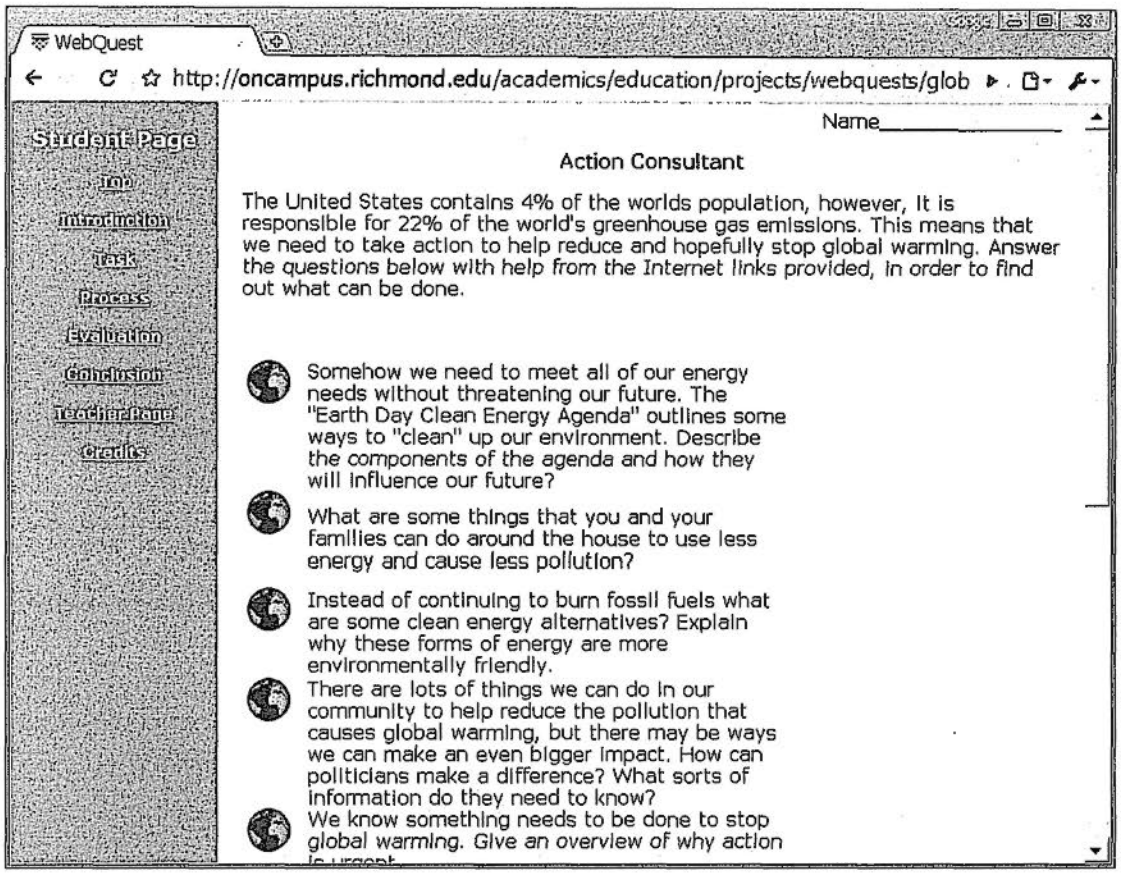
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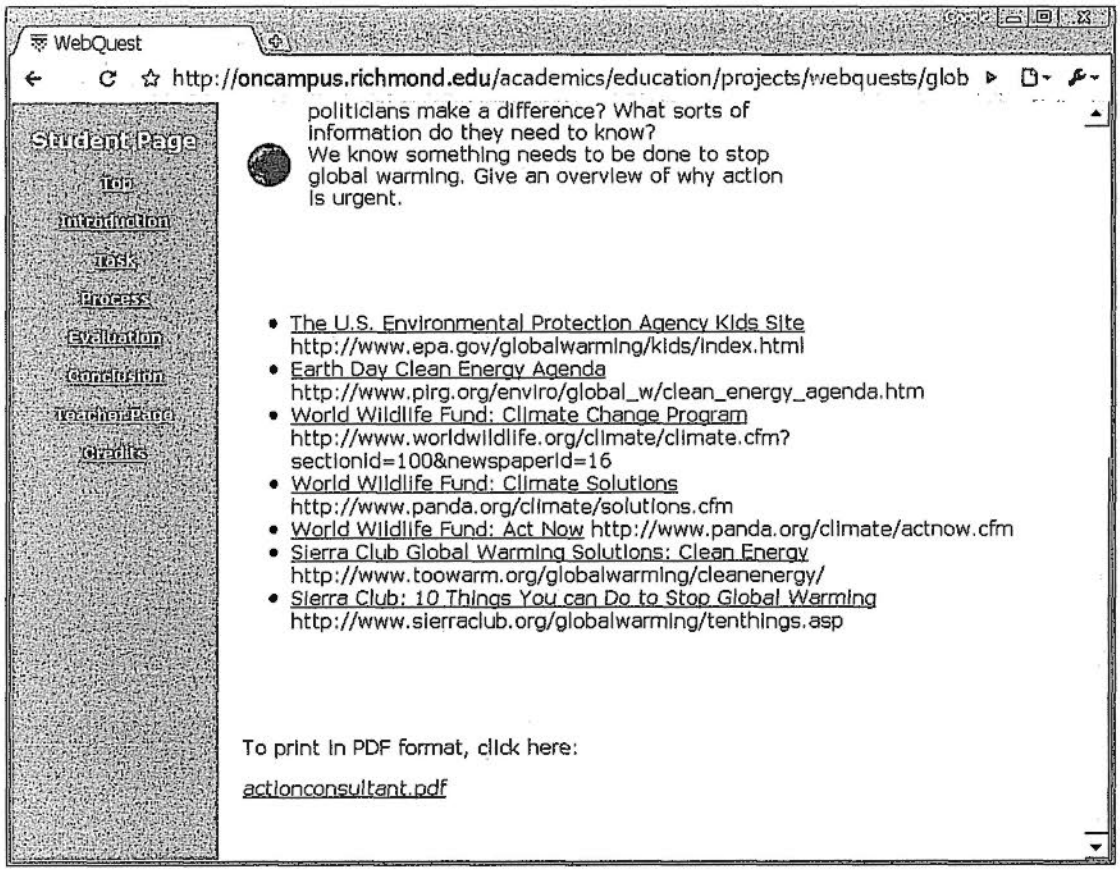
Action Consultant
The United States contains 4% of the worlds population, however, it is responsible for 22% of the world's greenhouse gas emissions. This means that we need to take action to help reduce and hopefully stop global warming. Answer the questions below with help from the Internet links provided, in order to find out what can be done.
Somehow we need to meet all of our energy needs without threatening our future. The "Earth Day Clean Energy Agenda" outlines some ways to "clean" up our environment. Describe the components of the agenda and how they will influence our future?
What are some things that you and your families can do around the house to use less energy and cause less pollution?
Instead of continuing to burn fossil fuels what are some clean energy alternatives? Explain why these forms of energy are more environmentally friendly.
There are lots of things we can do in our community to help reduce the pollution that causes global warming, but there may be ways we can make an even bigger impact. How can politicians make a difference? What sorts of information do they need to know?
We know something needs to be done to stop global warming. Give an overview of why action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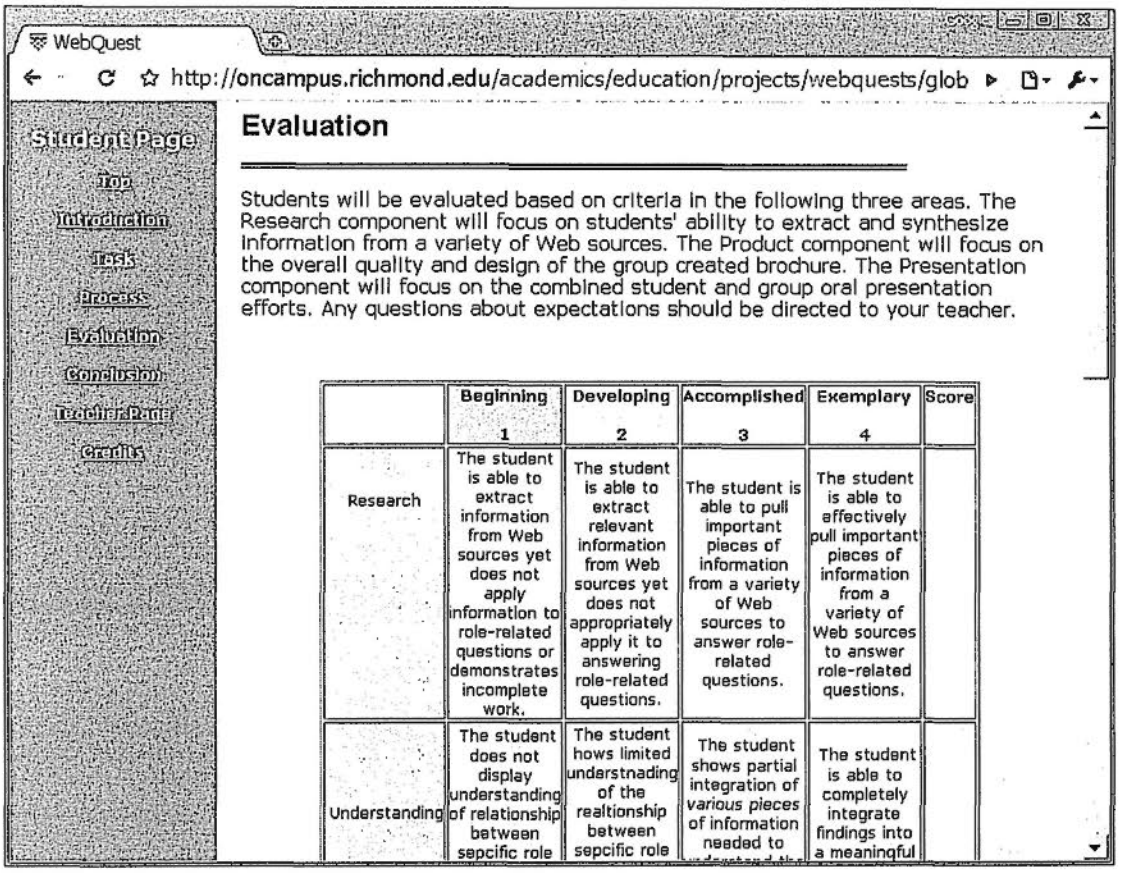
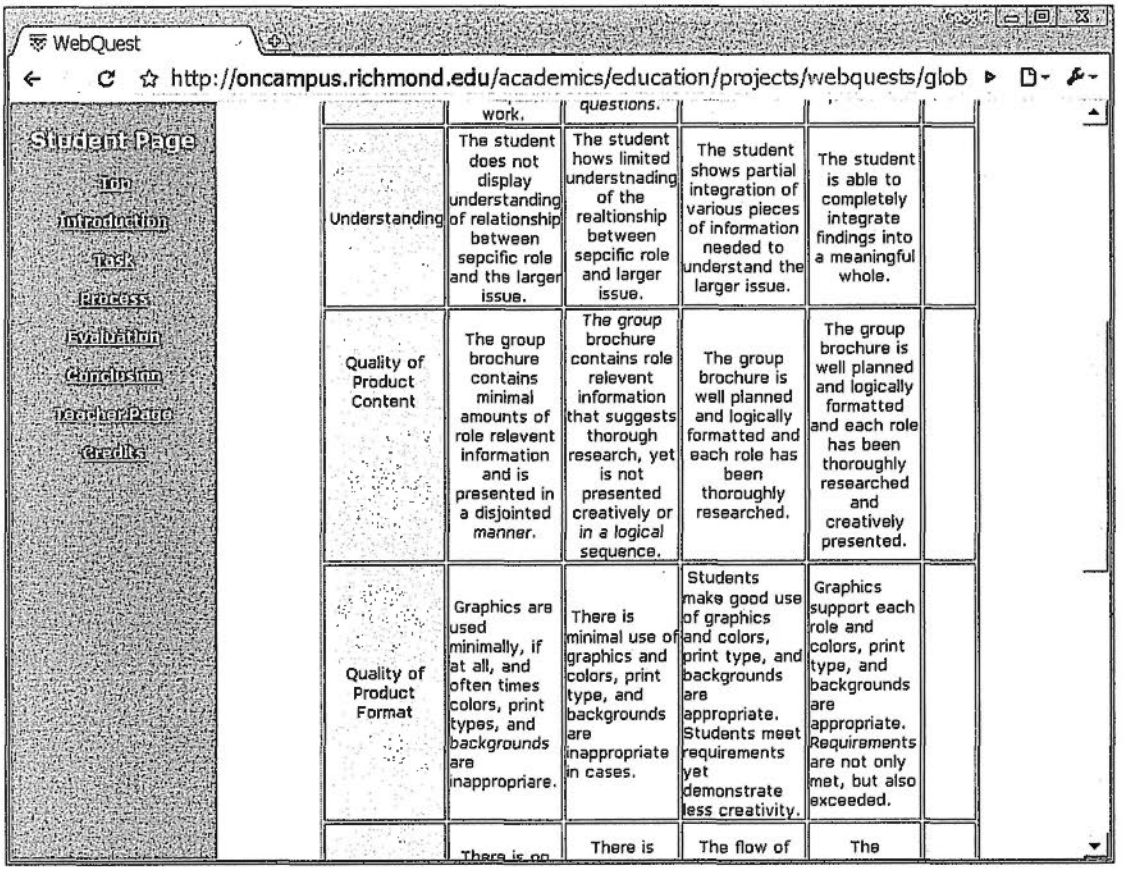
We know something needs to be done to stop global warming. Give an overview of why action is urgent.
The U.S. Environmental Protection Agency Kids Site http://www.epa.gov/globalwarming/kids/index.html
Earth Day Clean Energy Agenda http://www.pirg.org/enviro/global_w/clean_energy_agenda.htm
World Wildlife Fund: Climate Change Program http://www.worldwildlife.org/climate/climate.cfm?sectionId=100&newspaperId=16
World Wildlife Fund: Climate Solutions http://www.panda.org/climate/solutions.cfm
World Wildlife Fund: Act Now http://www.panda.org/climate/actnow.cfm
Sierra Club Global Warming Solutions: Clean Energy http://www.toowarm.org/globalwarming/cleanenergy/
Sierra Club: 10 Things You can Do to Stop Global Warming http://www.sierraclub.org/globalwarming/tenthings.asp
To print in PDF format, click here:
actionconsultant.pdf



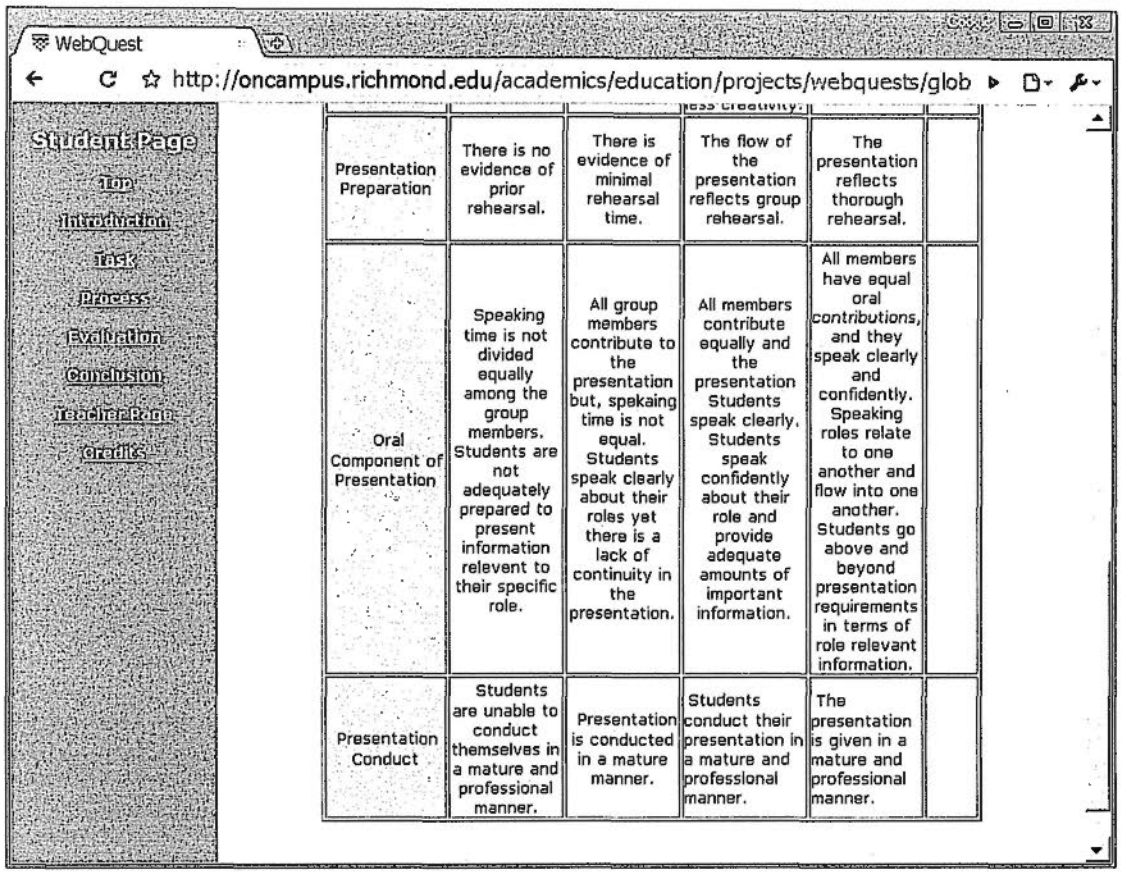
Evaluation

Students will be evaluated based on criteria in the following three areas. The Research component will focus on students' ability to extract and synthesize information from a variety of Web sources. The Product component will focus on the overall quality and design of the group created brochure. The Presentation component will focus on the combined student and group oral presentation efforts. Any questions about expectations should be directed to your teacher.

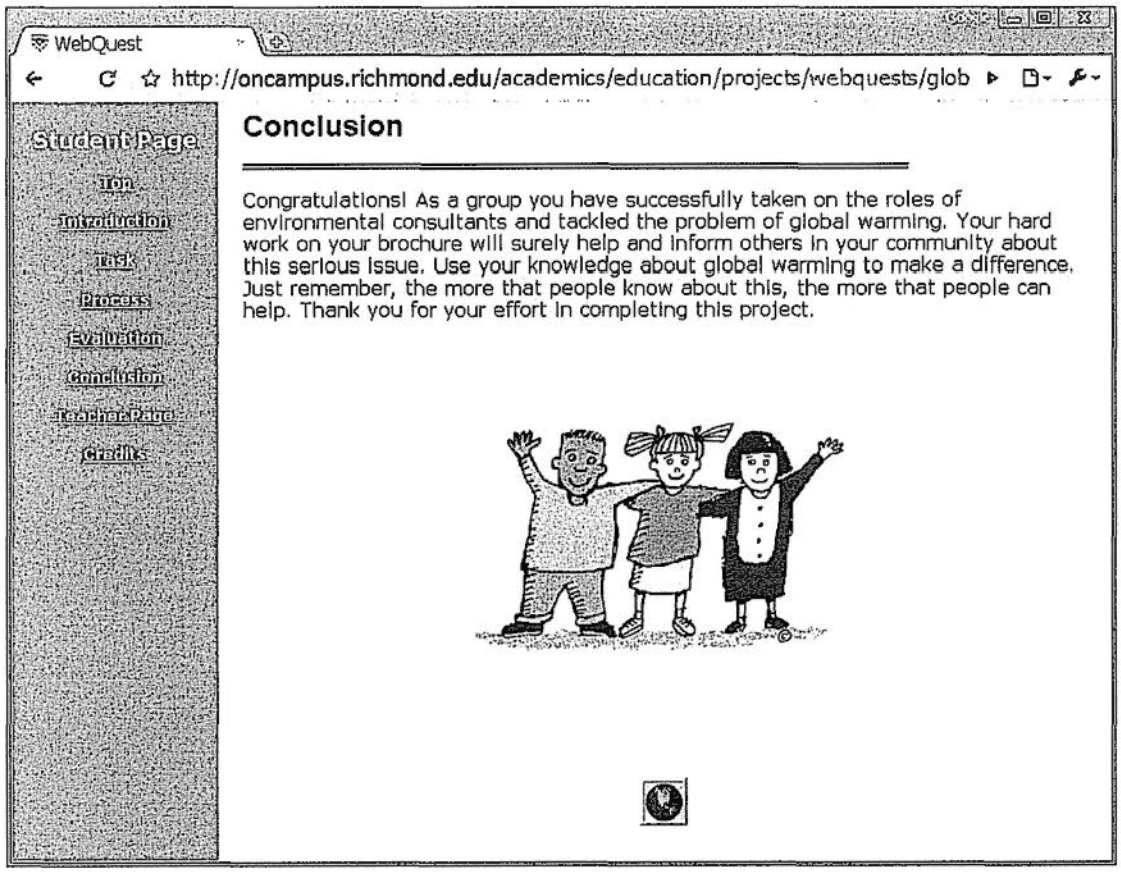
	Beginning 1	Developing 2	Accomplished 3	Exemplary 4	Score
Research	The student is able to extract information from Web sources yet does not apply information to role-related questions or demonstrates incomplete work.	The student is able to extract relevant information from Web sources yet does not appropriately apply it to answering role-related questions.	The student is able to pull important pieces of information from a variety of Web sources to answer role-related questions.	The student is able to effectively pull important pieces of information from a variety of Web sources to answer role-related questions.	
Understanding	The student does not display understanding of relationship between sepcific role	The student hows limited understnading of the realtionship between sepcific role	The student shows partial integration of *various pieces* of information needed to	The student is able to completely integrate findings into a meaningful	



	work.	*questions.*			
Understanding	The student does not display understanding of relationship between sepcific role and the larger issue.	The student hows limited understnading of the realtionship between sepcific role and larger issue.	The student shows partial integration of various pieces of information needed to understand the larger issue.	The student is able to completely integrate findings into a meaningful whole.	
Quality of Product Content	The group brochure contains minimal amounts of role relevent information and is presented in a disjointed *manner.*	*The group* brochure contains role relevent information that suggests thorough research, yet is not presented creatively or *in a logical* sequence.	The group brochure is well planned and logically formatted and each role has been thoroughly researched.	The group brochure is well planned and logically formatted and each role has been thoroughly researched and creatively presented.	
Quality of Product Format	Graphics are used minimally, if at all, and often times colors, print types, and *backgrounds* are inappropriare.	There is minimal use of graphics and colors, print type, and backgrounds are inappropriate in cases.	Students make good use of graphics and colors, print type, and backgrounds are appropriate. Students meet requirements yet demonstrate less creativity.	Graphics support each role and colors, print type, and backgrounds are appropriate. *Requirements* are not only met, but also exceeded.	
	There is no	There is	The flow of	The	



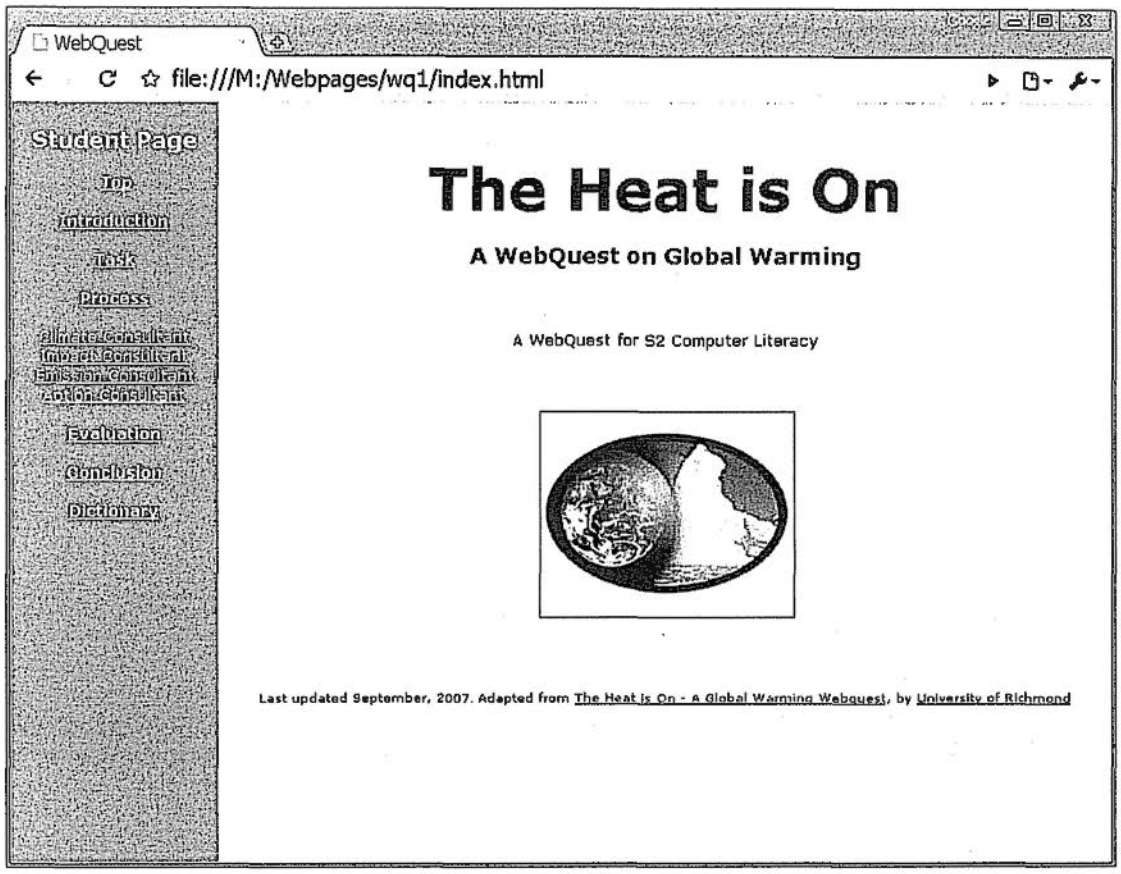
Presentation Preparation	There is no evidence of prior rehearsal.	There is evidence of minimal rehearsal time.	The flow of the presentation reflects group rehearsal.	The presentation reflects thorough rehearsal.	
Oral Component of Presentation	Speaking time is not divided equally among the group members. Students are not adequately prepared to present information relevent to their specific role.	All group members contribute to the presentation but, spekaing time is not equal. Students speak clearly about their roles yet there is a lack of continuity in the presentation.	All members contribute equally and the presentation Students speak clearly. Students speak confidently about their role and provide adequate amounts of important information.	All members have equal oral contributions, and they speak clearly and confidently. Speaking roles relate to one another and flow into one another. Students go above and beyond presentation requirements in terms of role relevant information.	
Presentation Conduct	Students are unable to conduct themselves in a mature and professional manner.	Presentation is conducted in a mature manner.	Students conduct their presentation in a mature and professional manner.	The presentation is given in a mature and professional manner.	

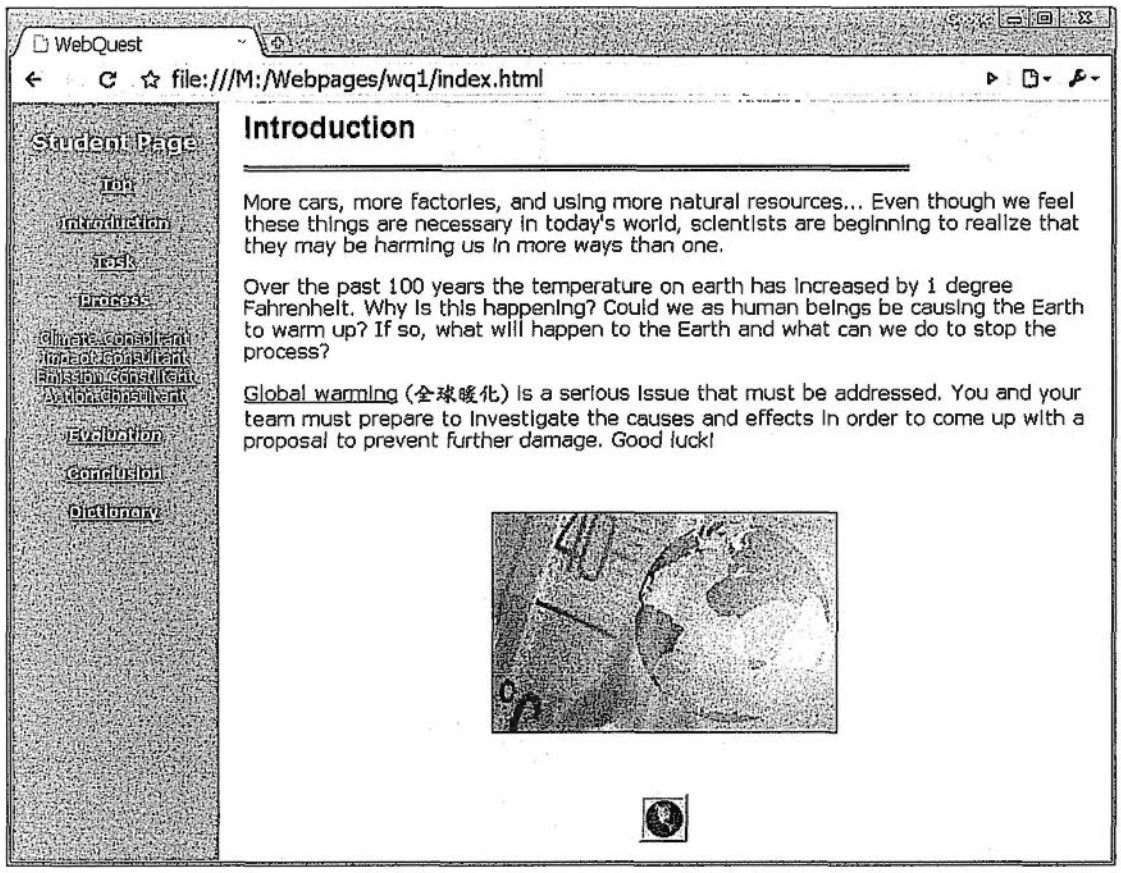


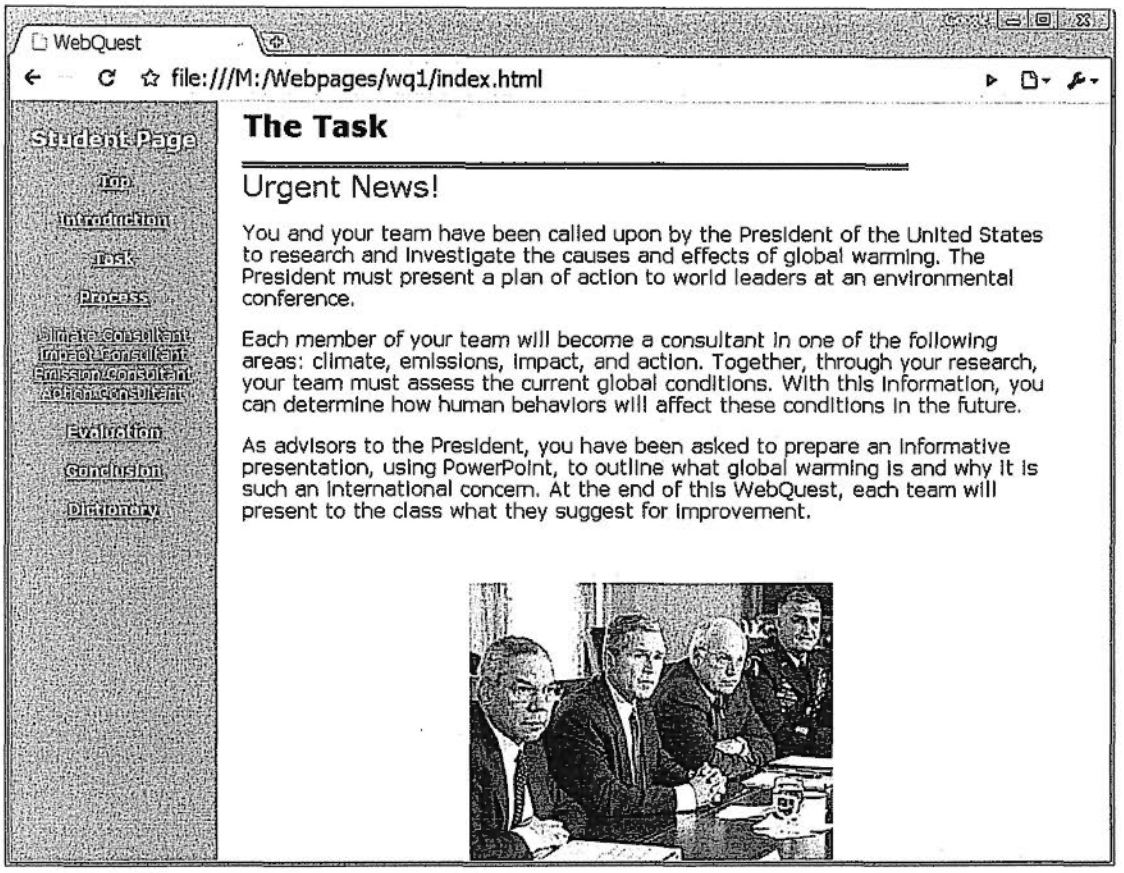
Conclusion

Congratulations! As a group you have successfully taken on the roles of environmental consultants and tackled the problem of global warming. Your hard work on your brochure will surely help and inform others in your community about this serious issue. Use your knowledge about global warming to make a difference. Just remember, the more that people know about this, the more that people can help. Thank you for your effort in completing this project.

Appendix 4: Screenshots of the Modified WebQuest (*WQ1* after Adaptation)



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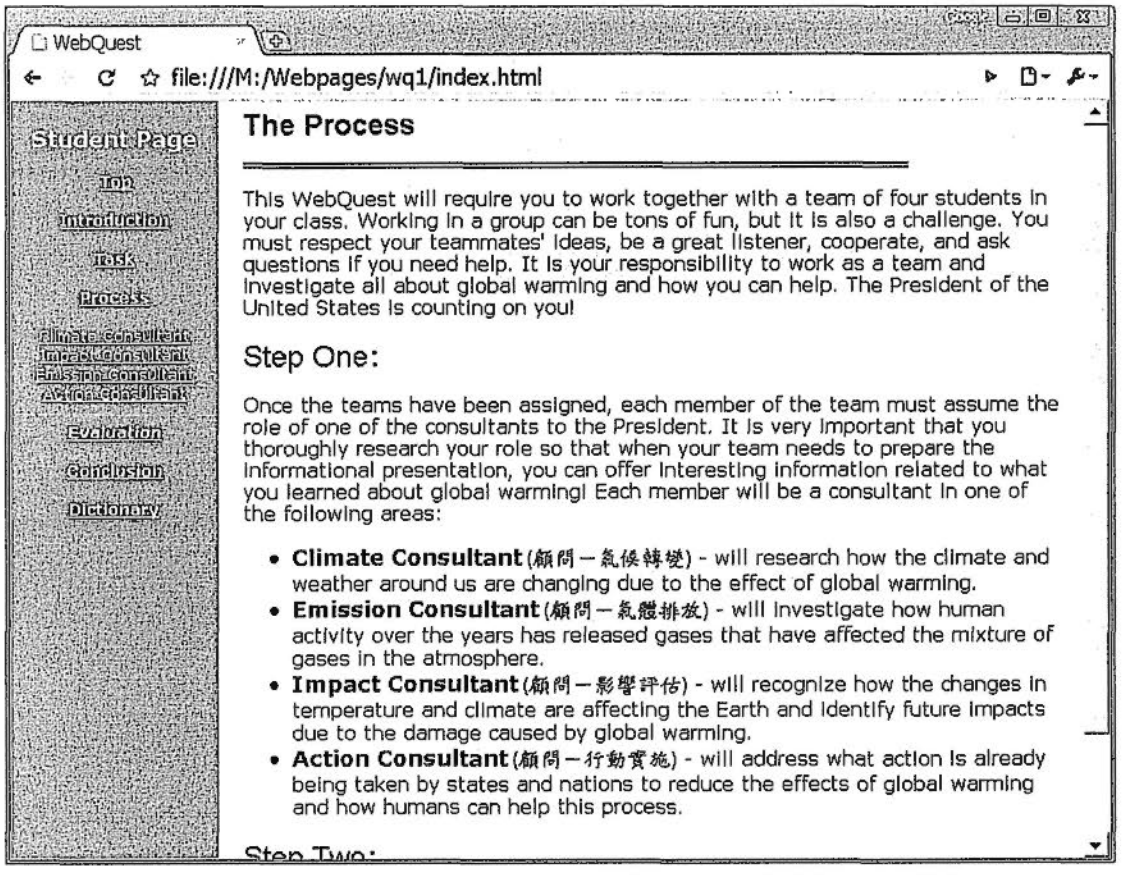
The Task
Urgent News!
You and your team have been called upon by the President of the United States to research and investigate the causes and effects of global warming. The President must present a plan of action to world leaders at an environmental conference.
Each member of your team will become a consultant in one of the following areas: climate, emissions, impact, and action. Together, through your research, your team must assess the current global conditions. With this information, you can determine how human behaviors will affect these conditions in the future.
As advisors to the President, you have been asked to prepare an informative presentation, using PowerPoint, to outline what global warming is and why it is such an international concern. At the end of this WebQuest, each team will present to the class what they suggest for improvement.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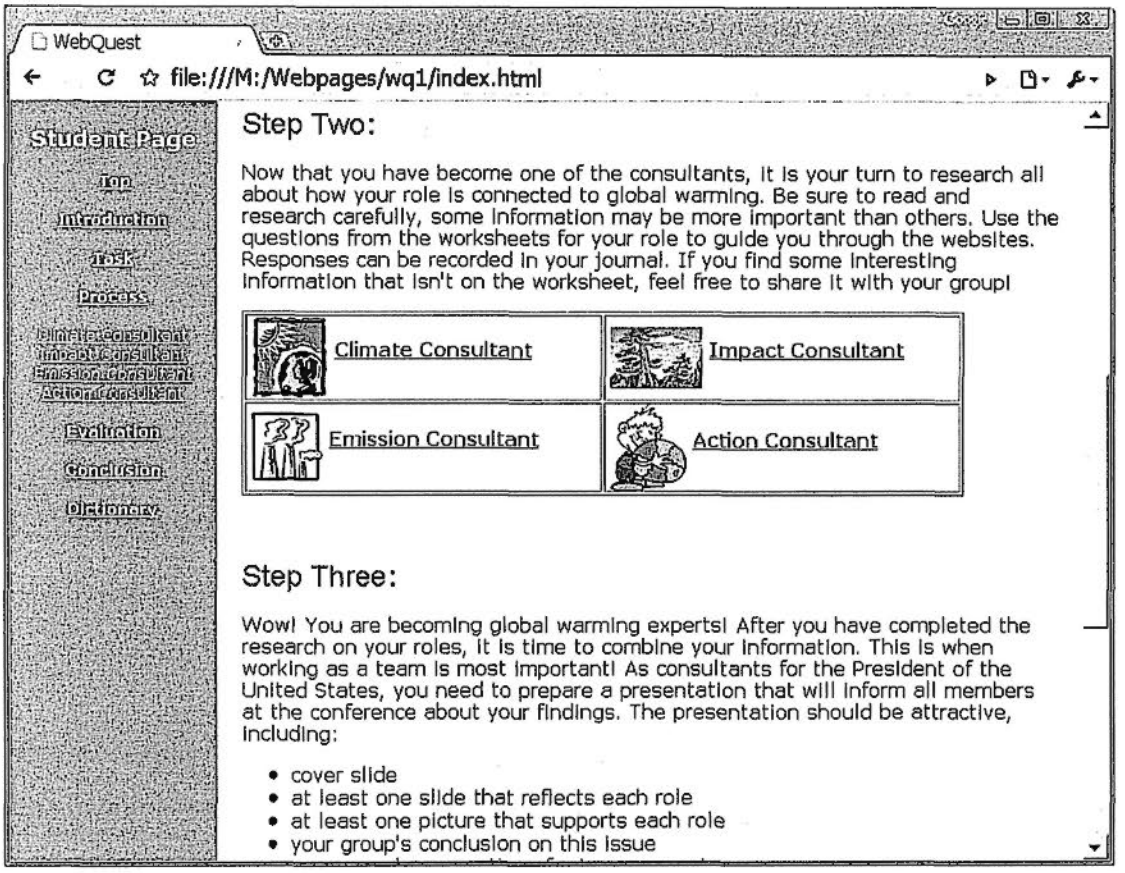
The Process
This WebQuest will require you to work together with a team of four students in your class. Working in a group can be tons of fun, but it is also a challenge. You must respect your teammates' ideas, be a great listener, cooperate, and ask questions if you need help. It is your responsibility to work as a team and investigate all about global warming and how you can help. The President of the United States is counting on you!
Step One:
Once the teams have been assigned, each member of the team must assume the role of one of the consultants to the President. It is very important that you thoroughly research your role so that when your team needs to prepare the informational presentation, you can offer interesting information related to what you learned about global warming! Each member will be a consultant in one of the following areas:
• Climate Consultant (顧問－氣候轉變) - will research how the climate and weather around us are changing due to the effect of global warming.
• Emission Consultant (顧問－氣體排放) - will investigate how human activity over the years has released gases that have affected the mixture of gases in the atmosphere.
• Impact Consultant (顧問－影響評估) - will recognize how the changes in temperature and climate are affecting the Earth and identify future impacts due to the damage caused by global warming.
• Action Consultant (顧問－行動實施) - will address what action is already being taken by states and nations to reduce the effects of global warming and how humans can help this process.
Step Two: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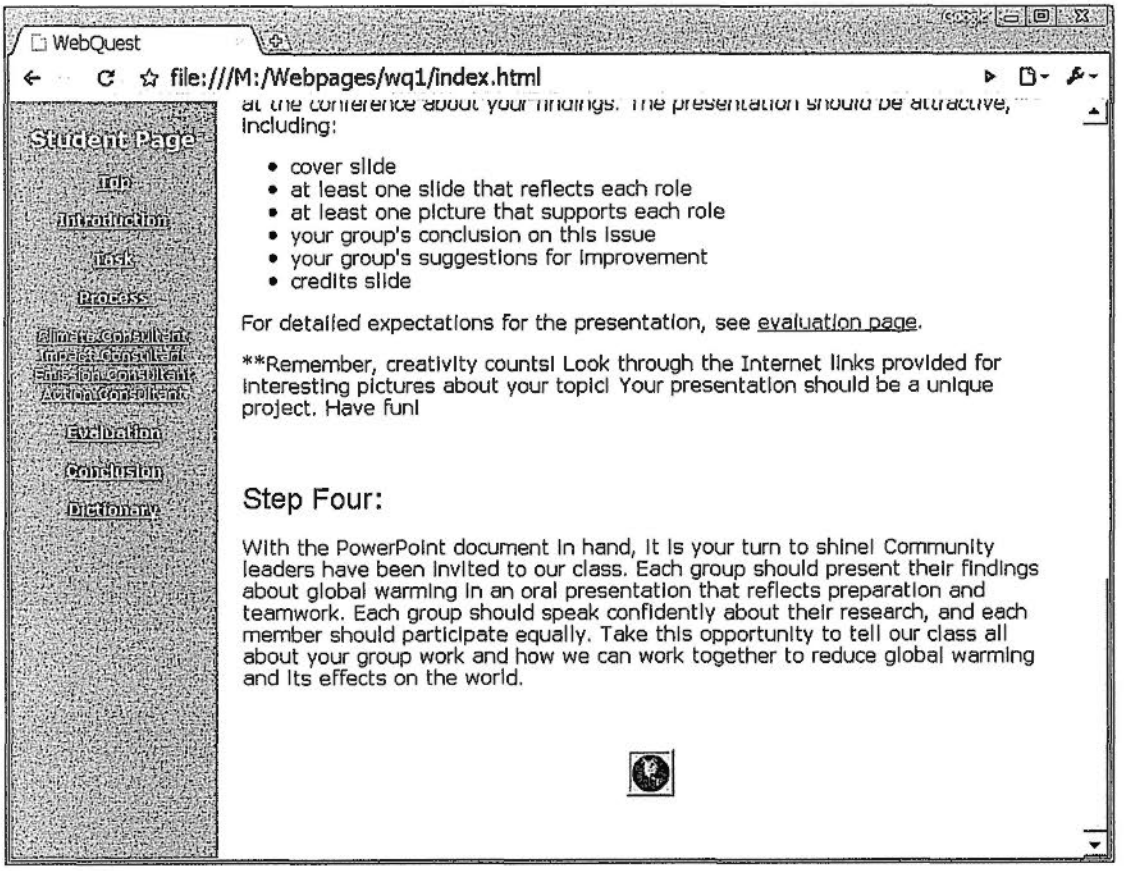
Step Two:
Now that you have become one of the consultants, it is your turn to research all about how your role is connected to global warming. Be sure to read and research carefully, some information may be more important than others. Use the questions from the worksheets for your role to guide you through the websites. Responses can be recorded in your journal. If you find some interesting information that isn't on the worksheet, feel free to share it with your group!
Climate Consultant
Impact Consultant
Emission Consultant
Action Consultant
Step Three:
Wow! You are becoming global warming experts! After you have completed the research on your roles, it is time to combine your information. This is when working as a team is most important! As consultants for the President of the United States, you need to prepare a presentation that will inform all members at the conference about your findings. The presentation should be attractive, including:
• cover slide
• at least one slide that reflects each role
• at least one picture that supports each role
• your group's conclusion on this issue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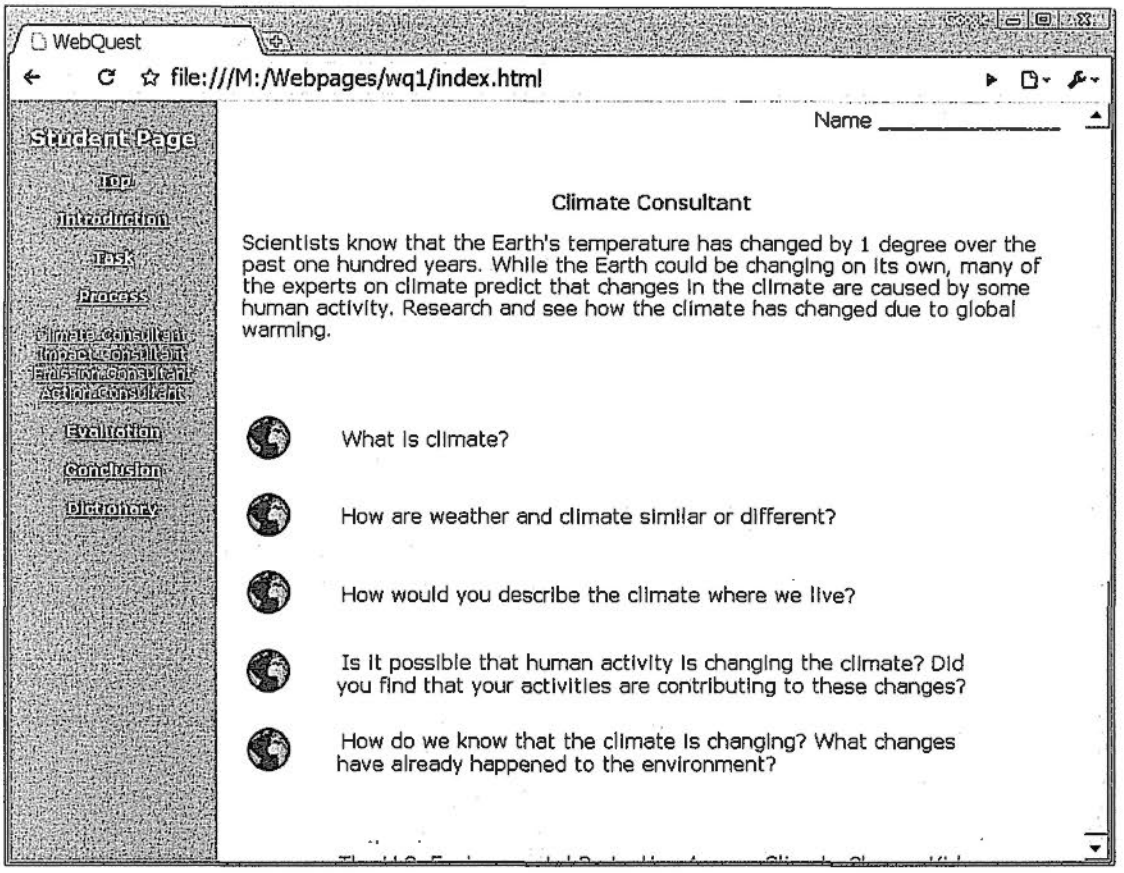
• your group's suggestions for improvement
• credits slide
For detailed expectations for the presentation, see evaluation page.
**Remember, creativity counts! Look through the Internet links provided for interesting pictures about your topic! Your presentation should be a unique project. Have fun!
Step Four:
With the PowerPoint document in hand, it is your turn to shine! Community leaders have been invited to our class. Each group should present their findings about global warming in an oral presentation that reflects preparation and teamwork. Each group should speak confidently about their research, and each member should participate equally. Take this opportunity to tell our class all about your group work and how we can work together to reduce global warming and its effects on the world.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What is climate?
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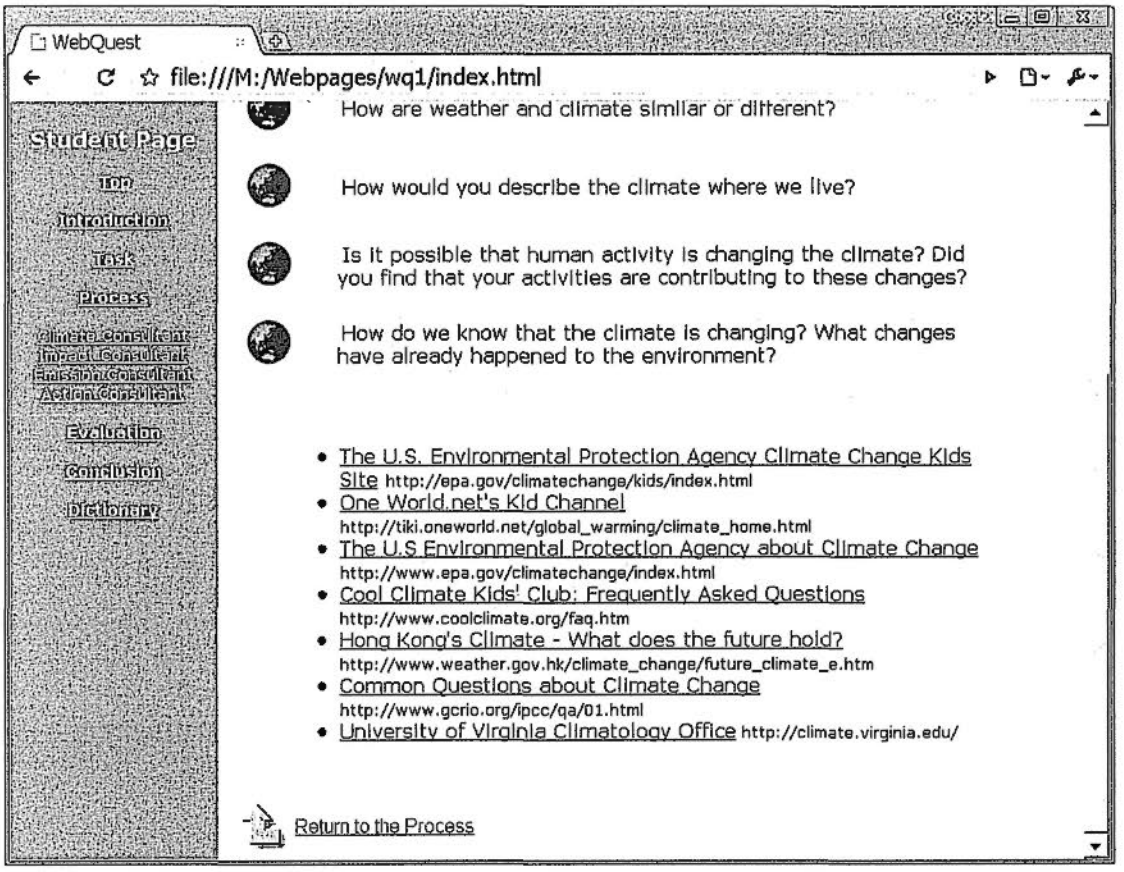
How would you describe the climate where we live?
Is it possible that human activity is changing the climate? Did you find that your activities are contributing to these changes?
How do we know that the climate is changing? What changes have already happened to the environment?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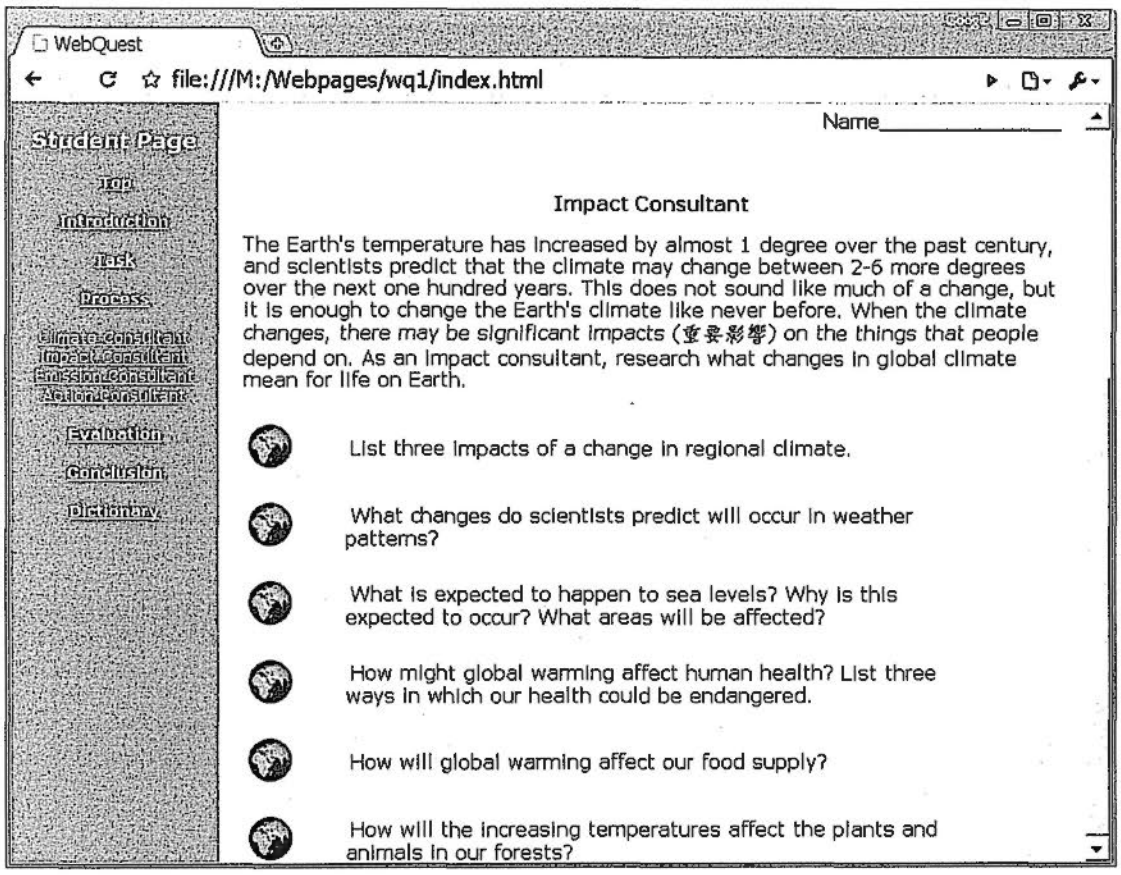
One World.net's Kid Channel http://tiki.oneworld.net/global_warming/climate_home.html
The U.S Environmental Protection Agency about Climate Change http://www.epa.gov/climatechange/index.html
Cool Climate Kids' Club: Frequently Asked Questions http://www.coolclimate.org/faq.htm
Hong Kong's Climate - What does the future hold? http://www.weather.gov.hk/climate_change/future_climate_e.htm
Common Questions about Climate Change http://www.gcrio.org/ipcc/qa/01.html
University of Virginia Climatology Office http://climate.virginia.edu/
Return to the Process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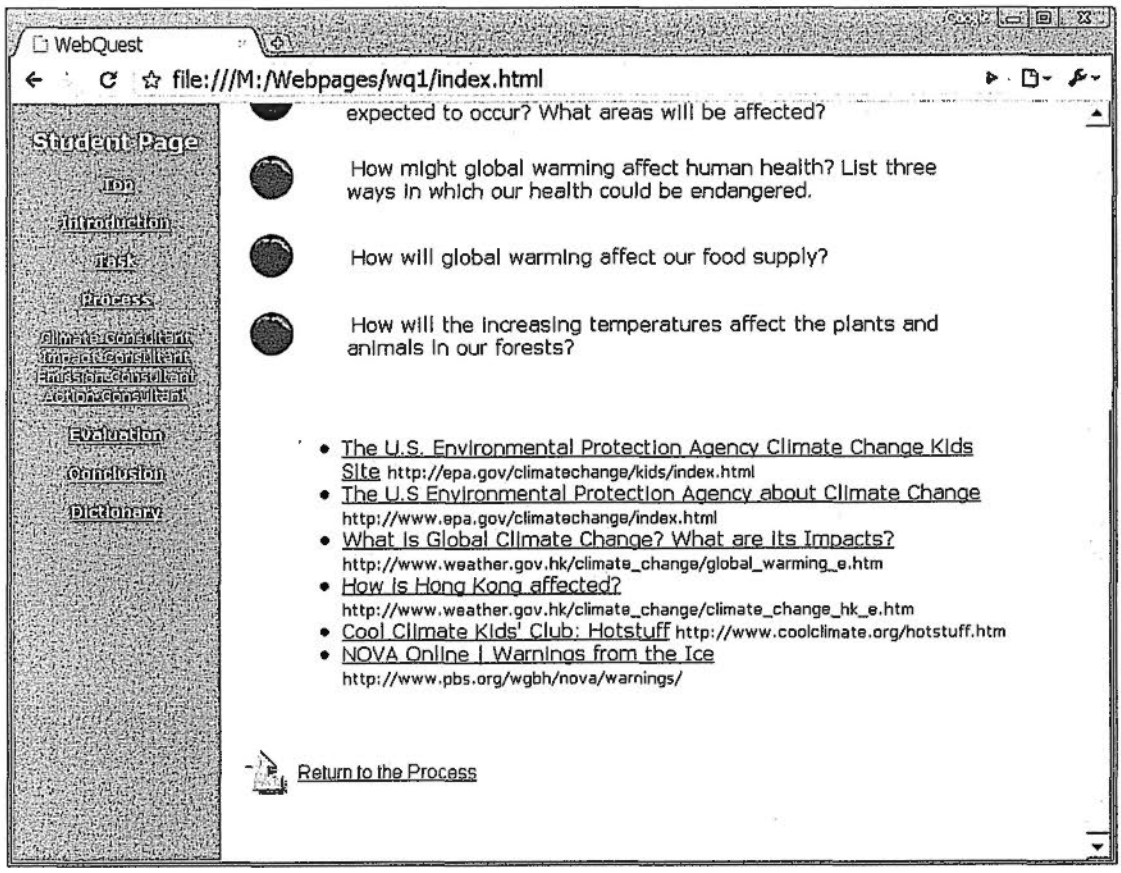
List three impacts of a change in regional climate.
What changes do scientists predict will occur in weather patterns?
What is expected to happen to sea levels? Why is this expected to occur? What areas will be affected?
How might global warming affect human health? List three ways in which our health could be endangered.
How will global warming affect our food supply?
How will the increasing temperatures affect the plants and animals in our forests?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expected to occur? What areas will be affected?
How might global warming affect human health? List three ways in which our health could be endangered.
How will global warming affect our food supply?
How will the increasing temperatures affect the plants and animals in our forests?
The U.S. Environmental Protection Agency Climate Change Kids Site http://epa.gov/climatechange/kids/index.html
The U.S Environmental Protection Agency about Climate Change http://www.epa.gov/climatechange/index.html
What is Global Climate Change? What are its Impacts? http://www.weather.gov.hk/climate_change/global_warming_e.htm
How is Hong Kong affected? http://www.weather.gov.hk/climate_change/climate_change_hk_e.htm
Cool Climate Kids' Club: Hotstuff http://www.coolclimate.org/hotstuff.htm
NOVA Online | Warnings from the Ice http://www.pbs.org/wgbh/nova/warnings/
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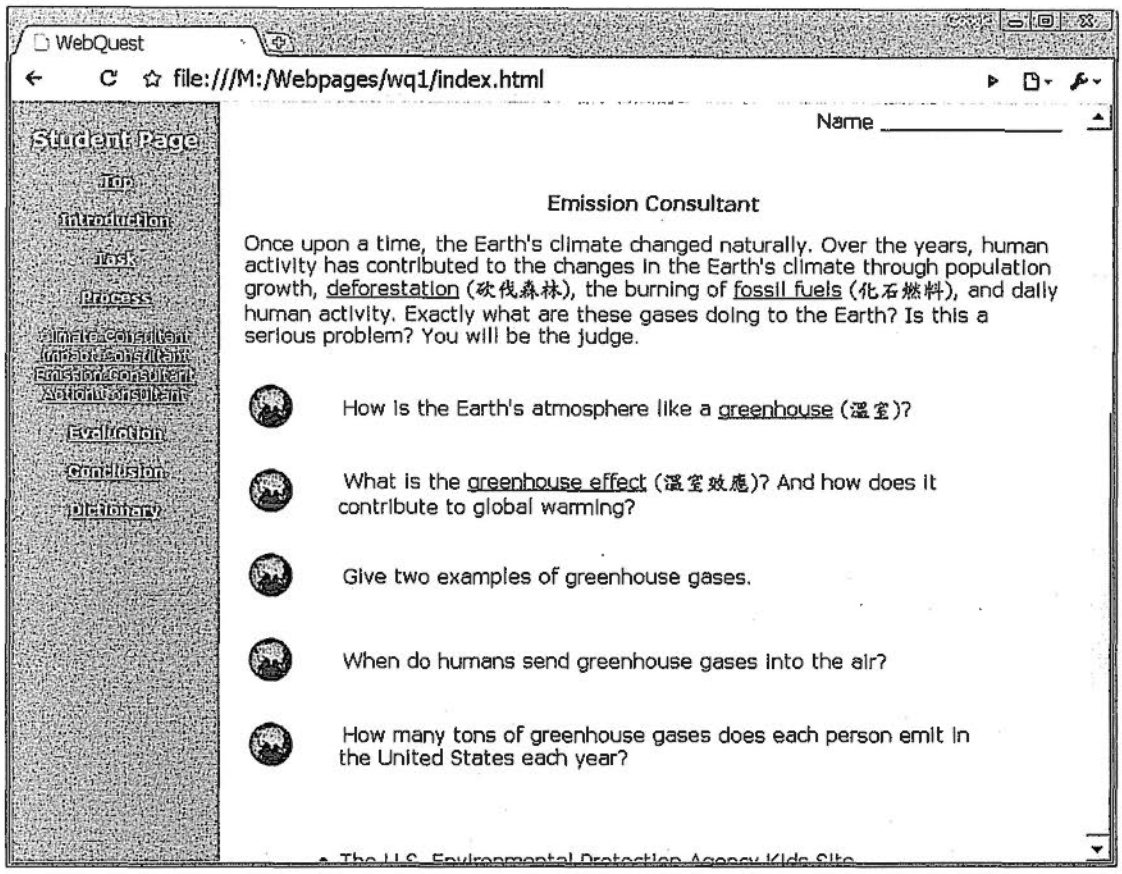
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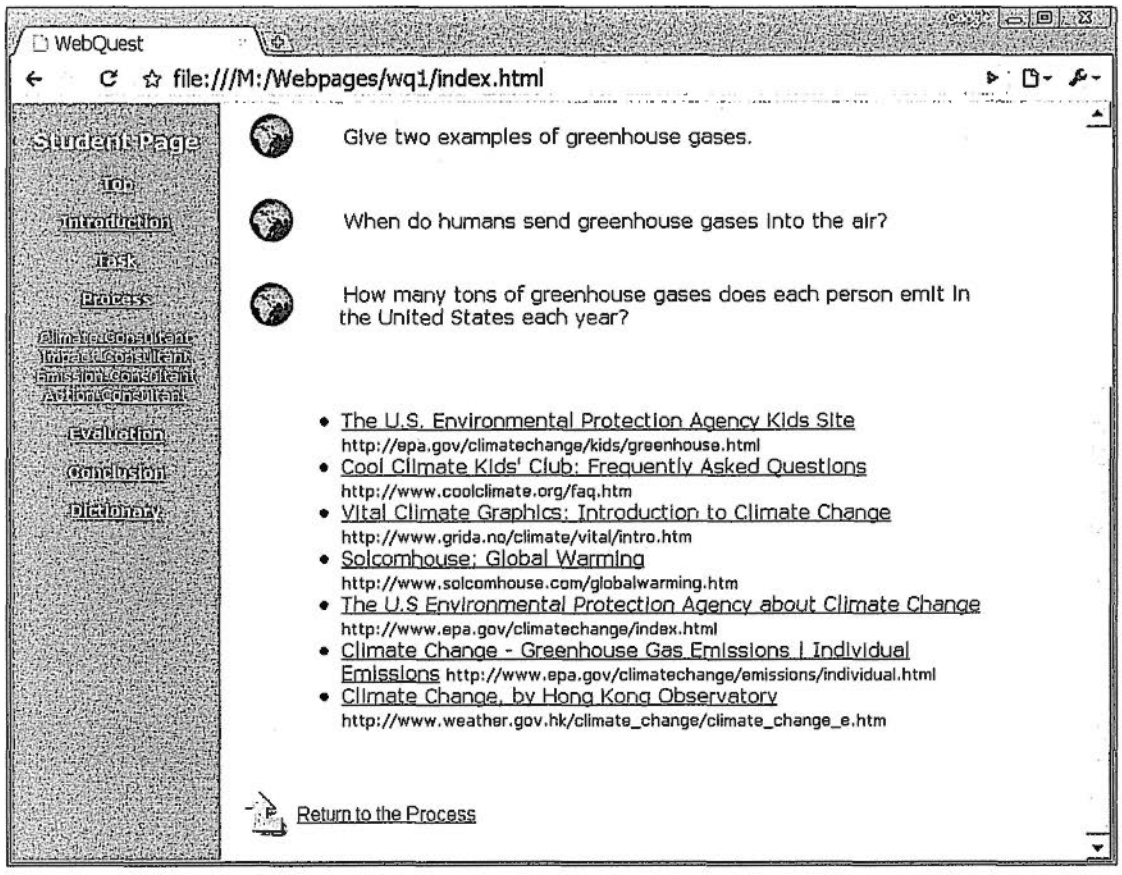
Once upon a time, the Earth's climate changed naturally. Over the years, human activity has contributed to the changes in the Earth's climate through population growth, deforestation (砍伐森林), the burning of fossil fuels (化石燃料), and daily human activity. Exactly what are these gases doing to the Earth? Is this a serious problem? You will be the judge.
How is the Earth's atmosphere like a greenhouse (溫室)?
What is the greenhouse effect (溫室效應)? And how does it contribute to global warming?
Give two examples of greenhouse gases.
When do humans send greenhouse gases into the air?
How many tons of greenhouse gases does each person emit in the United States each year?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When do humans send greenhouse gases into the air?
How many tons of greenhouse gases does each person emit in the United States each year?
The U.S. Environmental Protection Agency Kids Site
http://epa.gov/climatechange/kids/greenhouse.html
Cool Climate Kids' Club: Frequently Asked Questions
http://www.coolclimate.org/faq.htm
Vital Climate Graphics: Introduction to Climate Change
http://www.grida.no/climate/vital/intro.htm
Solcomhouse: Global Warming
http://www.solcomhouse.com/globalwarming.htm
The U.S Environmental Protection Agency about Climate Change
http://www.epa.gov/climatechange/index.html
Climate Change - Greenhouse Gas Emissions | Individual Emissions http://www.epa.gov/climatechange/emissions/individual.html
Climate Change, by Hong Kong Observatory
http://www.weather.gov.hk/climate_change/climate_change_e.htm
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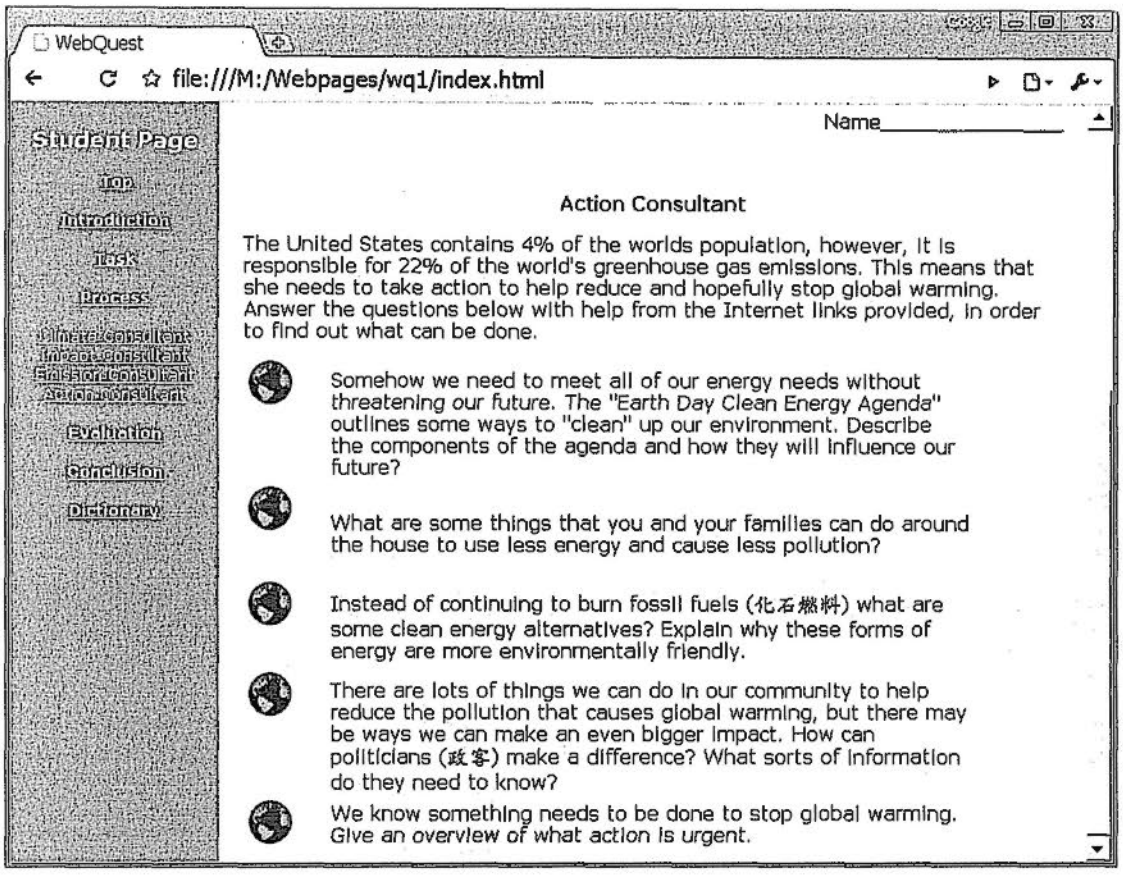
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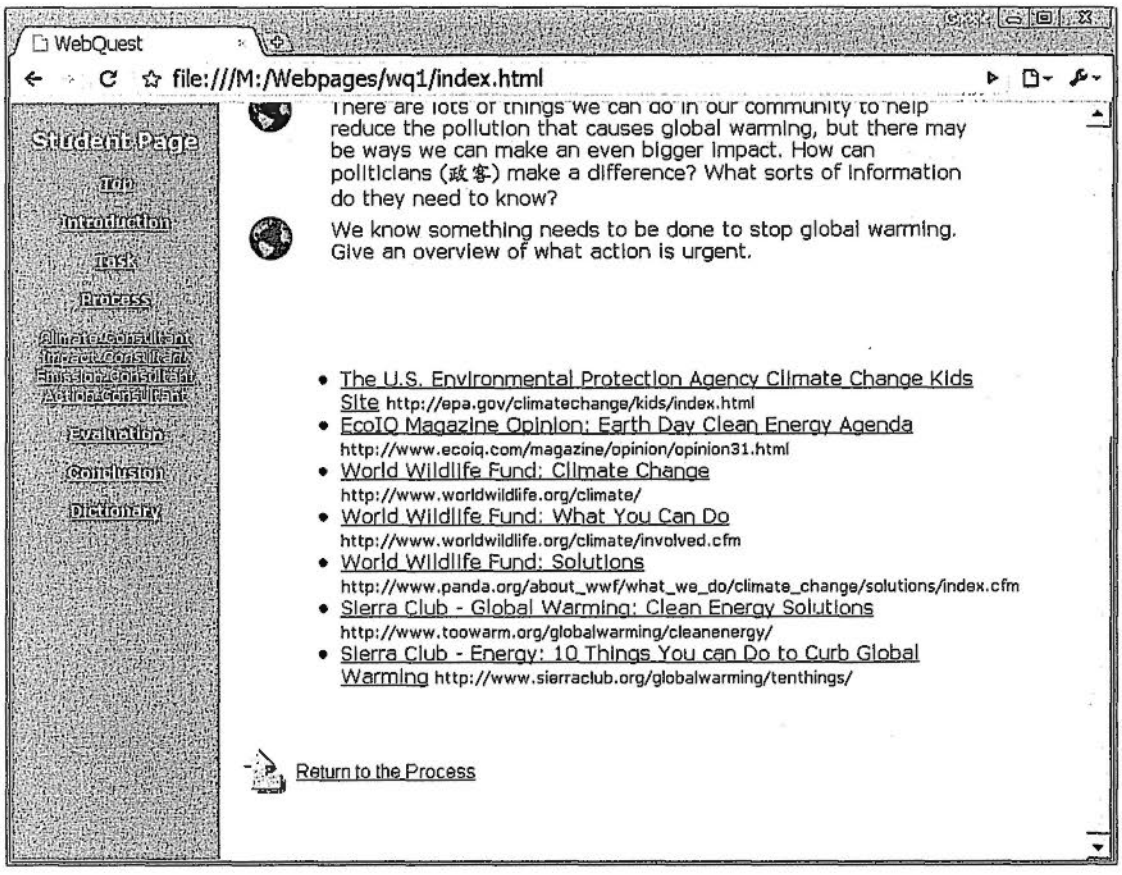
The United States contains 4% of the worlds population, however, it is responsible for 22% of the world's greenhouse gas emissions. This means that she needs to take action to help reduce and hopefully stop global warming. Answer the questions below with help from the Internet links provided, in order to find out what can be done.
Somehow we need to meet all of our energy needs without threatening our future. The "Earth Day Clean Energy Agenda" outlines some ways to "clean" up our environment. Describe the components of the agenda and how they will influence our future?
What are some things that you and your families can do around the house to use less energy and cause less pollution?
Instead of continuing to burn fossil fuels (化石燃料) what are some clean energy alternatives? Explain why these forms of energy are more environmentally friendly.
There are lots of things we can do in our community to help reduce the pollution that causes global warming, but there may be ways we can make an even bigger impact. How can politicians (政客) make a difference? What sorts of information do they need to know?
We know something needs to be done to stop global warming. Give an overview of what action is urgent.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EcoIQ Magazine Opinion: Earth Day Clean Energy Agenda http://www.ecoiq.com/magazine/opinion/opinion31.html
World Wildlife Fund: Climate Change http://www.worldwildlife.org/climate/
World Wildlife Fund: What You Can Do http://www.worldwildlife.org/climate/involved.cfm
World Wildlife Fund: Solutions http://www.panda.org/about_wwf/what_we_do/climate_change/solutions/index.cfm
Sierra Club - Global Warming: Clean Energy Solutions http://www.toowarm.org/globalwarming/cleanenergy/
Sierra Club - Energy: 10 Things You can Do to Curb Global Warming http://www.sierraclub.org/globalwarming/tenthings/
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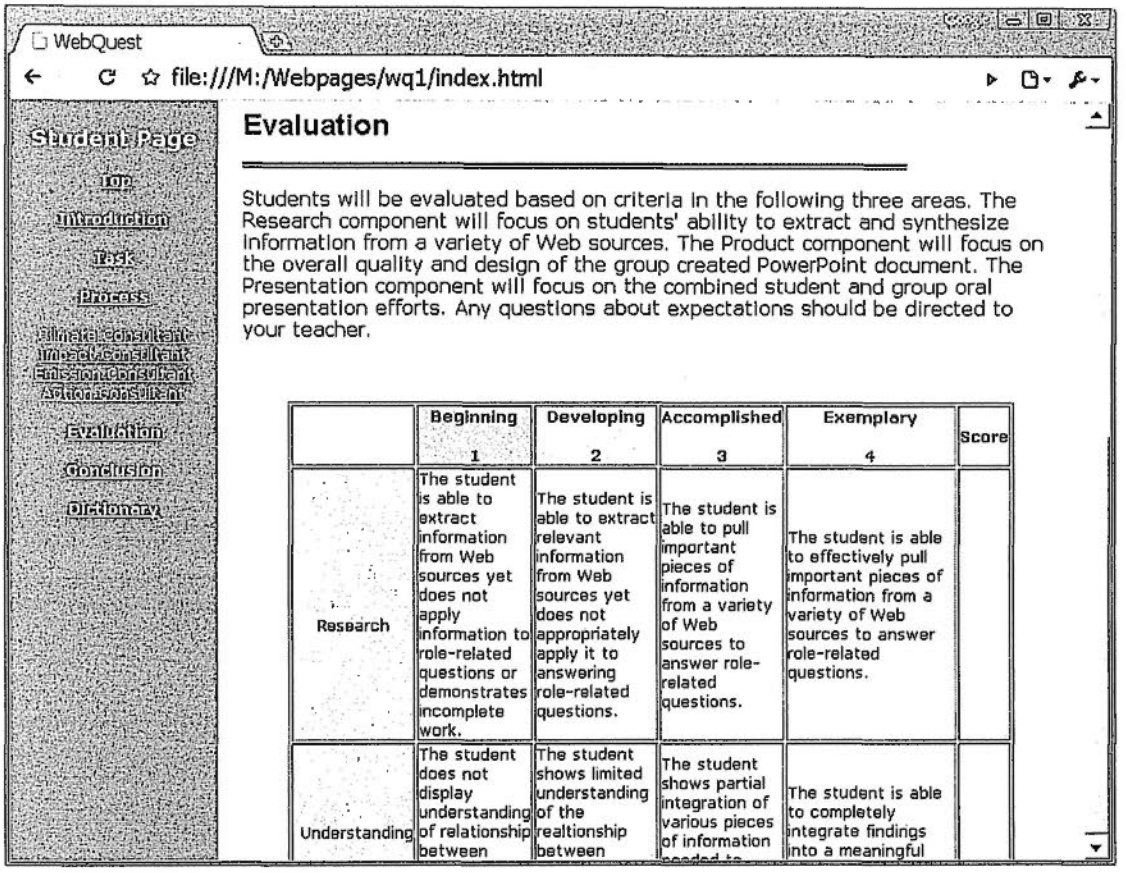
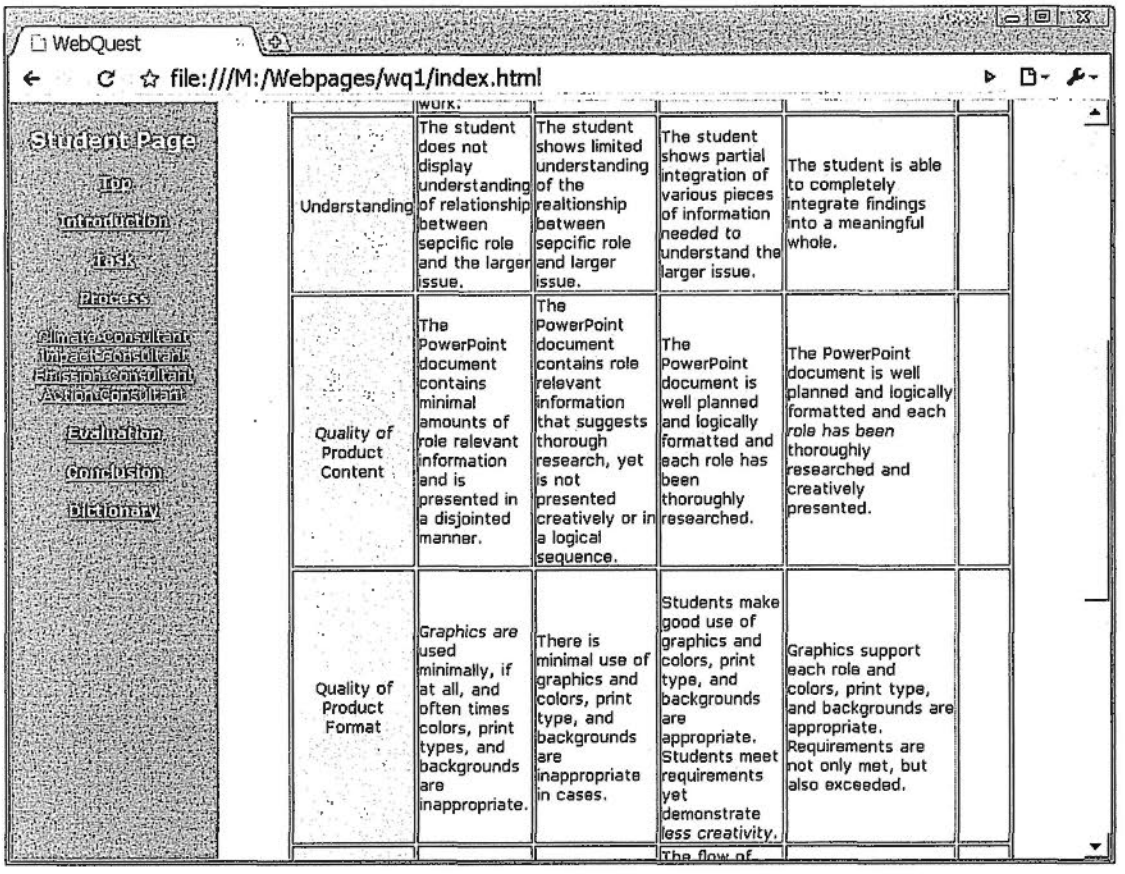


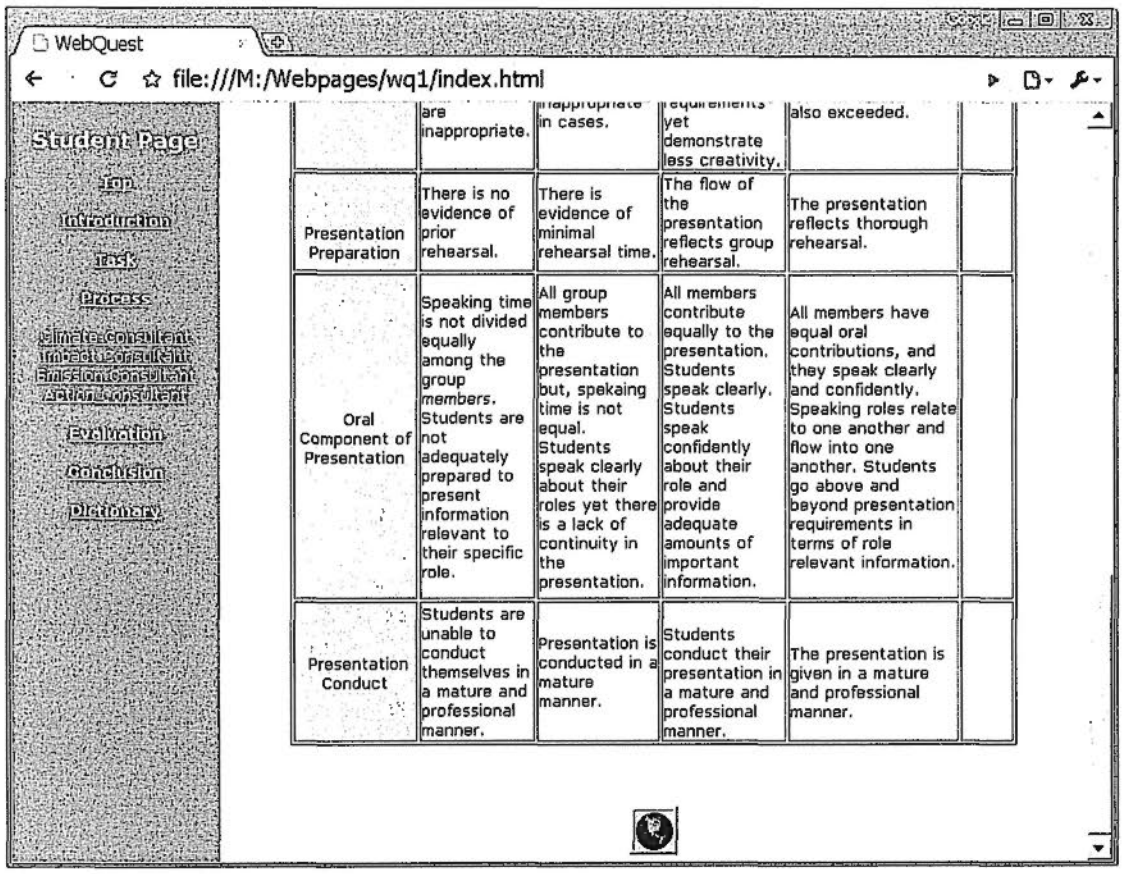
Evaluation

Students will be evaluated based on criteria in the following three areas. The Research component will focus on students' ability to extract and synthesize information from a variety of Web sources. The Product component will focus on the overall quality and design of the group created PowerPoint document. The Presentation component will focus on the combined student and group oral presentation efforts. Any questions about expectations should be directed to your teacher.

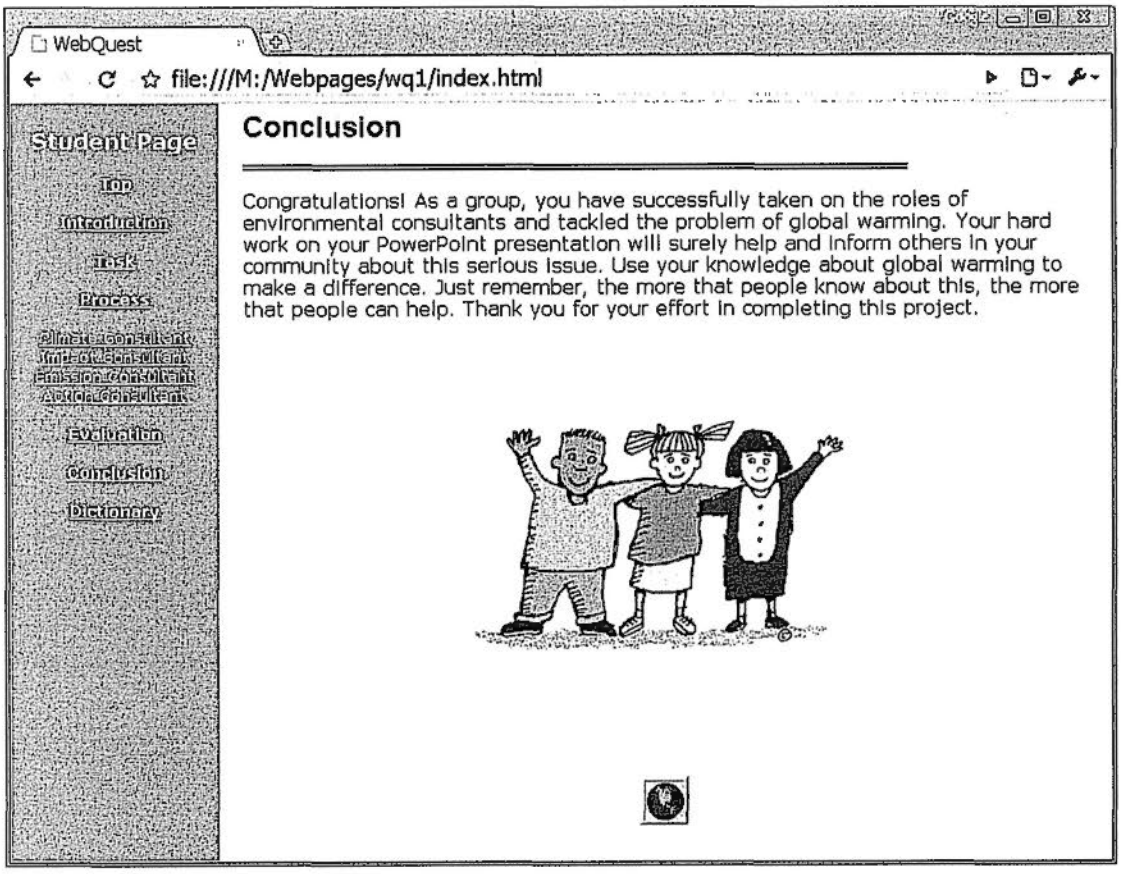
	Beginning 1	Developing 2	Accomplished 3	Exemplary 4	Score
Research	The student is able to extract information from Web sources yet does not apply information to role-related questions or demonstrates incomplete work.	The student is able to extract relevant information from Web sources yet does not appropriately apply it to answering role-related questions.	The student is able to pull important pieces of information from a variety of Web sources to answer role-related questions.	The student is able to effectively pull important pieces of information from a variety of Web sources to answer role-related questions.	
Understanding	The student does not display understanding of relationship between	The student shows limited understanding of the realtionship between	The student shows partial integration of various pieces of information	The student is able to completely integrate findings into a meaningful	



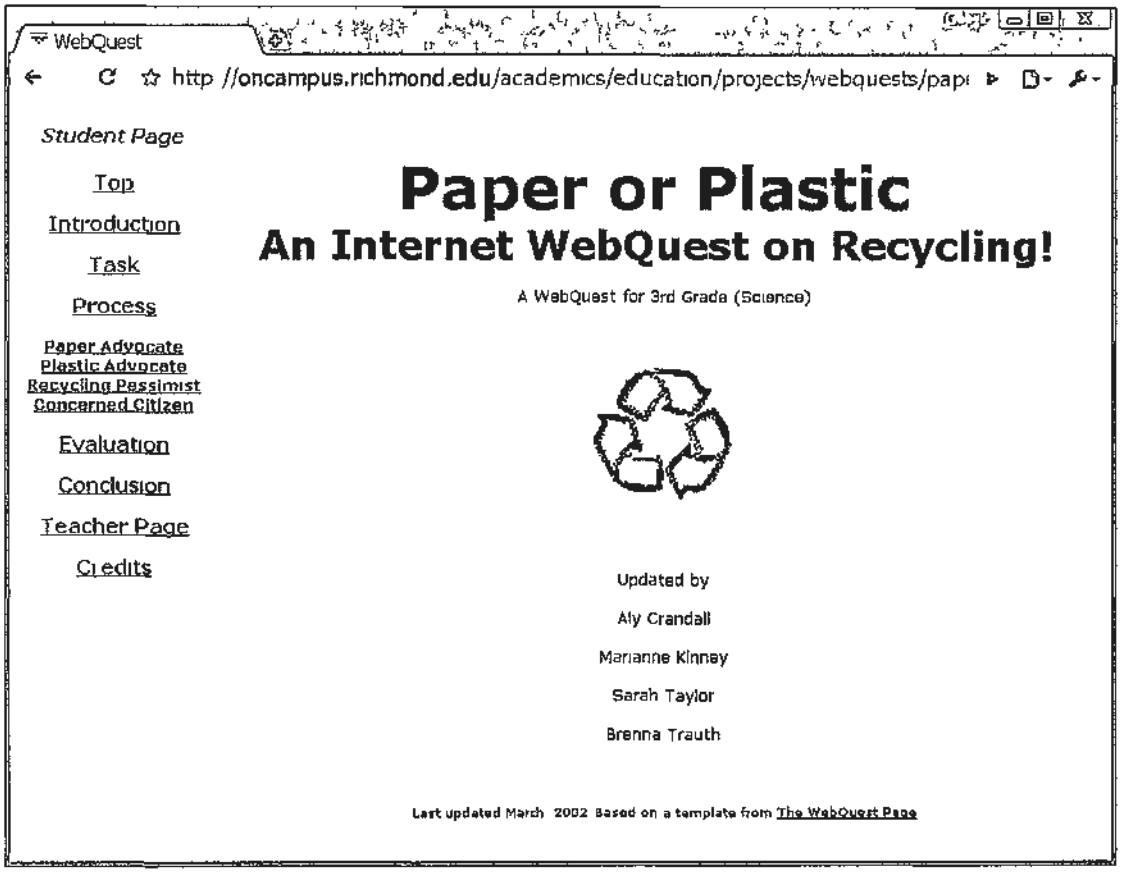
	work.				
Understanding	The student does not display understanding of relationship between sepcific role and the larger issue.	The student shows limited understanding of the realtionship between sepcific role and larger issue.	The student shows partial integration of various pieces of information needed to understand the larger issue.	The student is able to completely integrate findings into a meaningful whole.	
Quality of Product Content	The PowerPoint document contains minimal amounts of role relevant information and is presented in a disjointed manner.	The PowerPoint document contains role relevant information that suggests thorough research, yet is not presented creatively or in a logical sequence.	The PowerPoint document is well planned and logically formatted and each role has been thoroughly researched.	The PowerPoint document is well planned and logically formatted and each role has been thoroughly researched and creatively presented.	
Quality of Product Format	Graphics are used minimally, if at all, and often times colors, print types, and backgrounds are inappropriate.	There is minimal use of graphics and colors, print type, and backgrounds are inappropriate in cases.	Students make good use of graphics and colors, print type, and backgrounds are appropriate. Students meet requirements yet demonstrate less creativity.	Graphics support each role and colors, print type, and backgrounds are appropriate. Requirements are not only met, but also exceeded.	
			The flow of		

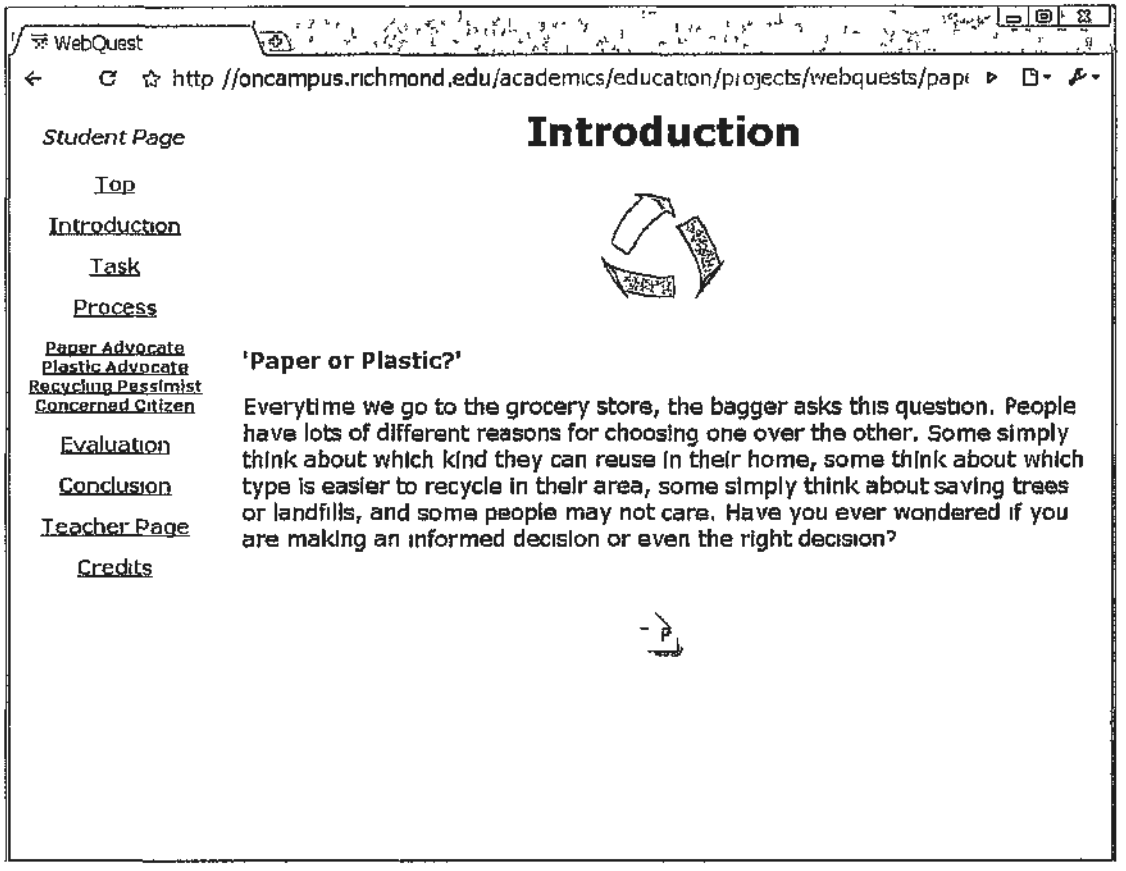


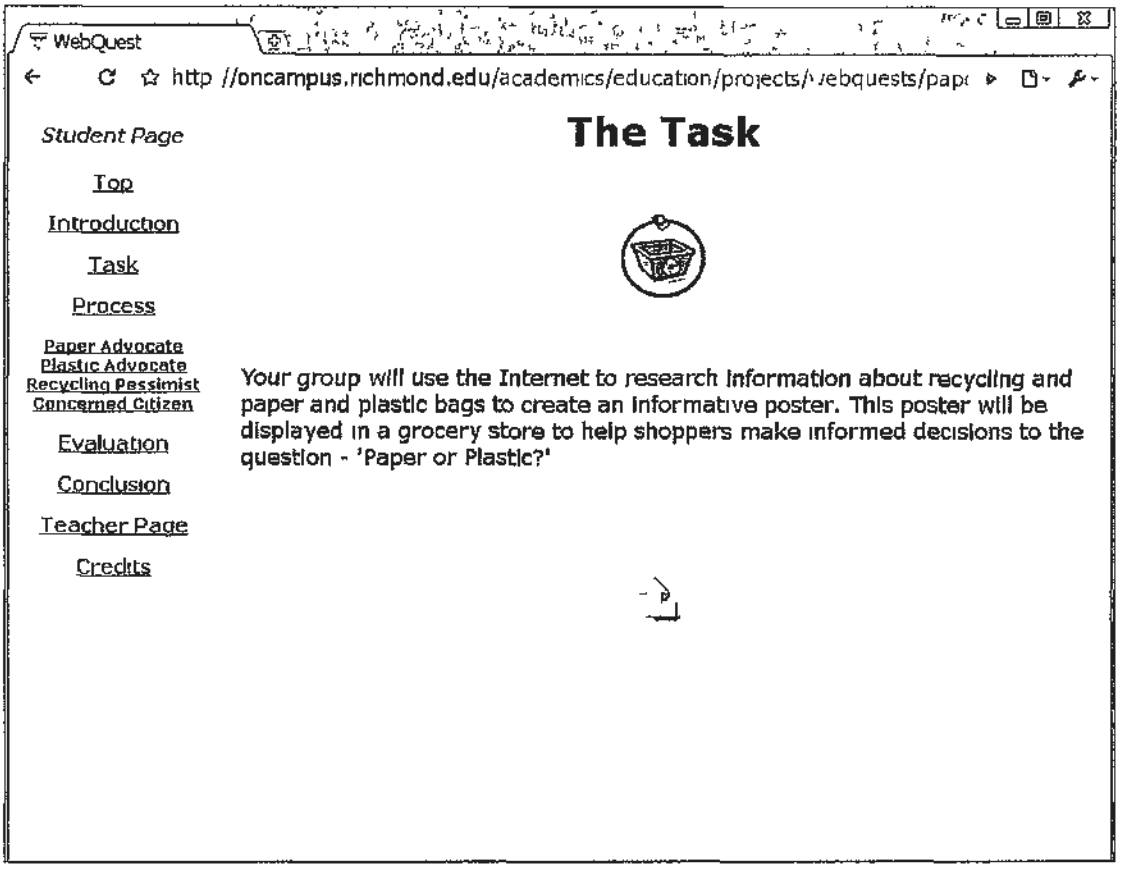
	are inappropriate.	in cases.	yet demonstrate less creativity.	also exceeded.	
Presentation Preparation	There is no evidence of prior rehearsal.	There is evidence of minimal rehearsal time.	The flow of the presentation reflects group rehearsal.	The presentation reflects thorough rehearsal.	
Oral Component of Presentation	Speaking time is not divided equally among the group members. Students are not adequately prepared to present information relevant to their specific role.	All group members contribute to the presentation but, spekaing time is not equal. Students speak clearly about their roles yet there is a lack of continuity in the presentation.	All members contribute equally to the presentation. Students speak clearly. Students speak confidently about their role and provide adequate amounts of important information.	All members have equal oral contributions, and they speak clearly and confidently. Speaking roles relate to one another and flow into one another. Students go above and beyond presentation requirements in terms of role relevant information.	
Presentation Conduct	Students are unable to conduct themselves in a mature and professional manner.	Presentation is conducted in a mature manner.	Students conduct their presentation in a mature and professional manner.	The presentation is given in a mature and professional manner.	



Appendix 5: Screenshots of the Original WebQuest (*WQ2* before Adaptation)



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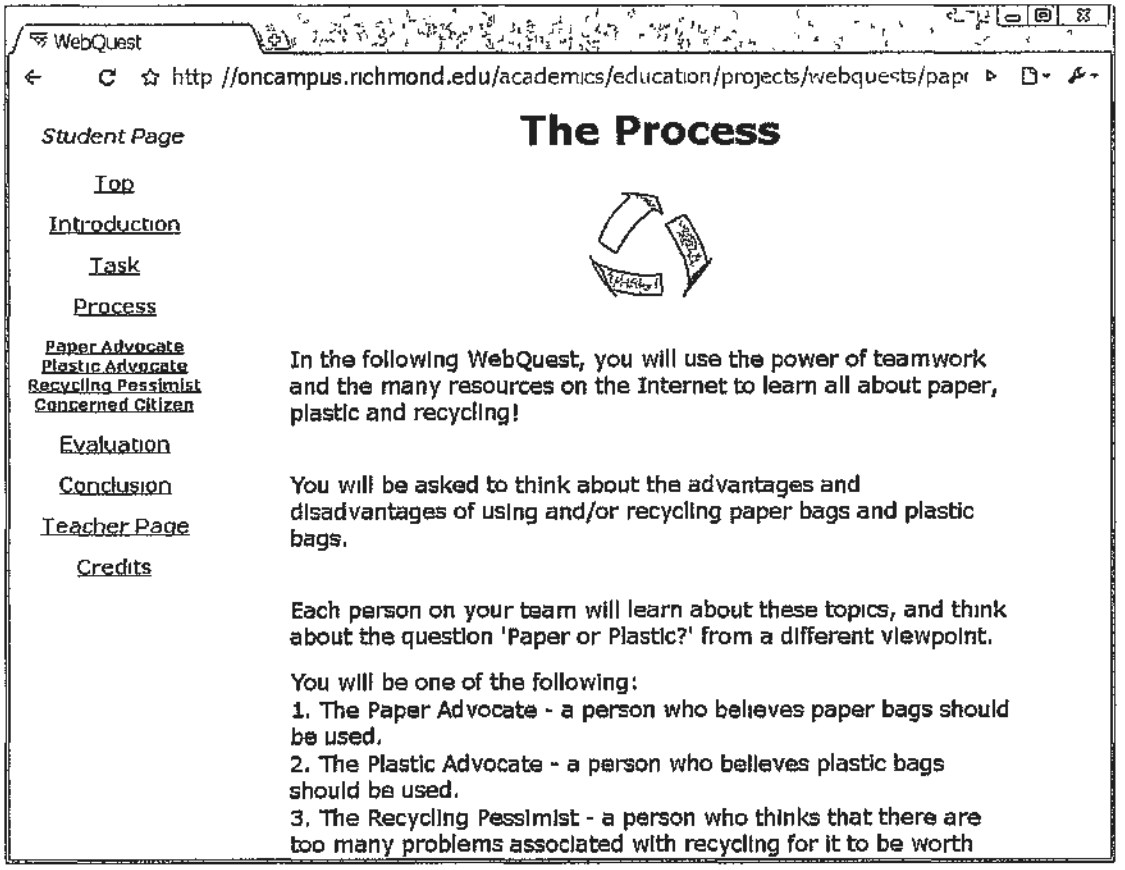
The Task
Your group will use the Internet to research information about recycling and paper and plastic bags to create an informative poster. This poster will be displayed in a grocery store to help shoppers make informed decisions to the question - 'Paper or Plastic?'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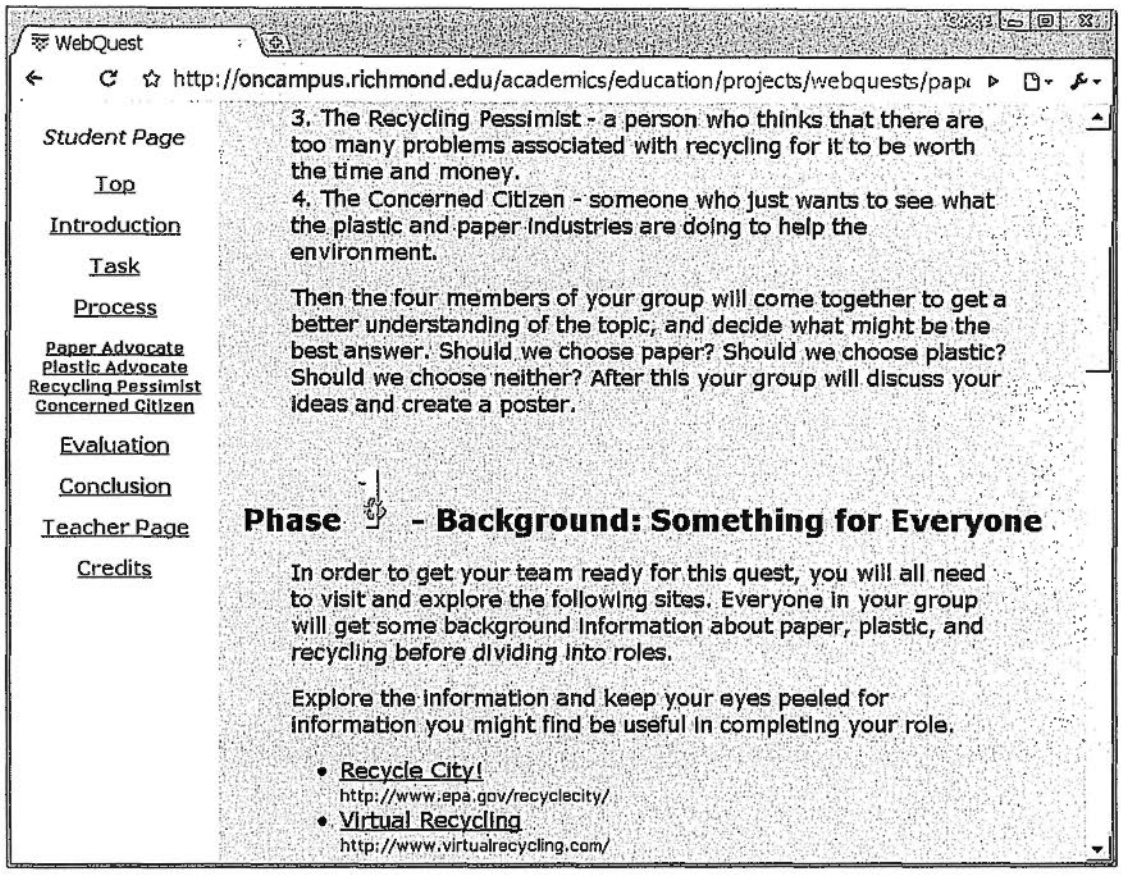
The Process
In the following WebQuest, you will use the power of teamwork and the many resources on the Internet to learn all about paper, plastic and recycling!
You will be asked to think about the advantages and disadvantages of using and/or recycling paper bags and plastic bags.
Each person on your team will learn about these topics, and think about the question 'Paper or Plastic?' from a different viewpoint.
You will be one of the following:
1. The Paper Advocate - a person who believes paper bags should be used.
2. The Plastic Advocate - a person who believes plastic bags should be used.
3. The Recycling Pessimist - a person who thinks that there are too many problems associated with recycling for it to be worth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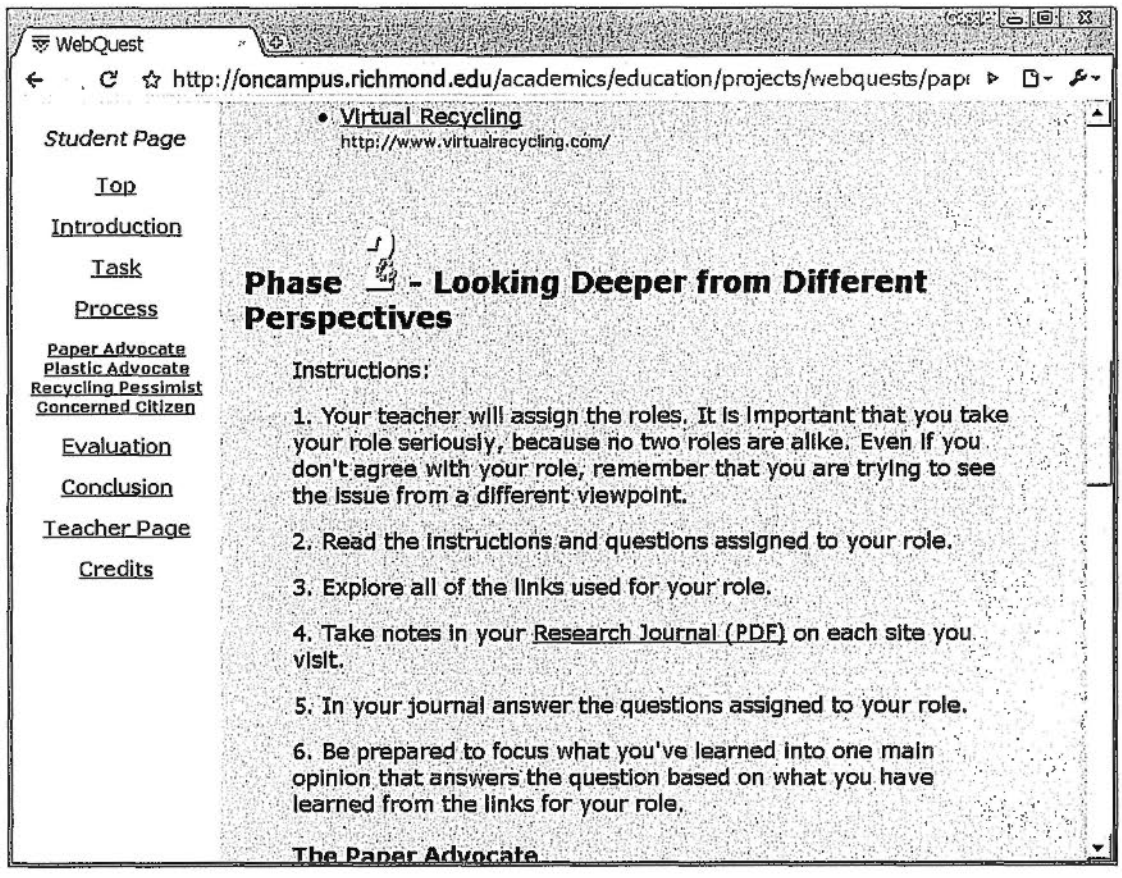
3. The Recycling Pessimist - a person who thinks that there are too many problems associated with recycling for it to be worth the time and money.
4. The Concerned Citizen - someone who just wants to see what the plastic and paper industries are doing to help the environment.
Then the four members of your group will come together to get a better understanding of the topic, and decide what might be the best answer. Should we choose paper? Should we choose plastic? Should we choose neither? After this your group will discuss your ideas and create a poster.
Phase 1 - Background: Something for Everyone
In order to get your team ready for this quest, you will all need to visit and explore the following sites. Everyone in your group will get some background information about paper, plastic, and recycling before dividing into roles.
Explore the information and keep your eyes peeled for information you might find be useful in completing your role.
Recycle City!
http://www.epa.gov/recyclecity/
Virtual Recycling
http://www.virtualrecycling.com/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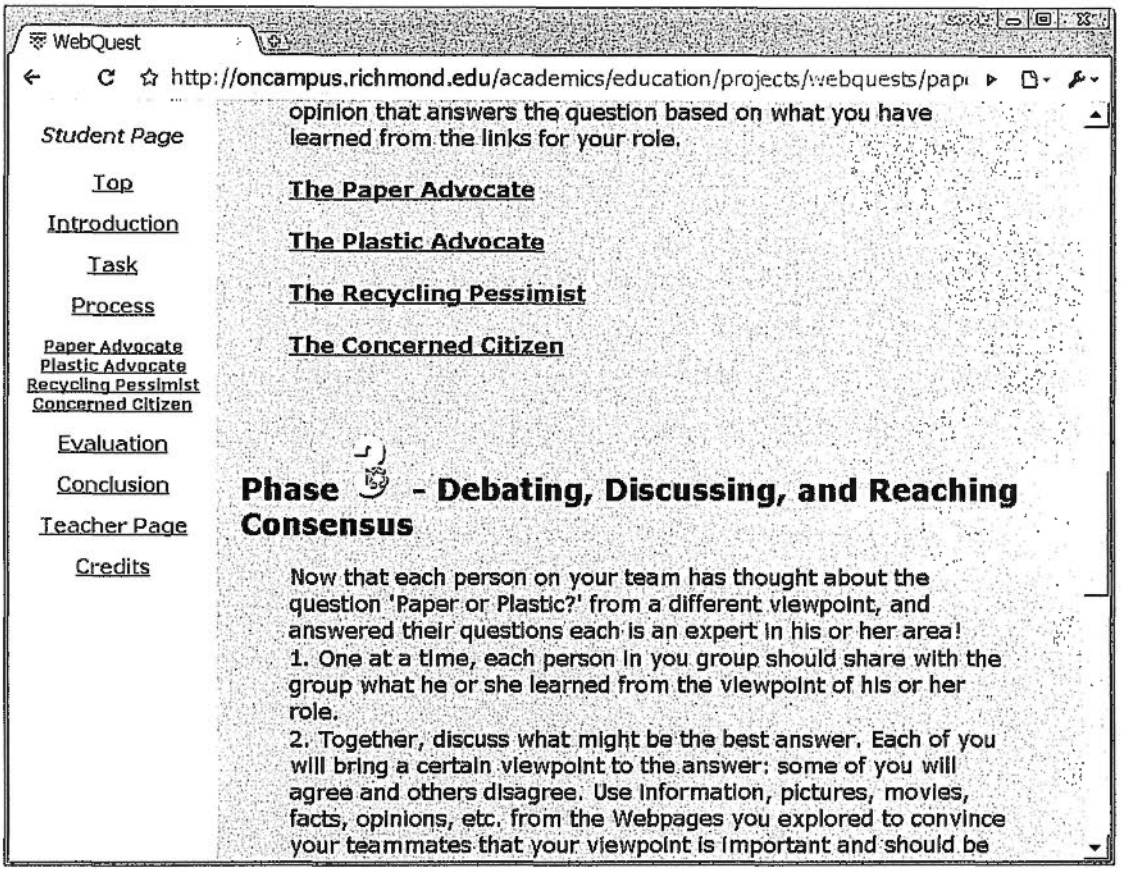
Virtual Recycling
http://www.virtualrecycling.com/
Phase 2 - Looking Deeper from Different Perspectives
Instructions:
1. Your teacher will assign the roles. It is important that you take your role seriously, because no two roles are alike. Even if you don't agree with your role, remember that you are trying to see the issue from a different viewpoint.
2. Read the instructions and questions assigned to your role.
3. Explore all of the links used for your role.
4. Take notes in your Research Journal (PDF) on each site you visit.
5. In your journal answer the questions assigned to your role.
6. Be prepared to focus what you've learned into one main opinion that answers the question based on what you have learned from the links for your role.
The Paper Advocate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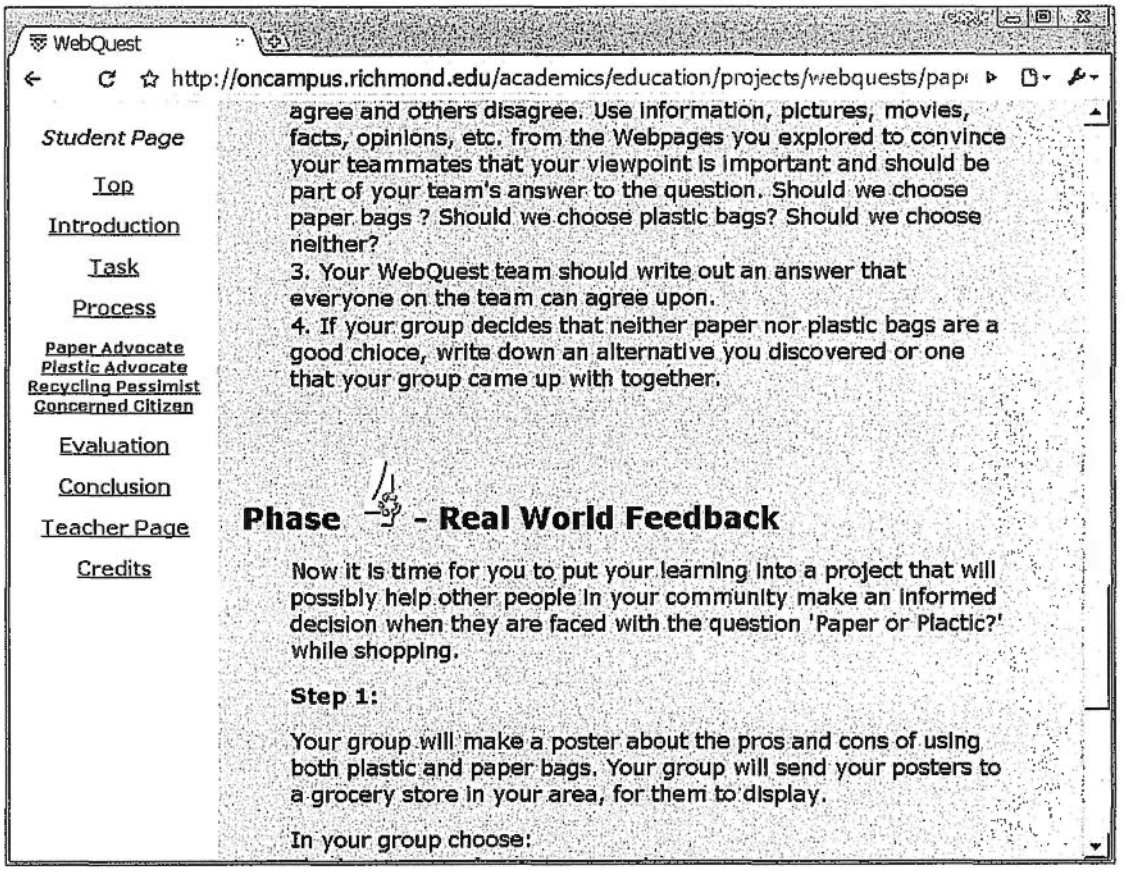
opinion that answers the question based on what you have learned from the links for your role.
The Paper Advocate
The Plastic Advocate
The Recycling Pessimist
The Concerned Citizen
Phase - Debating, Discussing, and Reaching Consensus
Now that each person on your team has thought about the question 'Paper or Plastic?' from a different viewpoint, and answered their questions each is an expert in his or her area!
1. One at a time, each person in you group should share with the group what he or she learned from the viewpoint of his or her role.
2. Together, discuss what might be the best answer. Each of you will bring a certain viewpoint to the answer: some of you will agree and others disagree. Use information, pictures, movies, facts, opinions, etc. from the Webpages you explored to convince your teammates that your viewpoint is important and should be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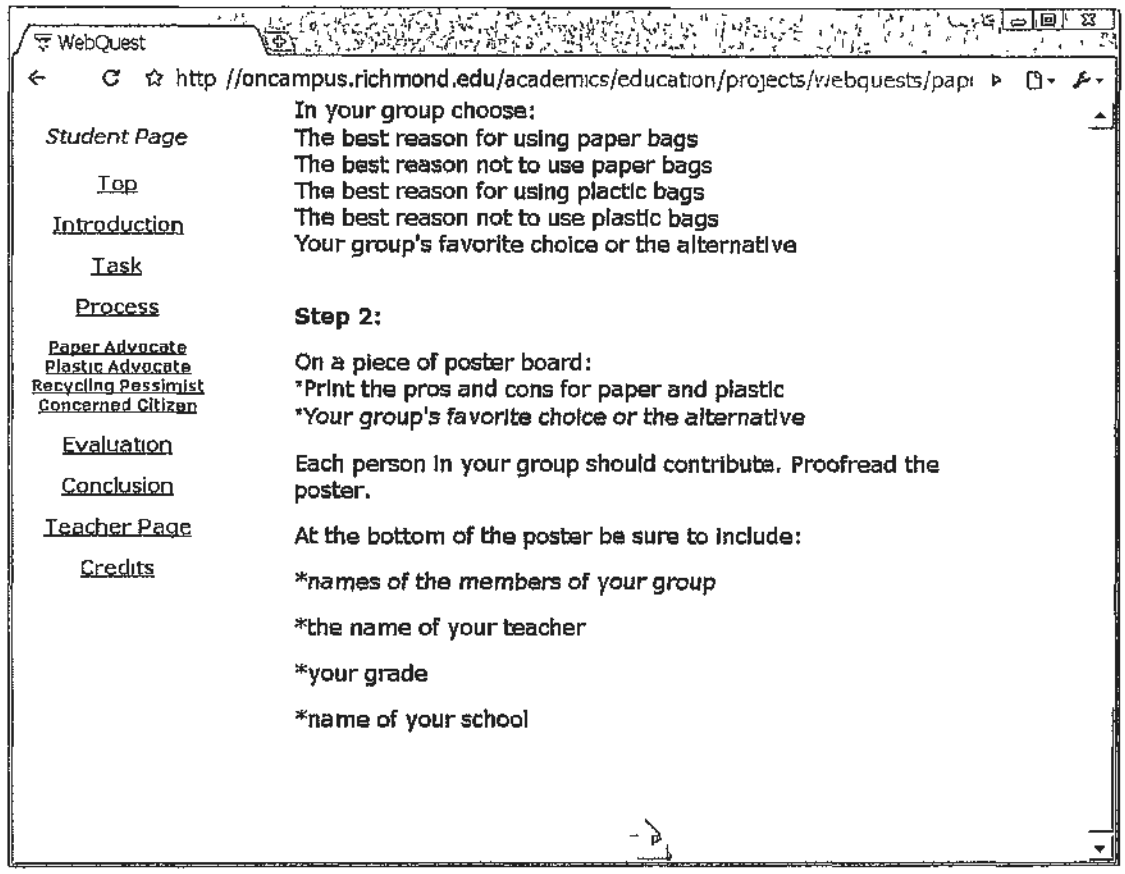
agree and others disagree. Use information, pictures, movies, facts, opinions, etc. from the Webpages you explored to convince your teammates that your viewpoint is important and should be part of your team's answer to the question. Should we choose paper bags ? Should we choose plastic bags? Should we choose neither?
3. Your WebQuest team should write out an answer that everyone on the team can agree upon.
4. If your group decides that neither paper nor plastic bags are a good chioce, write down an alternative you discovered or one that your group came up with together.
Phase - Real World Feedback
Now it is time for you to put your learning into a project that will possibly help other people in your community make an informed decision when they are faced with the question 'Paper or Plastic?' while shopping.
Step 1:
Your group will make a poster about the pros and cons of using both plastic and paper bags. Your group will send your posters to a grocery store in your area, for them to display.
In your group choose: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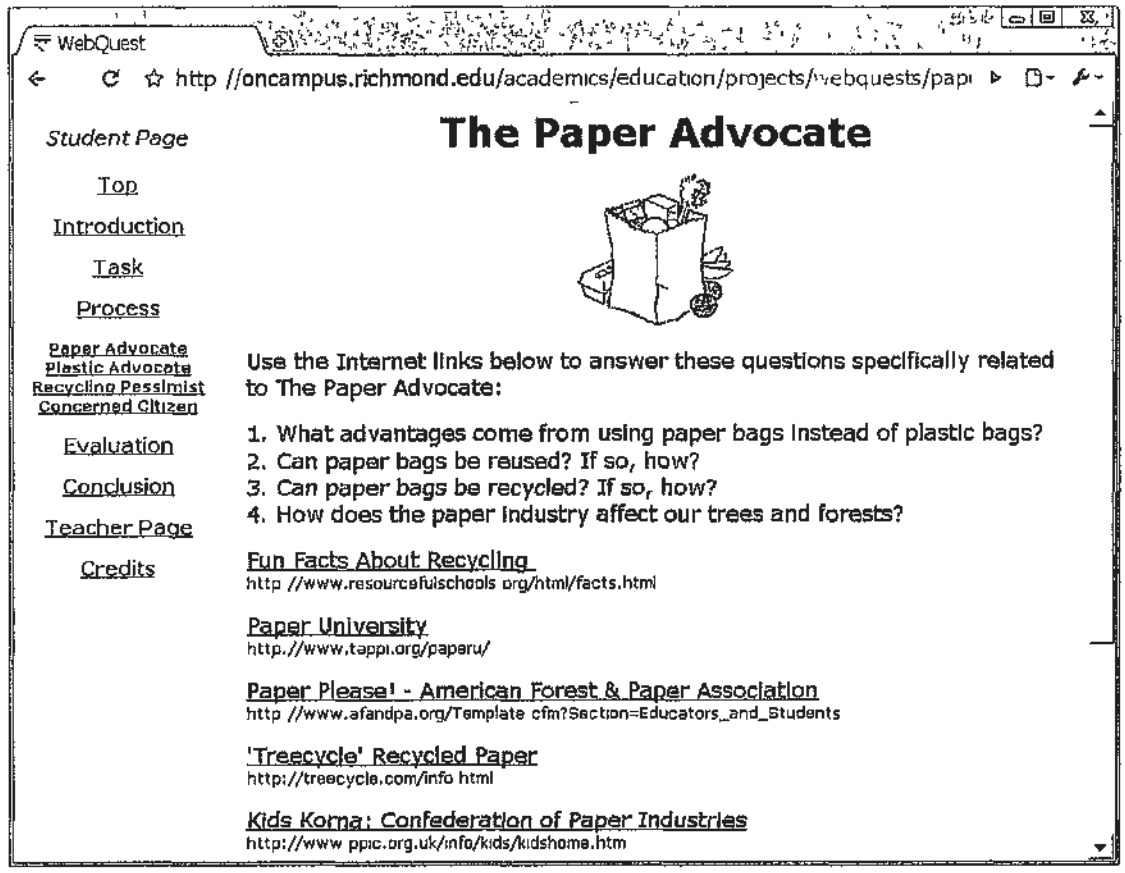
In your group choose:
The best reason for using paper bags
The best reason not to use paper bags
The best reason for using plactic bags
The best reason not to use plastic bags
Your group's favorite choice or the alternative
Step 2:
On a piece of poster board:
*Print the pros and cons for paper and plastic
*Your group's favorite choice or the alternative
Each person in your group should contribute. Proofread the poster.
At the bottom of the poster be sure to include:
*names of the members of your group
*the name of your teacher
*your grade
*name of your school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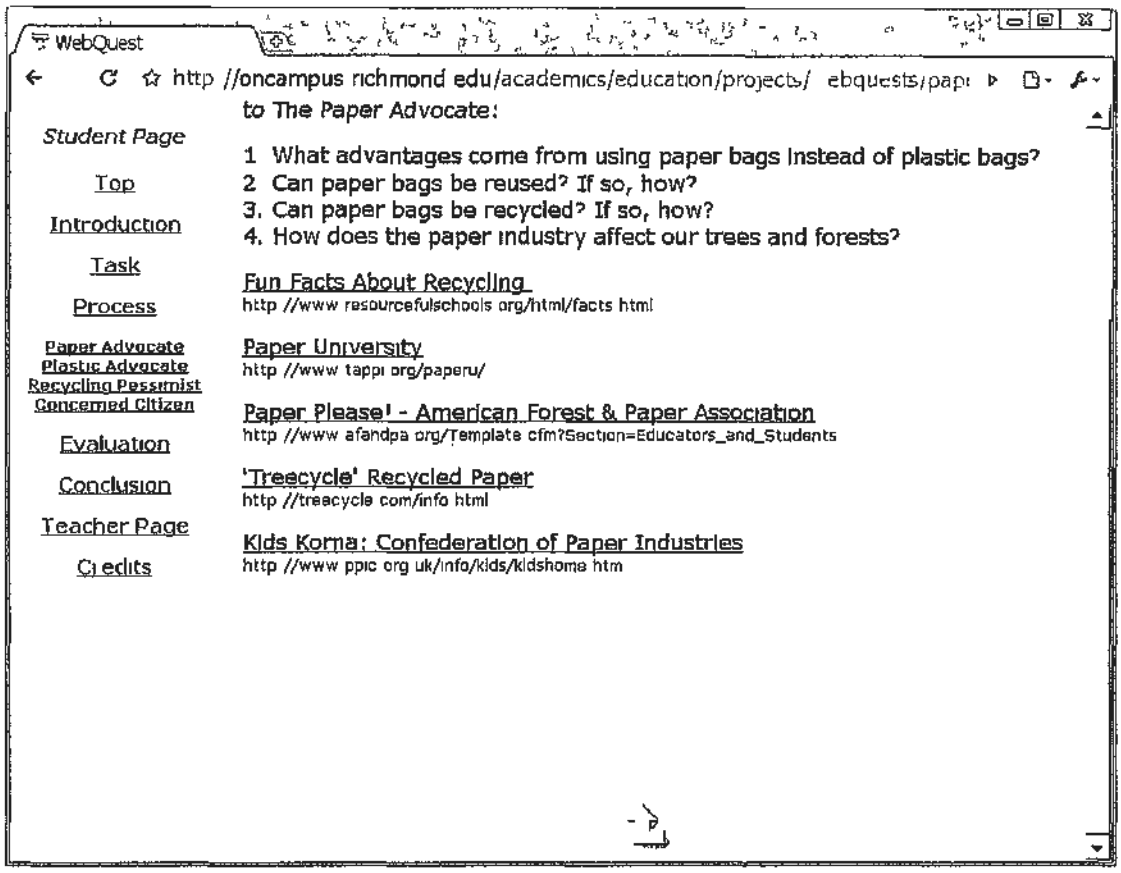
The Paper Advocate
Use the Internet links below to answer these questions specifically related to The Paper Advocate:
1. What advantages come from using paper bags instead of plastic bags?
2. Can paper bags be reused? If so, how?
3. Can paper bags be recycled? If so, how?
4. How does the paper industry affect our trees and forests?
Fun Facts About Recycling
http //www.resourcefulschools org/html/facts.html
Paper University
http.//www.tappi.org/paperu/
Paper Please! - American Forest & Paper Association
http //www.afandpa.org/Template cfm?Section=Educators_and_Students
'Treecycle' Recycled Paper
http://treecycle.com/info html
Kids Korna: Confederation of Paper Industries
http://www ppic.org.uk/info/kids/kidshome.htm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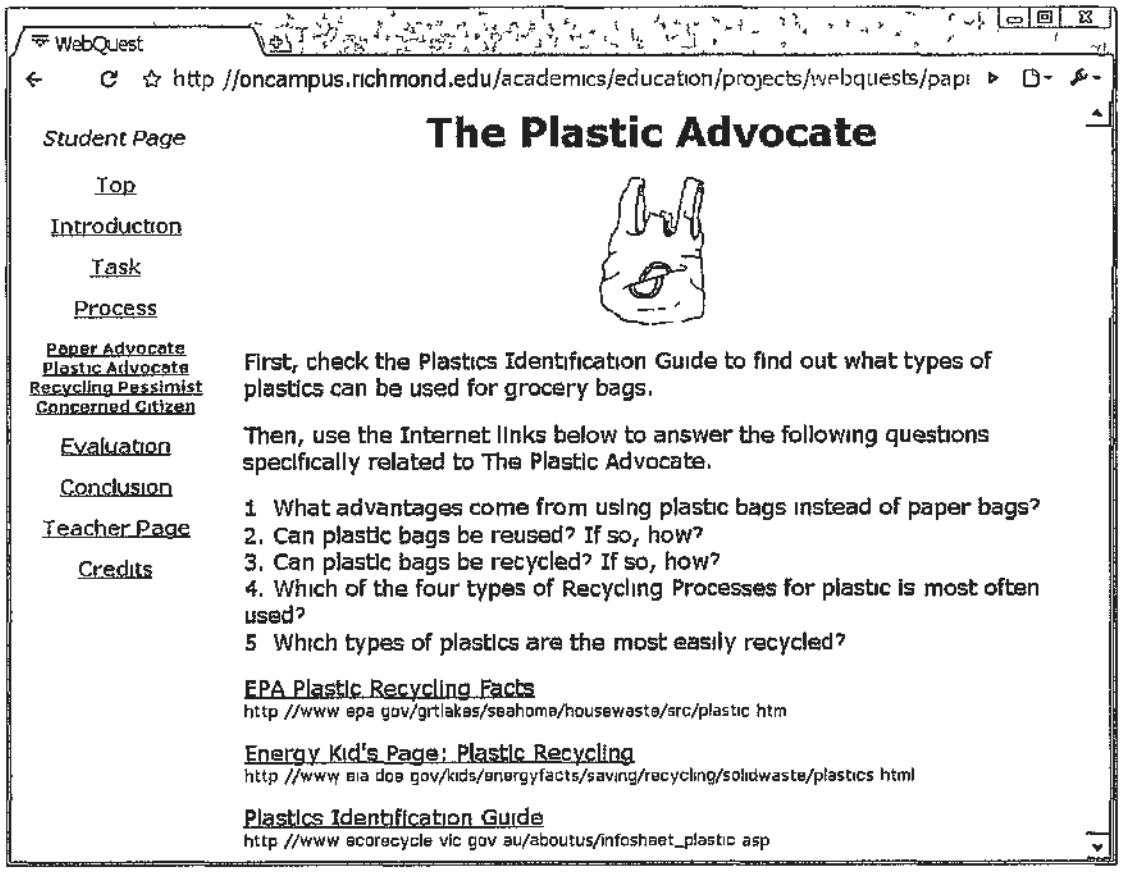
1 What advantages come from using paper bags instead of plastic bags?
2 Can paper bags be reused? If so, how?
3. Can paper bags be recycled? If so, how?
4. How does the paper industry affect our trees and forests?
Fun Facts About Recycling
http //www resourcefulschools org/html/facts html
Paper University
http //www tappi org/paperu/
Paper Please! - American Forest & Paper Association
http //www afandpa org/Template cfm?Section=Educators_and_Students
'Treecycle' Recycled Paper
http //treecycle com/info html
Kids Korna: Confederation of Paper Industries
http //www ppic org uk/info/kids/kidshome htm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The Plastic Advocate
First, check the Plastics Identification Guide to find out what types of plastics can be used for grocery bags.
Then, use the Internet links below to answer the following questions specifically related to The Plastic Advocate.
1 What advantages come from using plastic bags instead of paper bags?
2. Can plastic bags be reused? If so, how?
3. Can plastic bags be recycled? If so, how?
4. Which of the four types of Recycling Processes for plastic is most often used?
5 Which types of plastics are the most easily recycled?
EPA Plastic Recycling Facts
http //www epa gov/grtlakes/seahome/housewaste/src/plastic htm
Energy Kid's Page: Plastic Recycling
http //www eia doe gov/kids/energyfacts/saving/recycling/solidwaste/plastics html
Plastics Identification Guide
http //www ecorecycle vic gov au/aboutus/infosheet_plastic asp

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http //oncampus.richmond.edu/academics/education/projects/webquests/pape

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plastics can be used for grocery bags.

Then, use the Internet links below to answer the following questions specifically related to The Plastic Advocate.

1. What advantages come from using plastic bags instead of paper bags?
2. Can plastic bags be reused? If so, how?
3. Can plastic bags be recycled? If so, how?
4. Which of the four types of Recycling Processes for plastic is most often used?
5. Which types of plastics are the most easily recycled?

EPA Plastic Recycling Facts
http //www epa gov/grtlakes/seahome/housewaste/src/plastic htm

Energy Kid's Page: Plastic Recycling
http //www eia doe gov/kids/energyfacts/saving/recycling/solidwaste/plastics html

Plastics Identification Guide
http //www ecorecycle vic gov au/aboutus/infosheet_plastic asp

Plastics Resource
http //www plasticsresource com/

Hands on Plastics
http //www handsonplastics com/hop_jr/index html

WebQuest

http //oncampus.richmond.edu/academics/education/projects/webquests/pape

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The Recycling Pessimist

Use the Internet links below to answer these questions specifically related to The Recycling Pessimist:

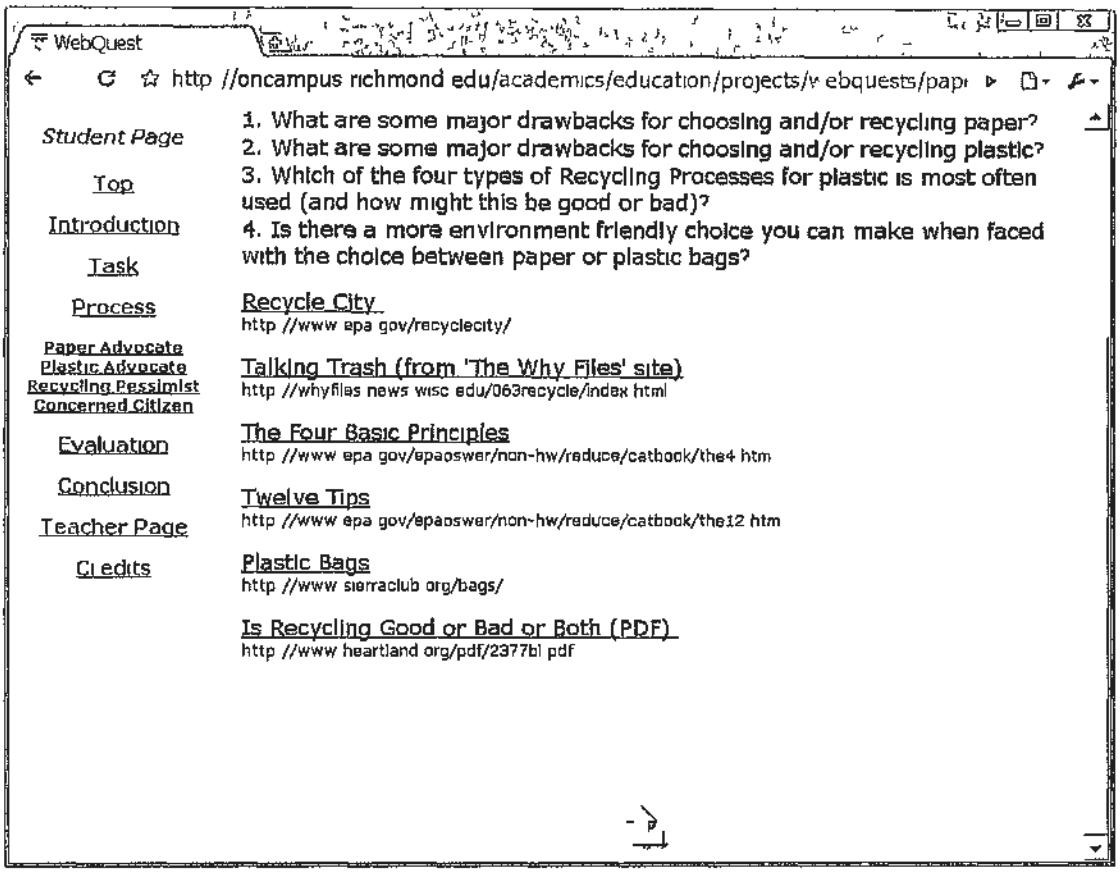
1. What are some major drawbacks for choosing and/or recycling paper?
2. What are some major drawbacks for choosing and/or recycling plastic?
3. Which of the four types of Recycling Processes for plastic is most often used (and how might this be good or bad)?
4. Is there a more environment friendly choice you can make when faced with the choice between paper or plastic bags?

Recycle City
http //www epa gov/recyclecity/

Talking Trash (from 'The Why Files' site)
http //whyfiles news wisc edu/063recycle/index html

The Four Basic Principles
http //www epa gov/epaoswer/non-hw/reduce/catbook/the4 htm

Twelve Tips
http //www epa gov/epaoswer/non-hw/reduce/catbook/the12 htm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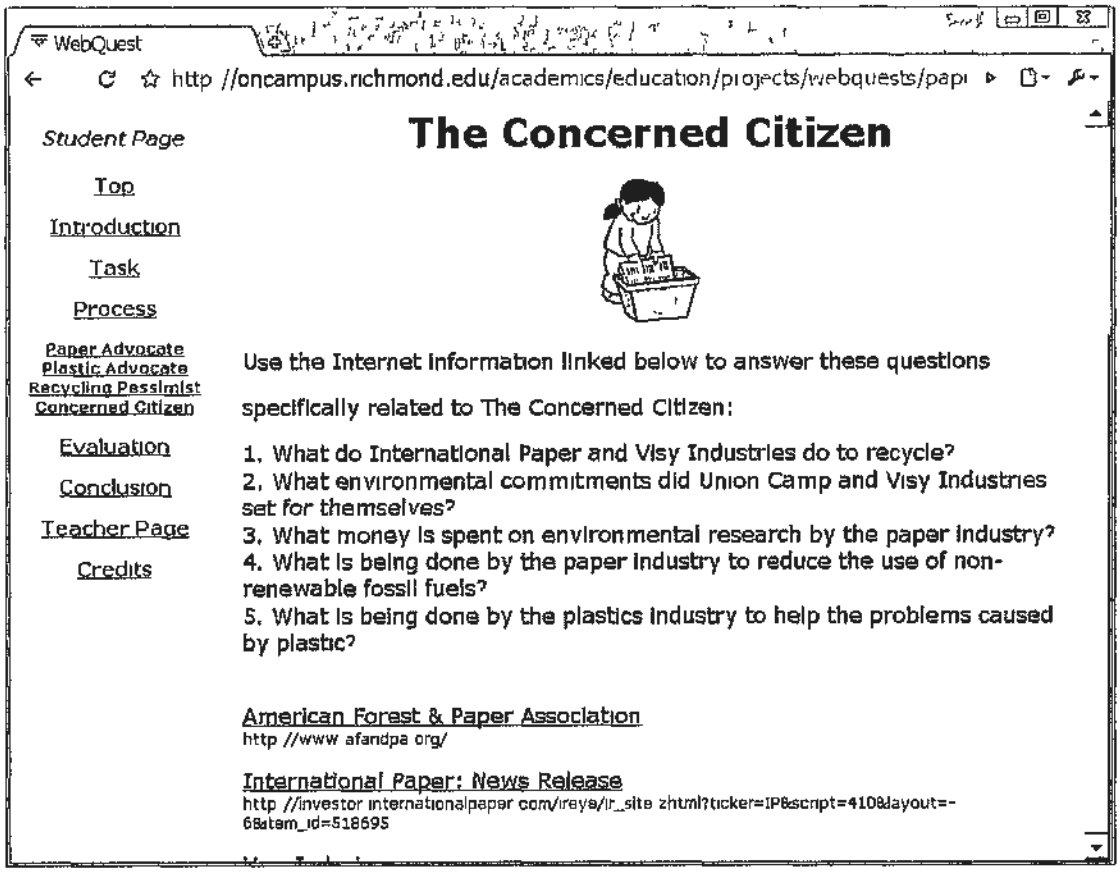
1. What are some major drawbacks for choosing and/or recycling paper?
2. What are some major drawbacks for choosing and/or recycling plastic?
3. Which of the four types of Recycling Processes for plastic is most often used (and how might this be good or bad)?
4. Is there a more environment friendly choice you can make when faced with the choice between paper or plastic bags?
Recycle City
http //www epa gov/recyclecity/
Talking Trash (from 'The Why Files' site)
http //whyfiles news wisc edu/063recycle/index html
The Four Basic Principles
http //www epa gov/epaoswer/non-hw/reduce/catbook/the4 htm
Twelve Tips
http //www epa gov/epaoswer/non-hw/reduce/catbook/the12 htm
Plastic Bags
http //www sierraclub org/bags/
Is Recycling Good or Bad or Both (PDF)
http //www heartland org/pdf/2377bl pdf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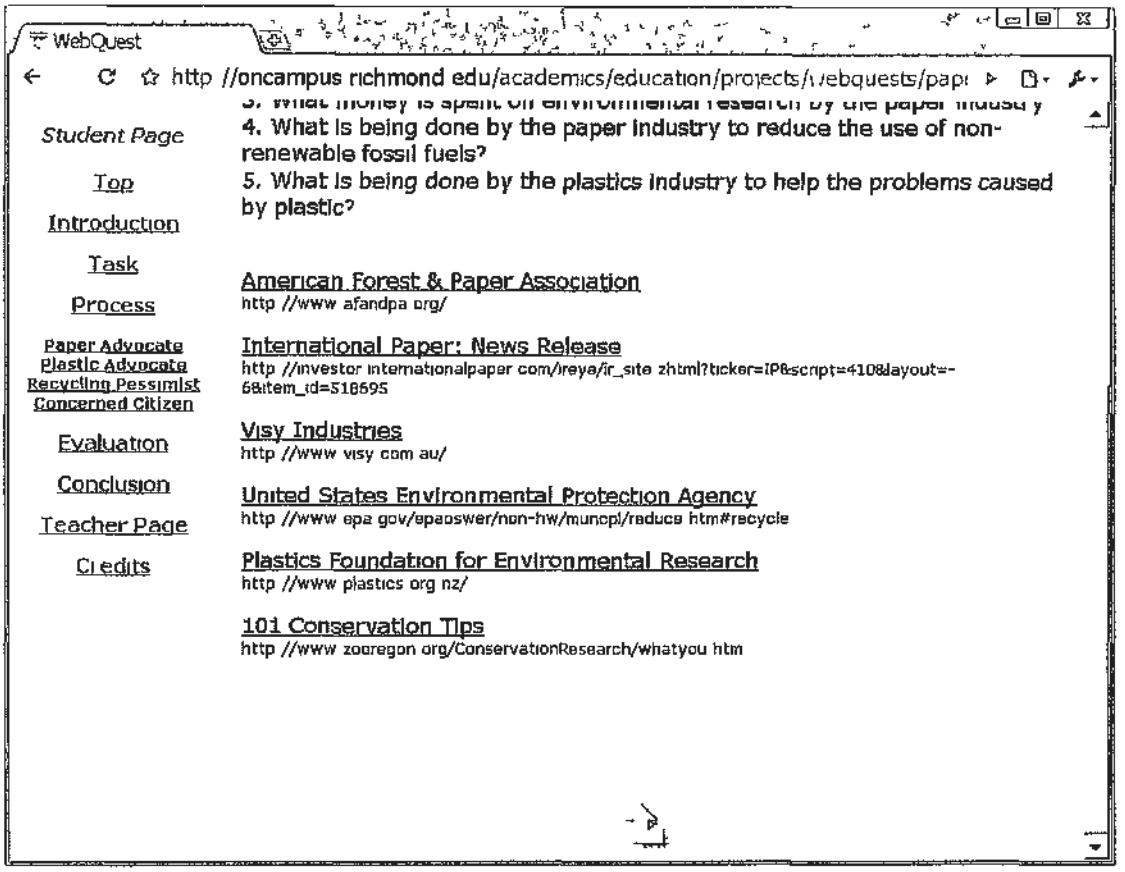
The Concerned Citizen
Use the Internet information linked below to answer these questions
specifically related to The Concerned Citizen:
1. What do International Paper and Visy Industries do to recycle?
2. What environmental commitments did Union Camp and Visy Industries set for themselves?
3. What money is spent on environmental research by the paper industry?
4. What is being done by the paper industry to reduce the use of non-renewable fossil fuels?
5. What is being done by the plastics industry to help the problems caused by plastic?
American Forest & Paper Association
http //www afandpa org/
International Paper: News Release
http //investor internationalpaper com/ireye/ir_site zhtml?ticker=IP&script=410&layout=-6&item_id=518695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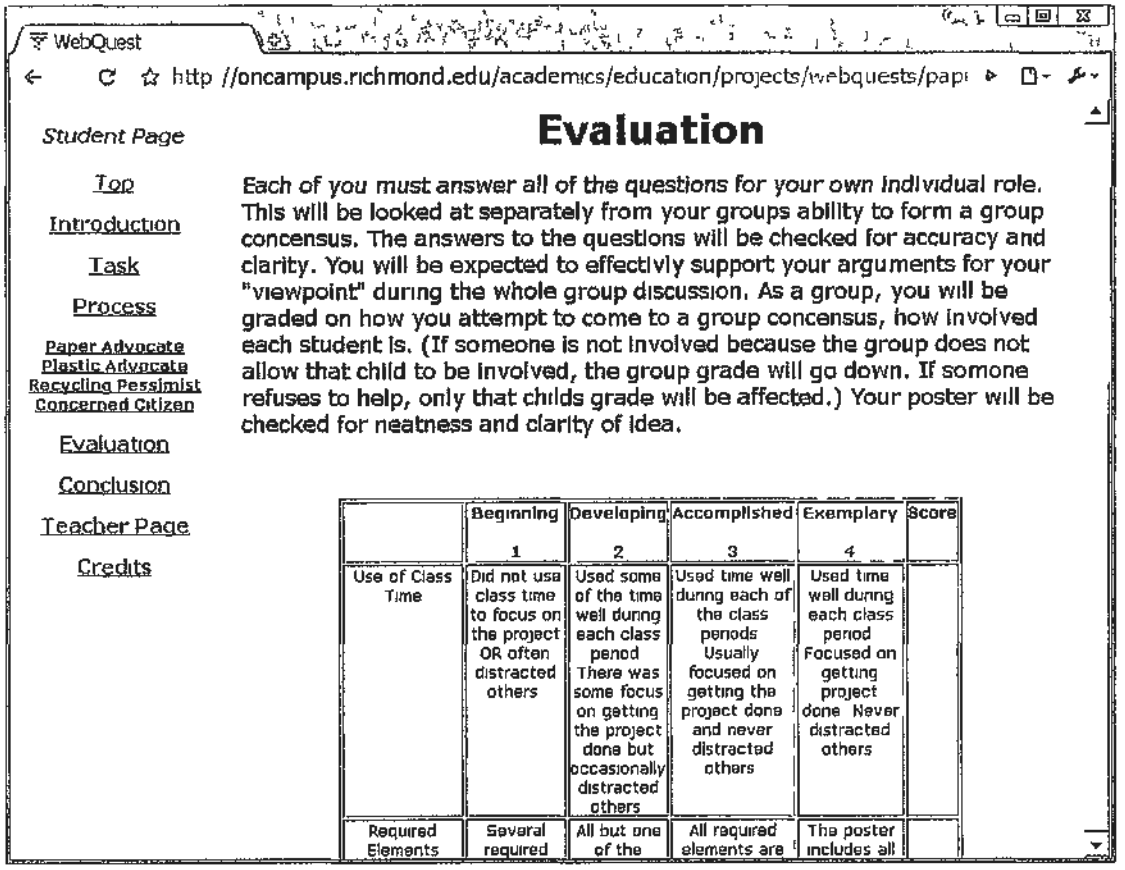
4. What is being done by the paper industry to reduce the use of non-renewable fossil fuels?
5. What is being done by the plastics industry to help the problems caused by plastic?
American Forest & Paper Association
http //www afandpa org/
International Paper: News Release
http //investor internationalpaper com/reya/ir_site zhtml?ticker=IP&script=410&layout=-6&item_id=516695
Visy Industries
http //www visy com au/
United States Environmental Protection Agency
http //www epa gov/epaoswer/non-hw/muncpl/reduce htm#recycle
Plastics Foundation for Environmental Research
http //www plastics org nz/
101 Conservation Tips
http //www zooregon org/ConservationResearch/whatyou htm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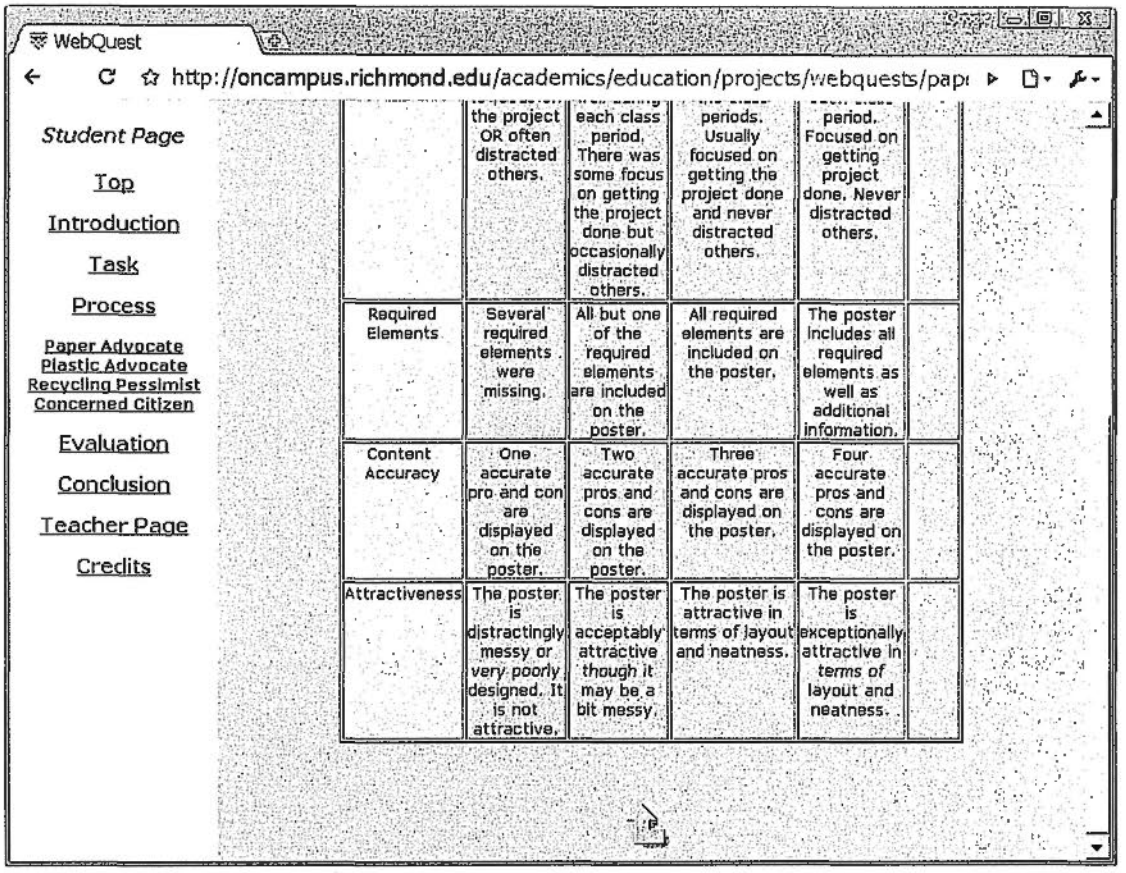
Each of you must answer all of the questions for your own individual role. This will be looked at separately from your groups ability to form a group concensus. The answers to the questions will be checked for accuracy and clarity. You will be expected to effectivly support your arguments for your "viewpoint" during the whole group discussion. As a group, you will be graded on how you attempt to come to a group concensus, how involved each student is. (If someone is not involved because the group does not allow that child to be involved, the group grade will go down. If somone refuses to help, only that childs grade will be affected.) Your poster will be checked for neatness and clarity of idea.
Beginning 1
Developing 2
Accomplished 3
Exemplary 4
Score
Use of Class Time
Did not use class time to focus on the project OR often distracted others
Used some of the time well during each class period There was some focus on getting the project done but occasionally distracted others
Used time well during each of the class periods Usually focused on getting the project done and never distracted others
Used time well during each class period Focused on getting project done Never distracted others
Required Elements
Several required
All but one of the
All required elements are
The poster includes all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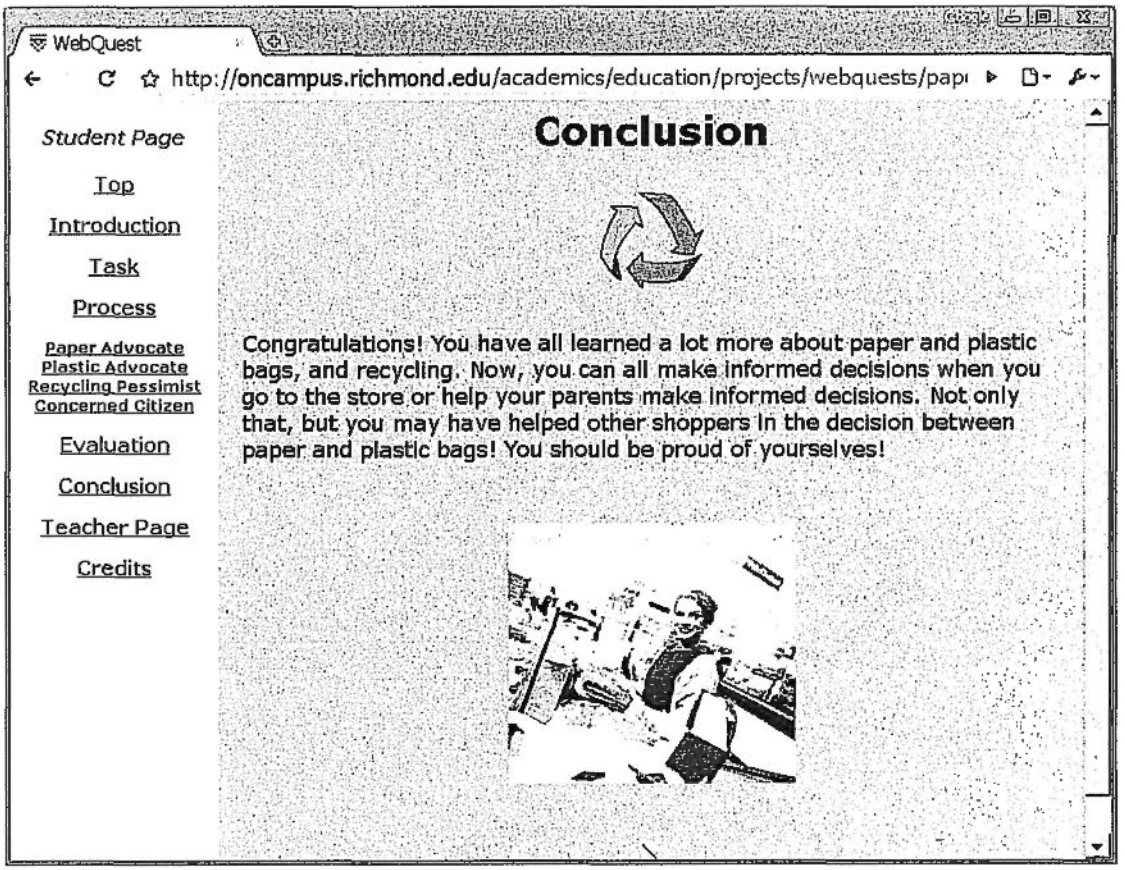
the project OR often distracted others.
each class period. There was some focus on getting the project done but occasionally distracted others.
periods. Usually focused on getting the project done and never distracted others.
period. Focused on getting project done. Never distracted others.
Required Elements
Several required elements were missing.
All but one of the required elements are included on the poster.
All required elements are included on the poster.
The poster includes all required elements as well as additional information.
Content Accuracy
One accurate pro and con are displayed on the poster.
Two accurate pros and cons are displayed on the poster.
Three accurate pros and cons are displayed on the poster.
Four accurate pros and cons are displayed on the poster.
Attractiveness
The poster is distractingly messy or very poorly designed. It is not attractive.
The poster is acceptably attractive though it may be a bit messy.
The poster is attractive in terms of layout and neatness.
The poster is exceptionally attractive in terms of layout and neatness.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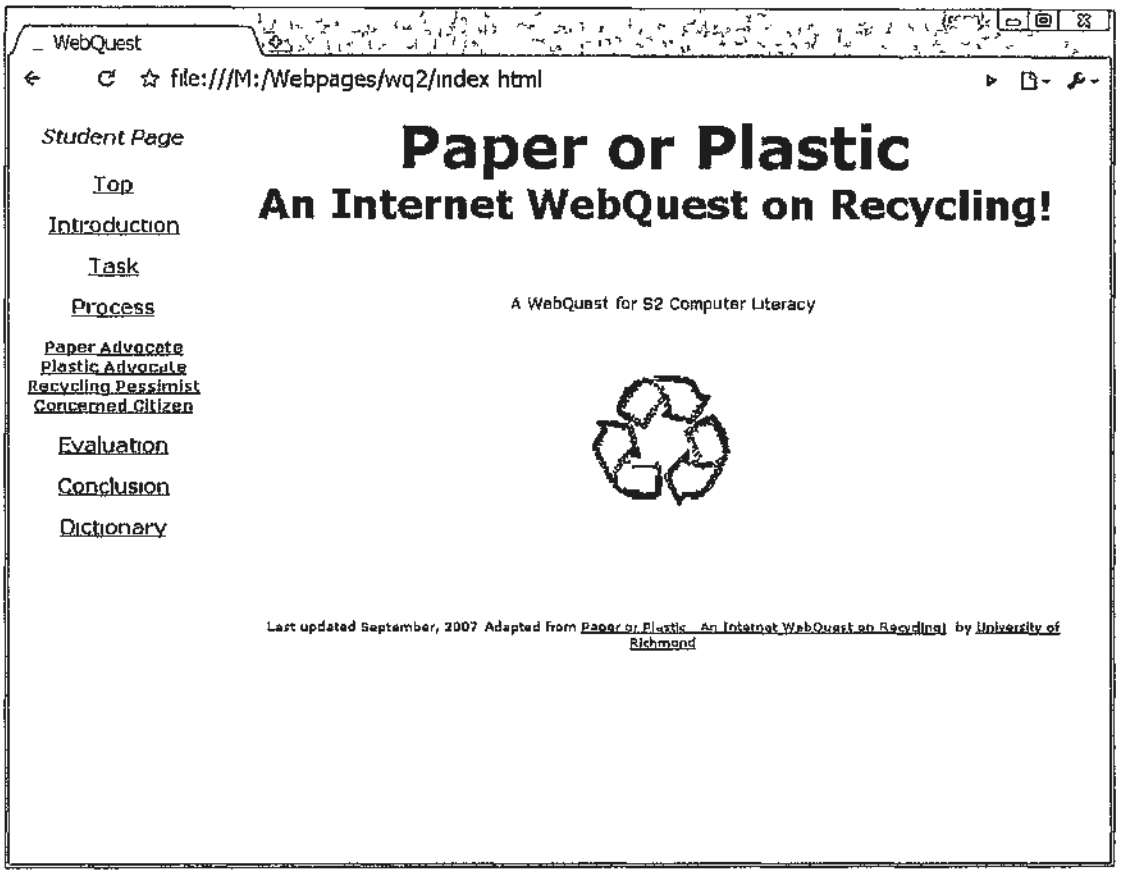
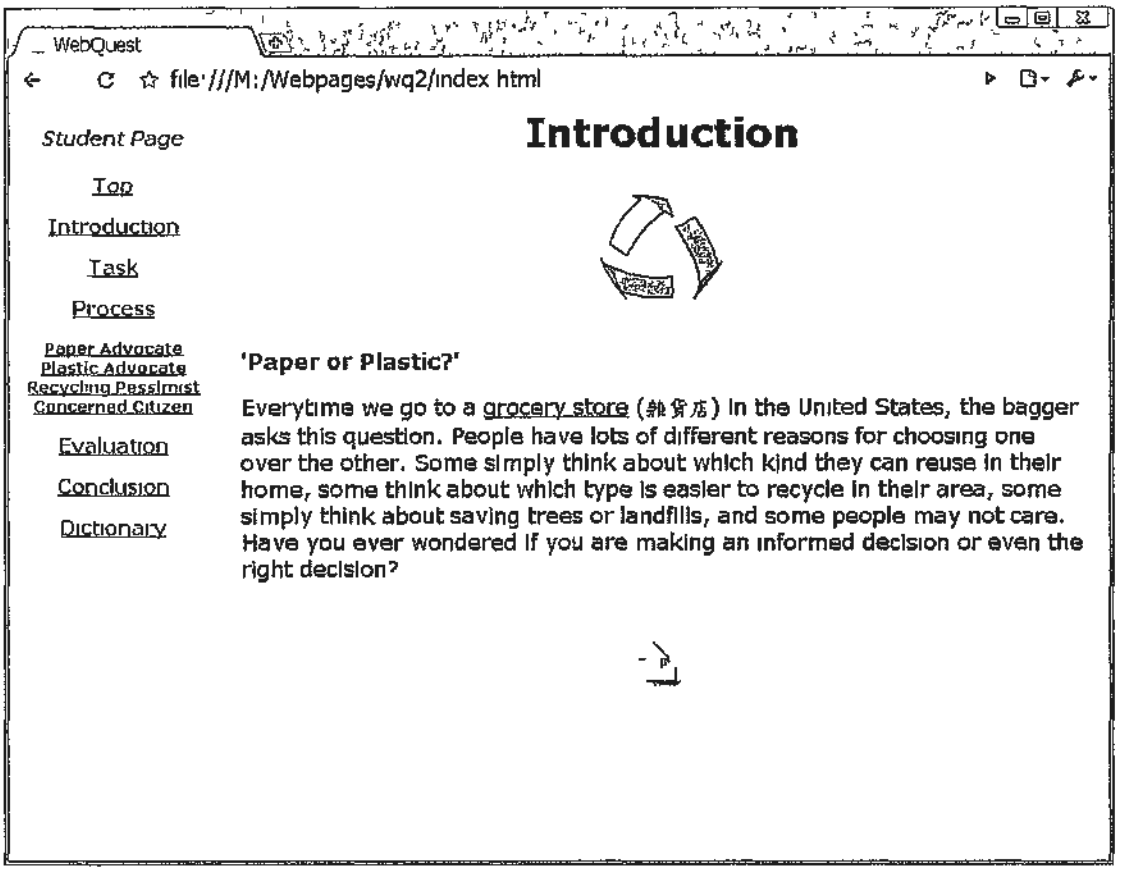
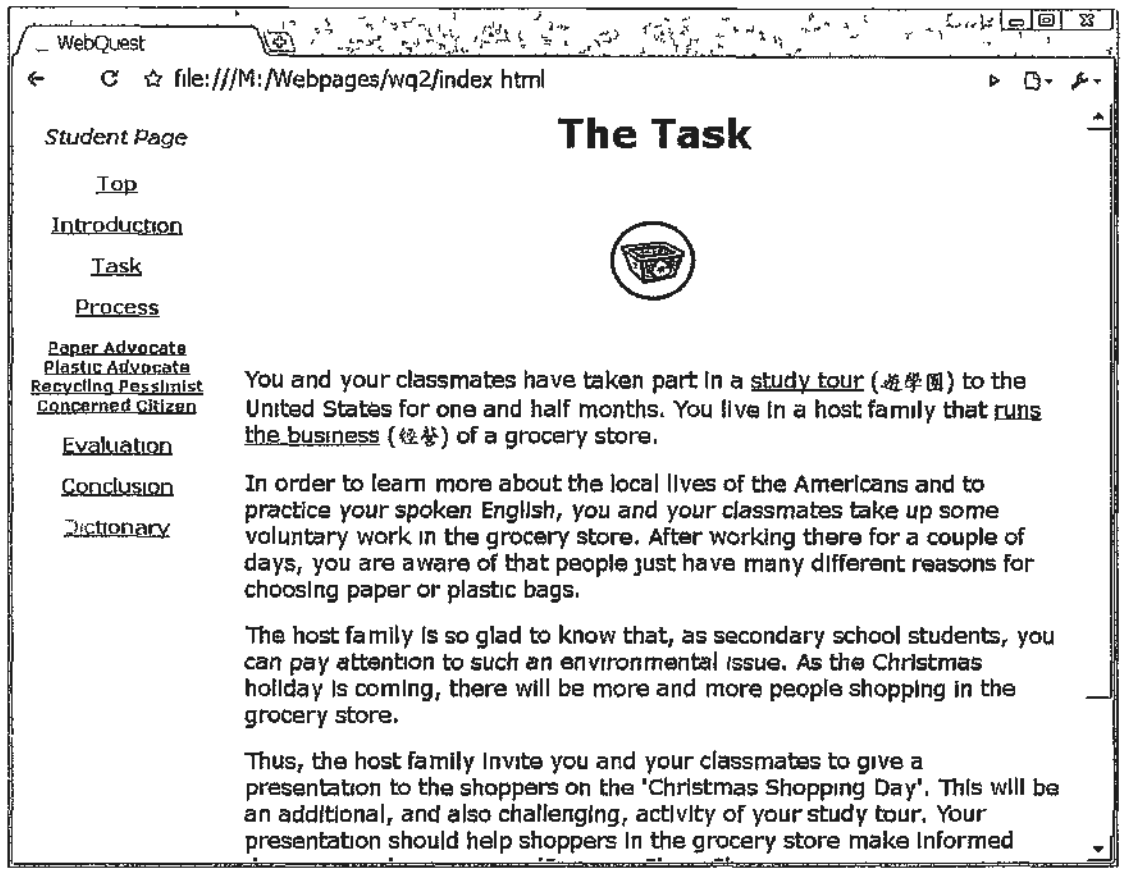
Congratulations! You have all learned a lot more about paper and plastic bags, and recycling. Now, you can all make informed decisions when you go to the store or help your parents make informed decisions. Not only that, but you may have helped other shoppers in the decision between paper and plastic bags! You should be proud of yourselves!

Appendix 6: Screenshots of the Modified WebQuest (*WQ2* after Adaptation)



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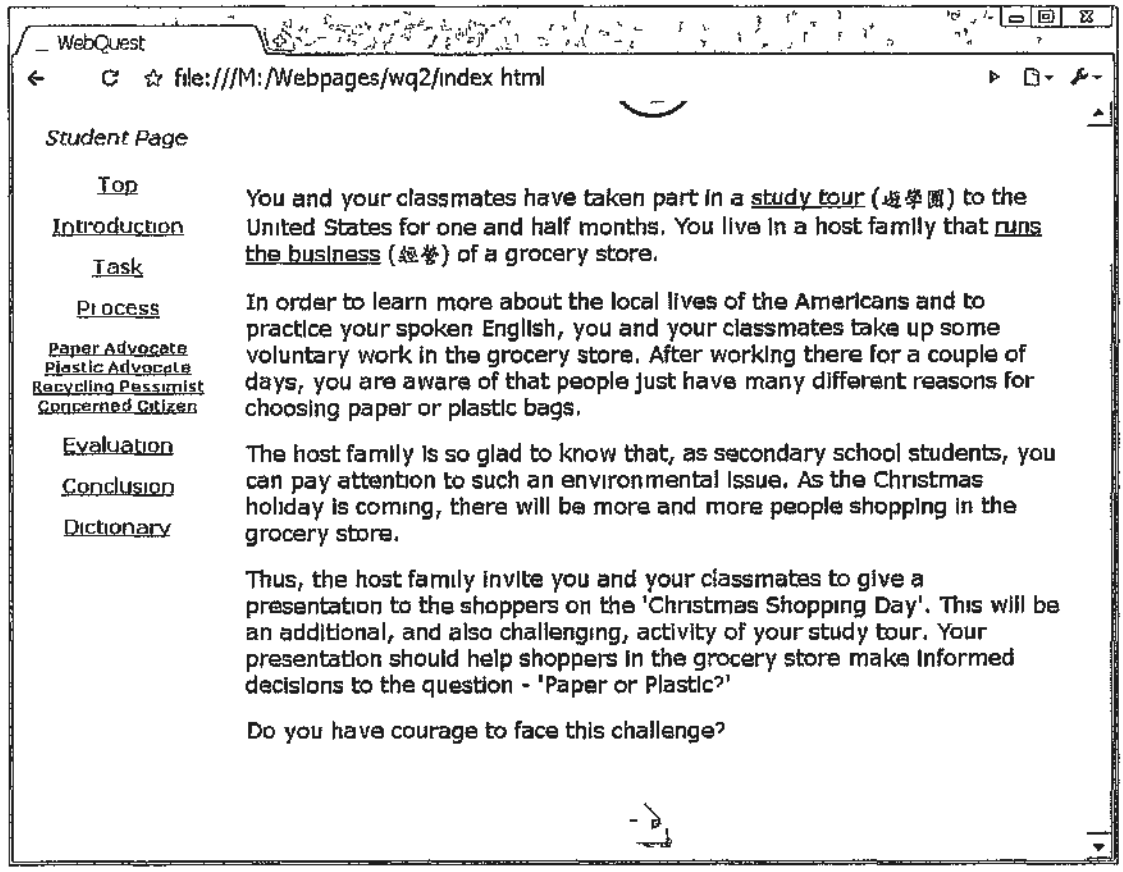
The Task
You and your classmates have taken part in a study tour (遊學團) to the United States for one and half months. You live in a host family that runs the business (經營) of a grocery store.
In order to learn more about the local lives of the Americans and to practice your spoken English, you and your classmates take up some voluntary work in the grocery store. After working there for a couple of days, you are aware of that people just have many different reasons for choosing paper or plastic bags.
The host family is so glad to know that, as secondary school students, you can pay attention to such an environmental issue. As the Christmas holiday is coming, there will be more and more people shopping in the grocery store.
Thus, the host family invite you and your classmates to give a presentation to the shoppers on the 'Christmas Shopping Day'. This will be an additional, and also challenging, activity of your study tour. Your presentation should help shoppers in the grocery store make informed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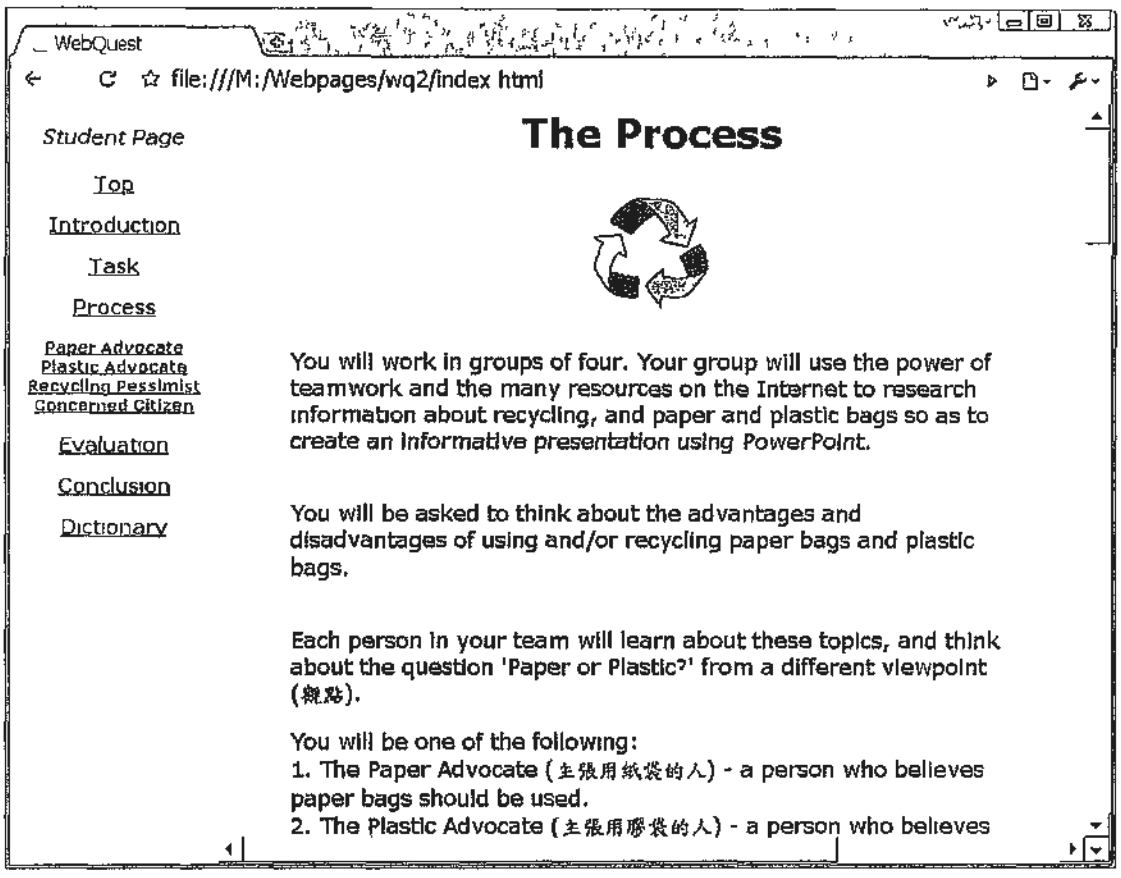
In order to learn more about the local lives of the Americans and to practice your spoken English, you and your classmates take up some voluntary work in the grocery store. After working there for a couple of days, you are aware of that people just have many different reasons for choosing paper or plastic bags.
The host family is so glad to know that, as secondary school students, you can pay attention to such an environmental issue. As the Christmas holiday is coming, there will be more and more people shopping in the grocery store.
Thus, the host family invite you and your classmates to give a presentation to the shoppers on the 'Christmas Shopping Day'. This will be an additional, and also challenging, activity of your study tour. Your presentation should help shoppers in the grocery store make informed decisions to the question - 'Paper or Plastic?'
Do you have courage to face this challenge?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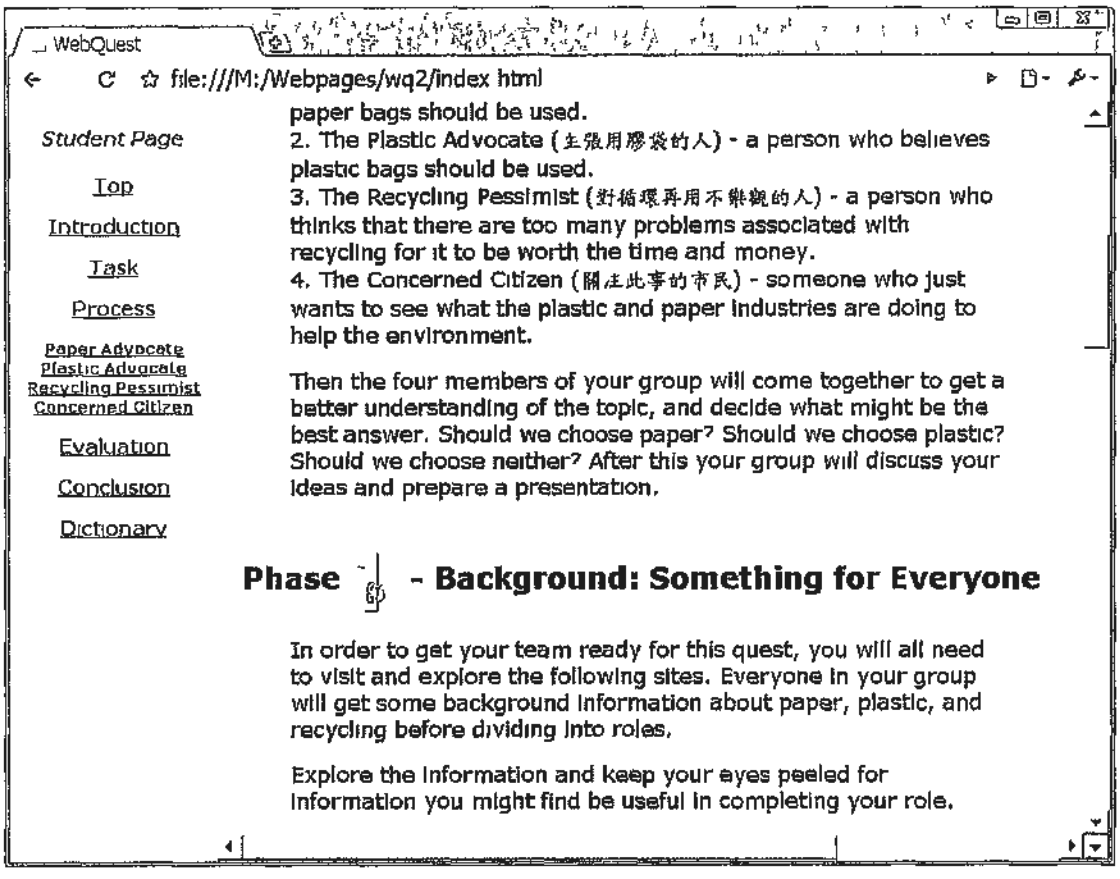
The Process
You will work in groups of four. Your group will use the power of teamwork and the many resources on the Internet to research information about recycling, and paper and plastic bags so as to create an informative presentation using PowerPoint.
You will be asked to think about the advantages and disadvantages of using and/or recycling paper bags and plastic bags.
Each person in your team will learn about these topics, and think about the question 'Paper or Plastic?' from a different viewpoint (觀點).
You will be one of the following:
1. The Paper Advocate (主張用紙袋的人) - a person who believes paper bags should be used.
2. The Plastic Advocate (主張用膠袋的人) - a person who believes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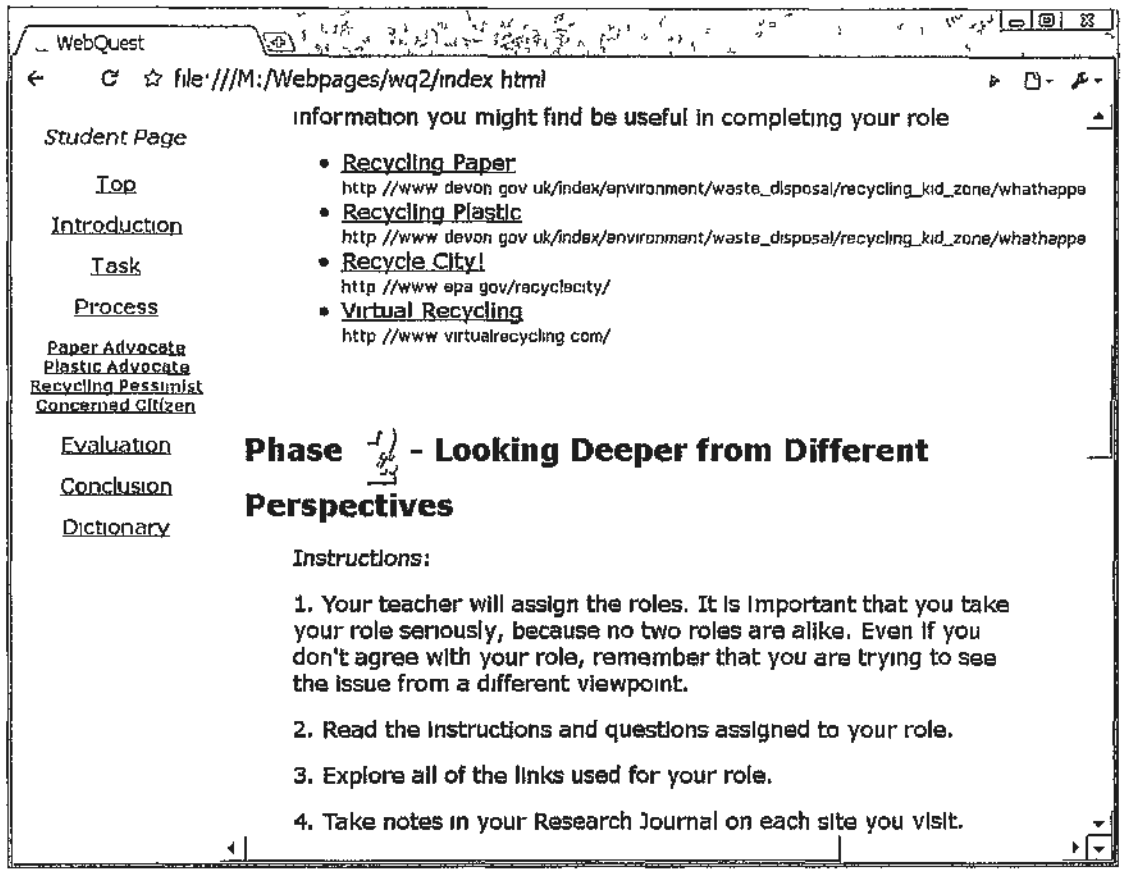
paper bags should be used.
2. The Plastic Advocate (主張用膠袋的人) - a person who believes plastic bags should be used.
3. The Recycling Pessimist (對循環再用不樂觀的人) - a person who thinks that there are too many problems associated with recycling for it to be worth the time and money.
4. The Concerned Citizen (關注此事的市民) - someone who just wants to see what the plastic and paper industries are doing to help the environment.
Then the four members of your group will come together to get a better understanding of the topic, and decide what might be the best answer. Should we choose paper? Should we choose plastic? Should we choose neither? After this your group will discuss your ideas and prepare a presentation.
Phase - Background: Something for Everyone
In order to get your team ready for this quest, you will all need to visit and explore the following sites. Everyone in your group will get some background information about paper, plastic, and recycling before dividing into roles.
Explore the information and keep your eyes peeled for information you might find be useful in completing your role.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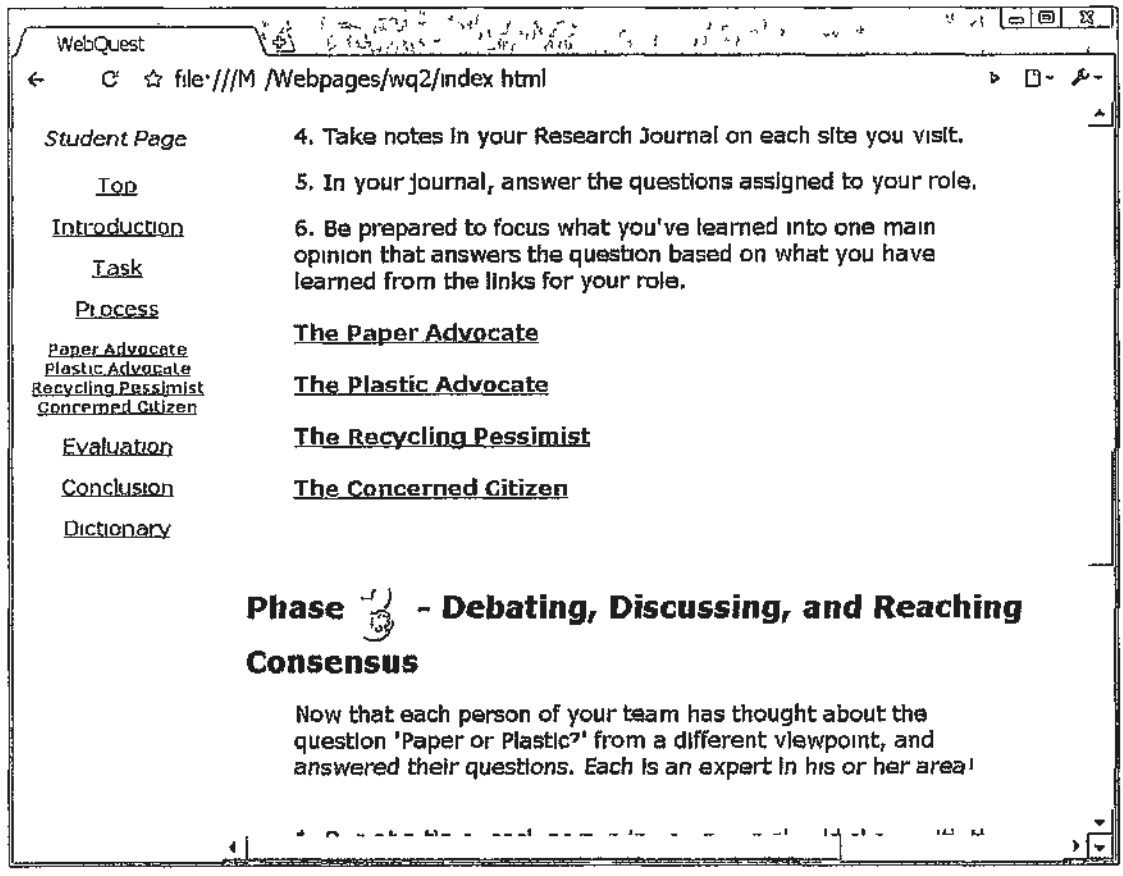
information you might find be useful in completing your role
Recycling Paper
http //www devon gov uk/index/environment/waste_disposal/recycling_kid_zone/whathappe
Recycling Plastic
http //www devon gov uk/index/environment/waste_disposal/recycling_kid_zone/whathappe
Recycle City!
http //www epa gov/recyclecity/
Virtual Recycling
http //www virtualrecycling com/
Phase - Looking Deeper from Different Perspectives
Instructions:
1. Your teacher will assign the roles. It is important that you take your role seriously, because no two roles are alike. Even if you don't agree with your role, remember that you are trying to see the issue from a different viewpoint.
2. Read the instructions and questions assigned to your role.
3. Explore all of the links used for your role.
4. Take notes in your Research Journal on each site you visit.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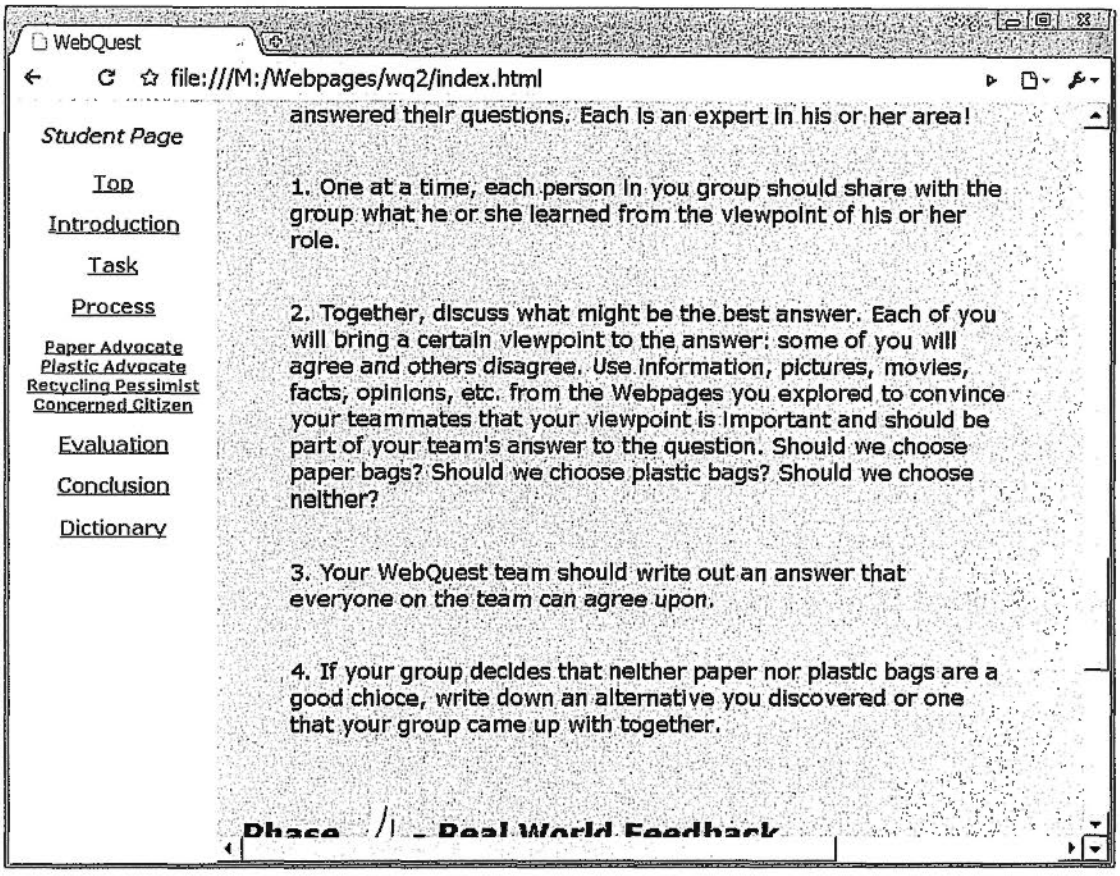
4. Take notes in your Research Journal on each site you visit.
5. In your journal, answer the questions assigned to your role.
6. Be prepared to focus what you've learned into one main opinion that answers the question based on what you have learned from the links for your role.
The Paper Advocate
The Plastic Advocate
The Recycling Pessimist
The Concerned Citizen
Phase - Debating, Discussing, and Reaching Consensus
Now that each person of your team has thought about the question 'Paper or Plastic?' from a different viewpoint, and answered their questions. Each is an expert in his or her area!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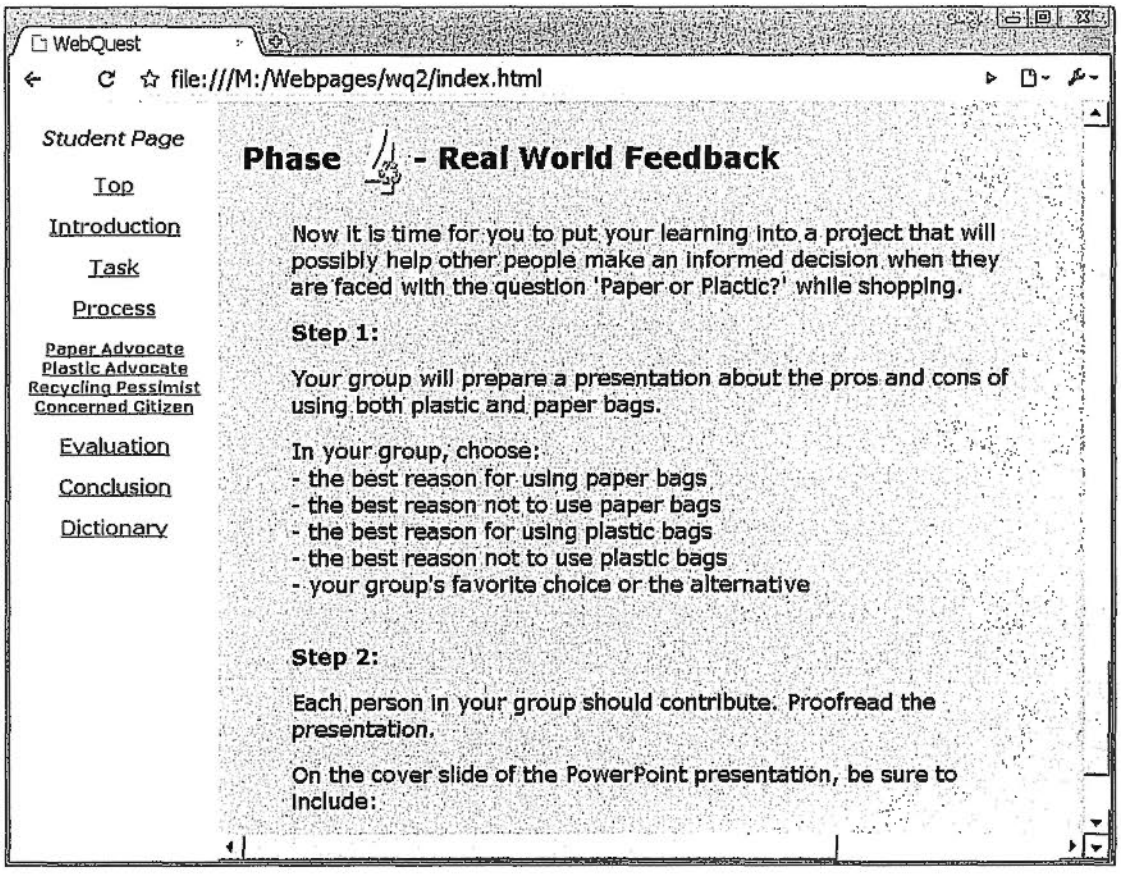
answered their questions. Each is an expert in his or her area!
1. One at a time, each person in you group should share with the group what he or she learned from the viewpoint of his or her role.
2. Together, discuss what might be the best answer. Each of you will bring a certain viewpoint to the answer: some of you will agree and others disagree. Use information, pictures, movies, facts, opinions, etc. from the Webpages you explored to convince your teammates that your viewpoint is important and should be part of your team's answer to the question. Should we choose paper bags? Should we choose plastic bags? Should we choose neither?
3. Your WebQuest team should write out an answer that everyone on the team can agree upon.
4. If your group decides that neither paper nor plastic bags are a good choice, write down an alternative you discovered or one that your group came up with together.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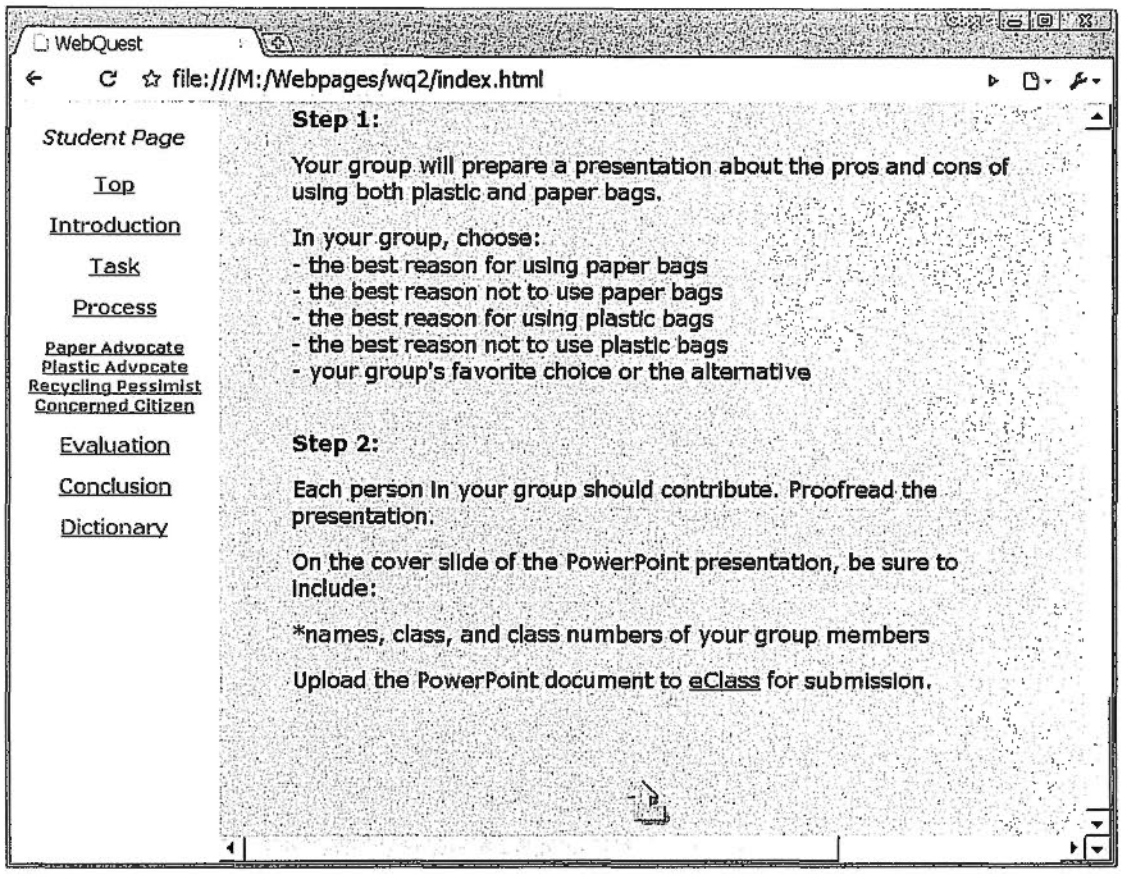
Phase - Real World Feedback
Now it is time for you to put your learning into a project that will possibly help other people make an informed decision when they are faced with the question 'Paper or Plastic?' while shopping.
Step 1:
Your group will prepare a presentation about the pros and cons of using both plastic and paper bags.
In your group, choose:
- the best reason for using paper bags
- the best reason not to use paper bags
- the best reason for using plastic bags
- the best reason not to use plastic bags
- your group's favorite choice or the alternative
Step 2:
Each person in your group should contribute. Proofread the presentation.
On the cover slide of the PowerPoint presentation, be sure to include: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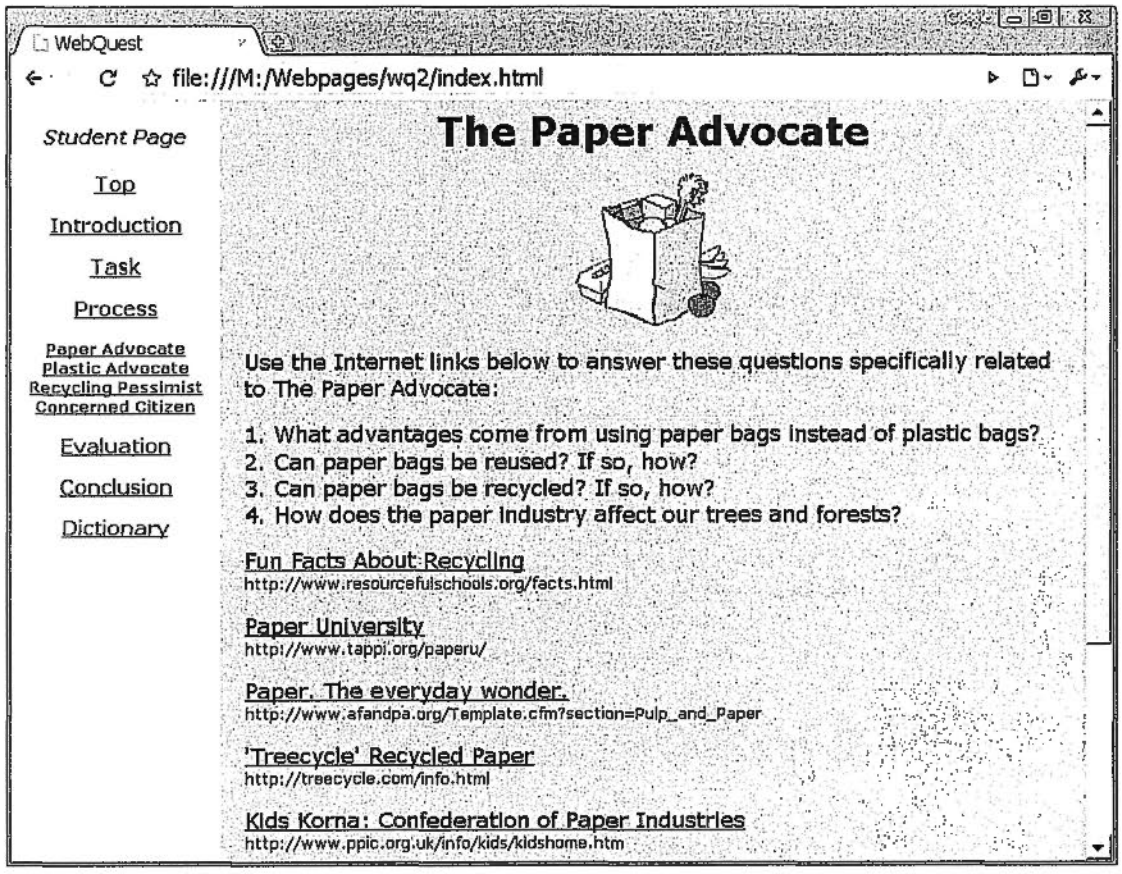
Step 1:
Your group will prepare a presentation about the pros and cons of using both plastic and paper bags.
In your group, choose:
- the best reason for using paper bags
- the best reason not to use paper bags
- the best reason for using plastic bags
- the best reason not to use plastic bags
- your group's favorite choice or the alternative
Step 2:
Each person in your group should contribute. Proofread the presentation.
On the cover slide of the PowerPoint presentation, be sure to include:
*names, class, and class numbers of your group members
Upload the PowerPoint document to eClass for submission.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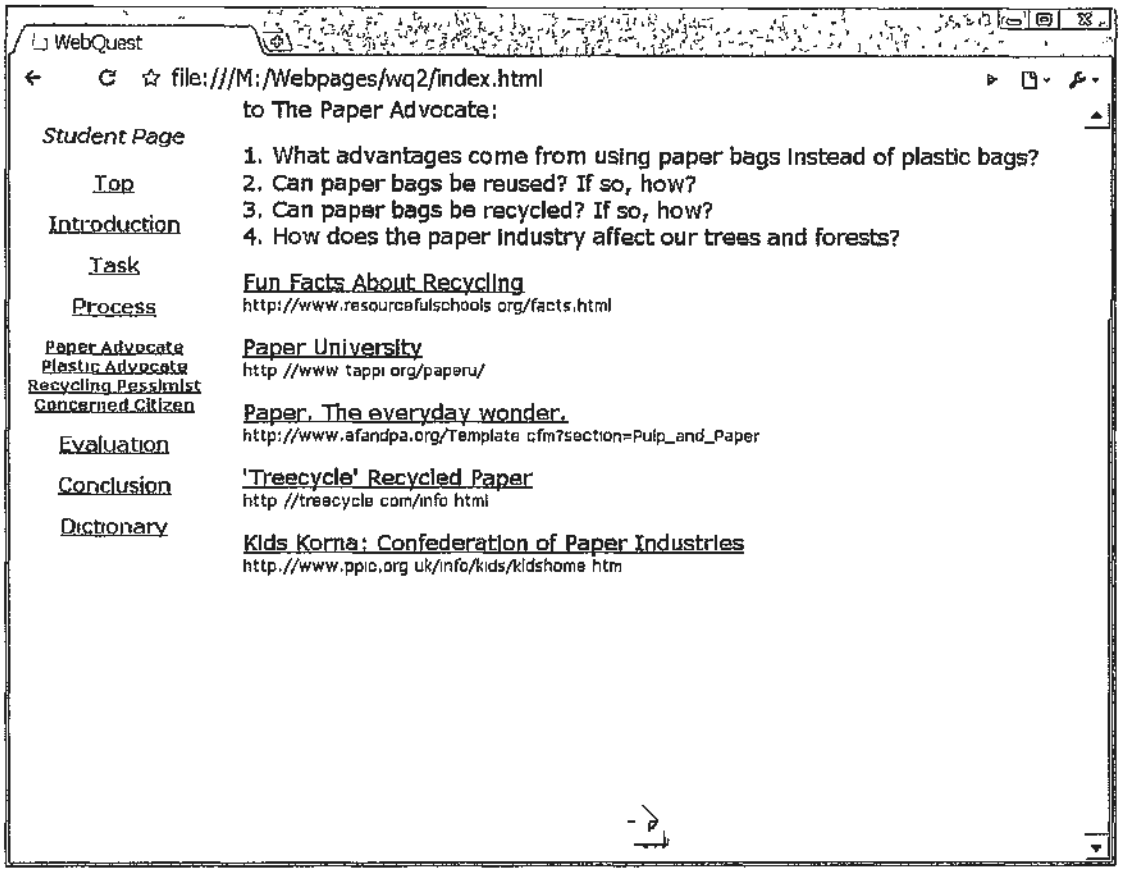
The Paper Advocate
Use the Internet links below to answer these questions specifically related to The Paper Advocate:
1. What advantages come from using paper bags instead of plastic bags?
2. Can paper bags be reused? If so, how?
3. Can paper bags be recycled? If so, how?
4. How does the paper industry affect our trees and forests?
Fun Facts About Recycling
http://www.resourcefulschools.org/facts.html
Paper University
http://www.tappi.org/paperu/
Paper. The everyday wonder.
http://www.afandpa.org/Template.cfm?section=Pulp_and_Paper
'Treecycle' Recycled Paper
http://treecycle.com/info.html
Kids Korna: Confederation of Paper Industries
http://www.ppic.org.uk/info/kids/kidshome.htm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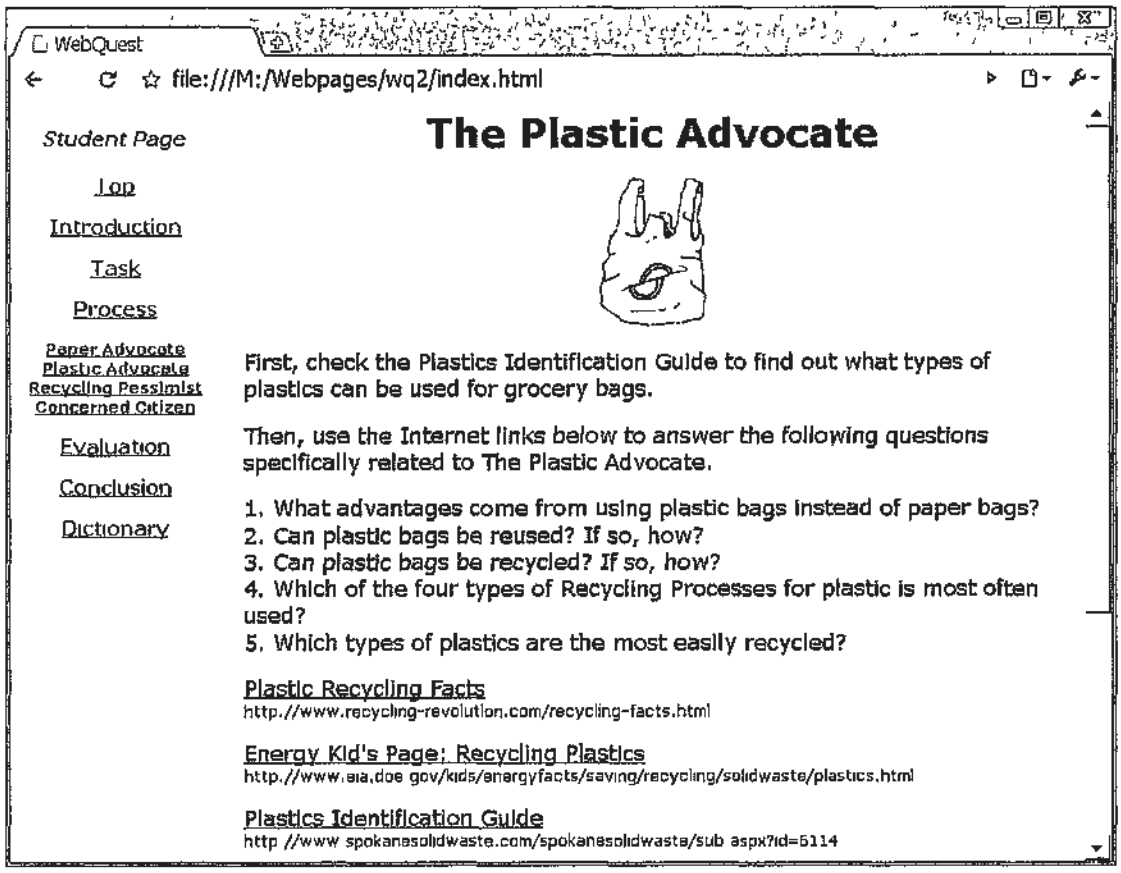
1. What advantages come from using paper bags instead of plastic bags?
2. Can paper bags be reused? If so, how?
3. Can paper bags be recycled? If so, how?
4. How does the paper industry affect our trees and forests?
Fun Facts About Recycling
http://www.resourcefulschools org/facts.html
Paper University
http //www tappi org/paperu/
Paper, The everyday wonder.
http://www.afandpa.org/Template cfm?section=Pulp_and_Paper
'Treecycle' Recycled Paper
http //treecycle com/info html
Kids Korna: Confederation of Paper Industries
http.//www.ppic.org uk/info/kids/kidshome htm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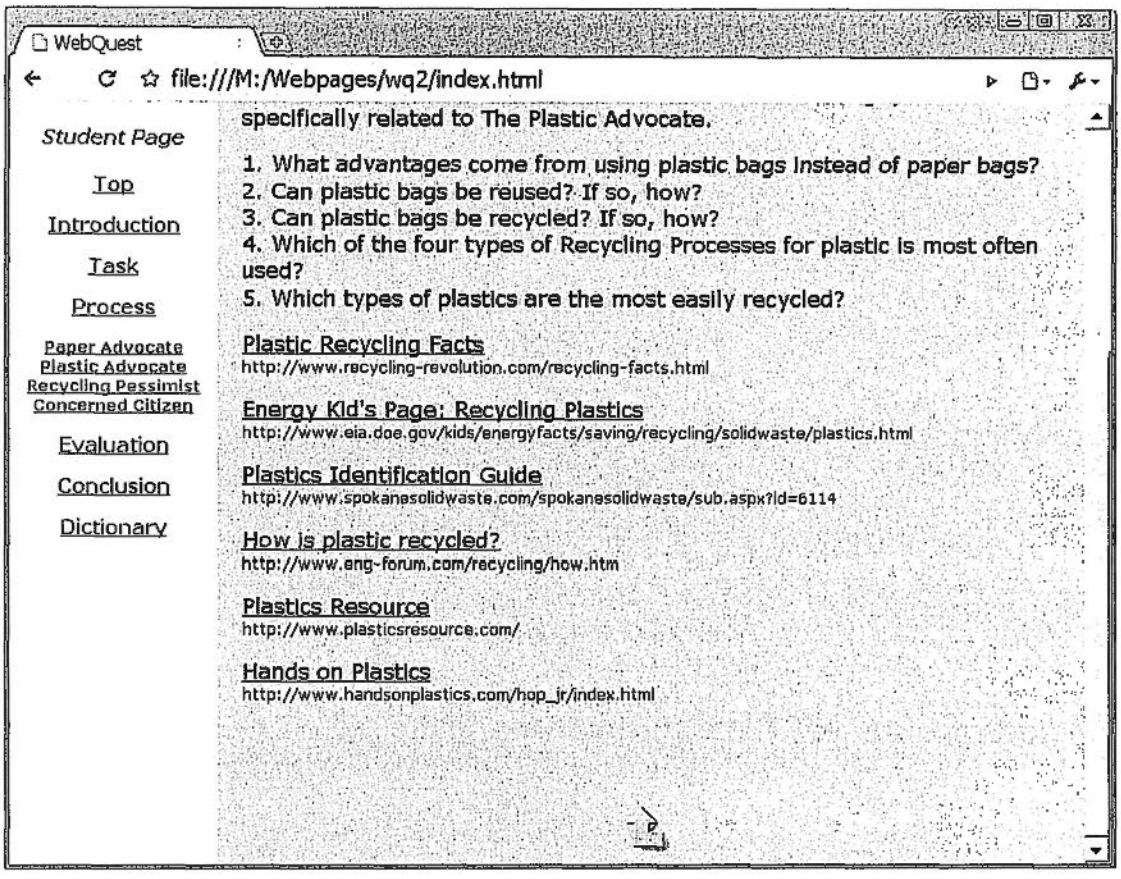
The Plastic Advocate
First, check the Plastics Identification Guide to find out what types of plastics can be used for grocery bags.
Then, use the Internet links below to answer the following questions specifically related to The Plastic Advocate.
1. What advantages come from using plastic bags instead of paper bags?
2. Can plastic bags be reused? If so, how?
3. Can plastic bags be recycled? If so, how?
4. Which of the four types of Recycling Processes for plastic is most often used?
5. Which types of plastics are the most easily recycled?
Plastic Recycling Facts
http.//www.recycling-revolution.com/recycling-facts.html
Energy Kid's Page: Recycling Plastics
http.//www.eia.doe gov/kids/energyfacts/saving/recycling/solidwaste/plastics.html
Plastics Identification Guide
http //www spokanesolidwaste.com/spokanesolidwaste/sub aspx?id=5114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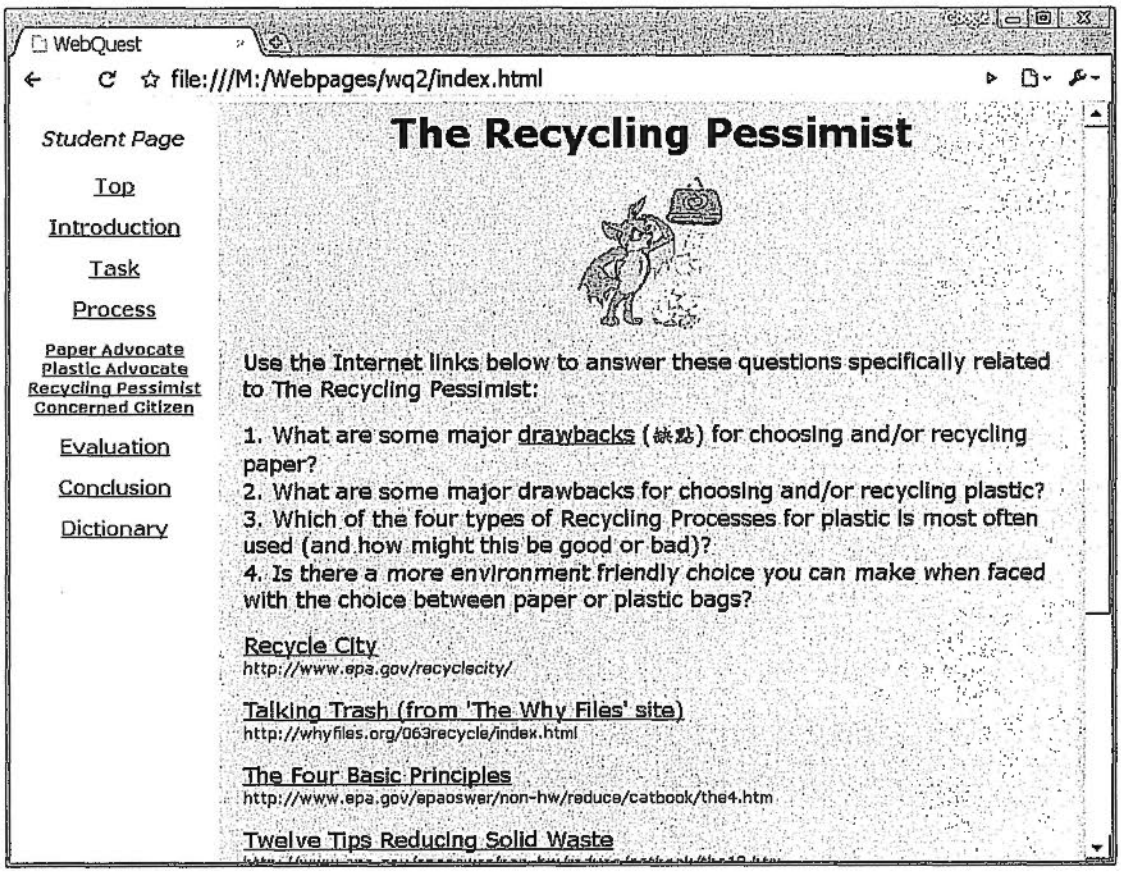
specifically related to The Plastic Advocate.
1. What advantages come from using plastic bags instead of paper bags?
2. Can plastic bags be reused? If so, how?
3. Can plastic bags be recycled? If so, how?
4. Which of the four types of Recycling Processes for plastic is most often used?
5. Which types of plastics are the most easily recycled?
Plastic Recycling Facts
http://www.recycling-revolution.com/recycling-facts.html
Energy Kid's Page: Recycling Plastics
http://www.eia.doe.gov/kids/energyfacts/saving/recycling/solidwaste/plastics.html
Plastics Identification Guide
http://www.spokanesolidwaste.com/spokanesolidwaste/sub.aspx?id=6114
How is plastic recycled?
http://www.eng-forum.com/recycling/how.htm
Plastics Resource
http://www.plasticsresource.com/
Hands on Plastics
http://www.handsonplastics.com/hop_jr/index.html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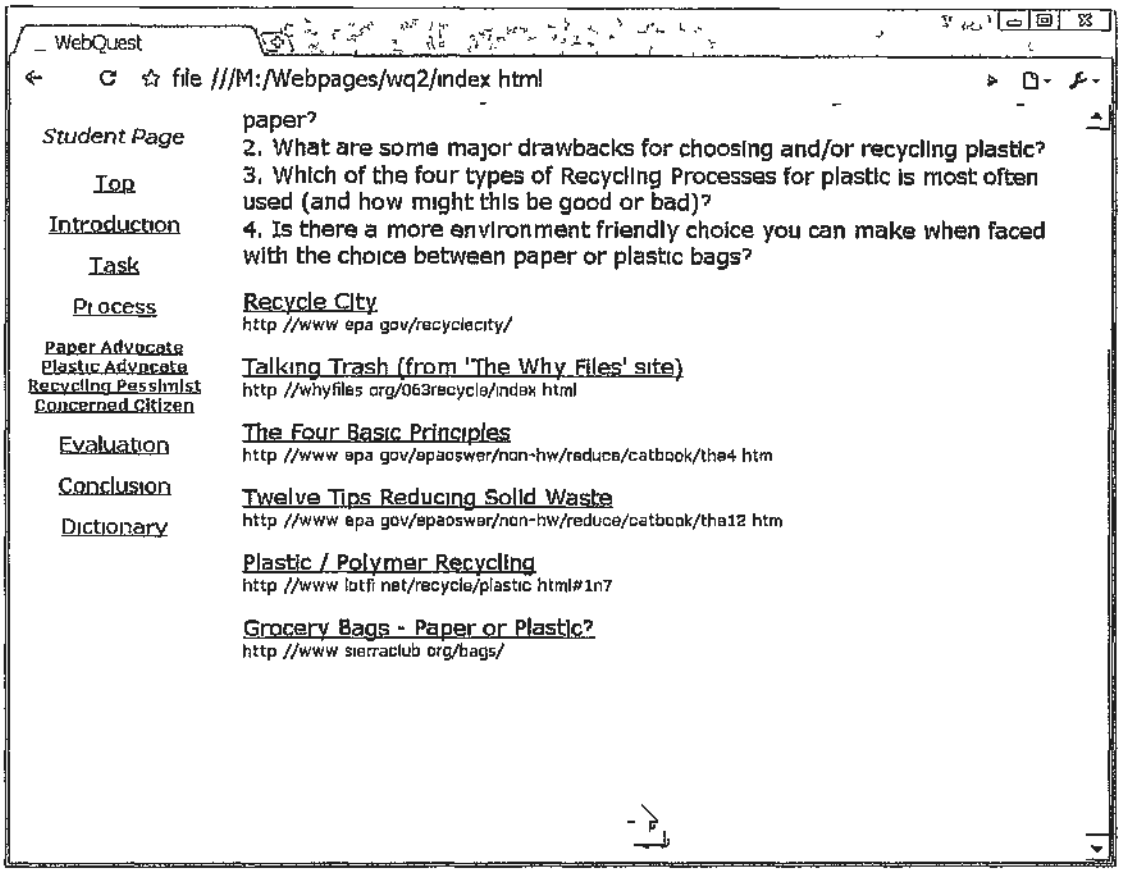
The Recycling Pessimist
Use the Internet links below to answer these questions specifically related to The Recycling Pessimist:
1. What are some major drawbacks (缺点) for choosing and/or recycling paper?
2. What are some major drawbacks for choosing and/or recycling plastic?
3. Which of the four types of Recycling Processes for plastic is most often used (and how might this be good or bad)?
4. Is there a more environment friendly choice you can make when faced with the choice between paper or plastic bags?
Recycle City
http://www.epa.gov/recyclecity/
Talking Trash (from 'The Why Files' site)
http://whyfiles.org/063recycle/index.html
The Four Basic Principles
http://www.epa.gov/epaoswer/non-hw/reduce/catbook/the4.htm
Twelve Tips Reducing Solid Waste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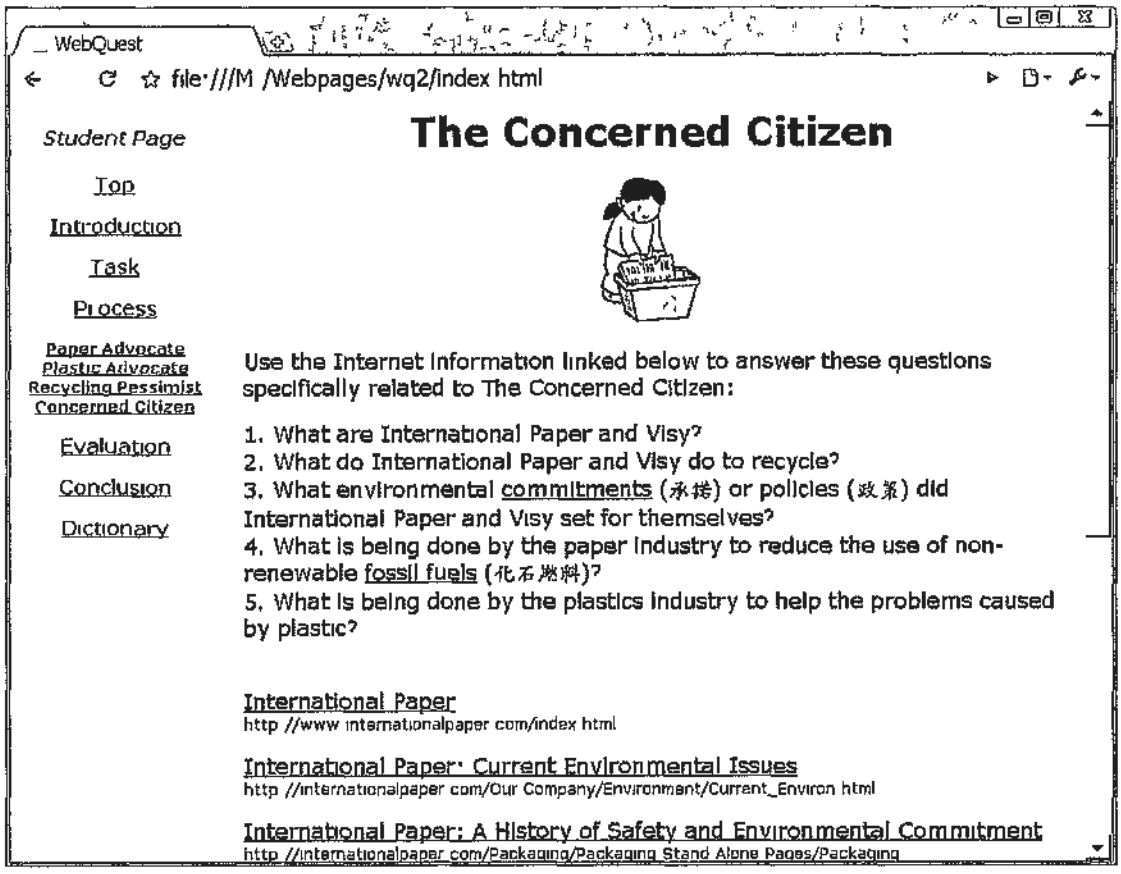
paper?
2. What are some major drawbacks for choosing and/or recycling plastic?
3. Which of the four types of Recycling Processes for plastic is most often used (and how might this be good or bad)?
4. Is there a more environment friendly choice you can make when faced with the choice between paper or plastic bags?
Recycle City
http //www epa gov/recyclecity/
Talking Trash (from 'The Why Files' site)
http //whyfiles org/063recycle/index html
The Four Basic Principles
http //www epa gov/epaoswer/non-hw/reduce/catbook/the4 htm
Twelve Tips Reducing Solid Waste
http //www epa gov/epaoswer/non-hw/reduce/catbook/tha12 htm
Plastic / Polymer Recycling
http //www lotfi net/recycle/plastic html#1n7
Grocery Bags - Paper or Plastic?
http //www sierraclub org/bags/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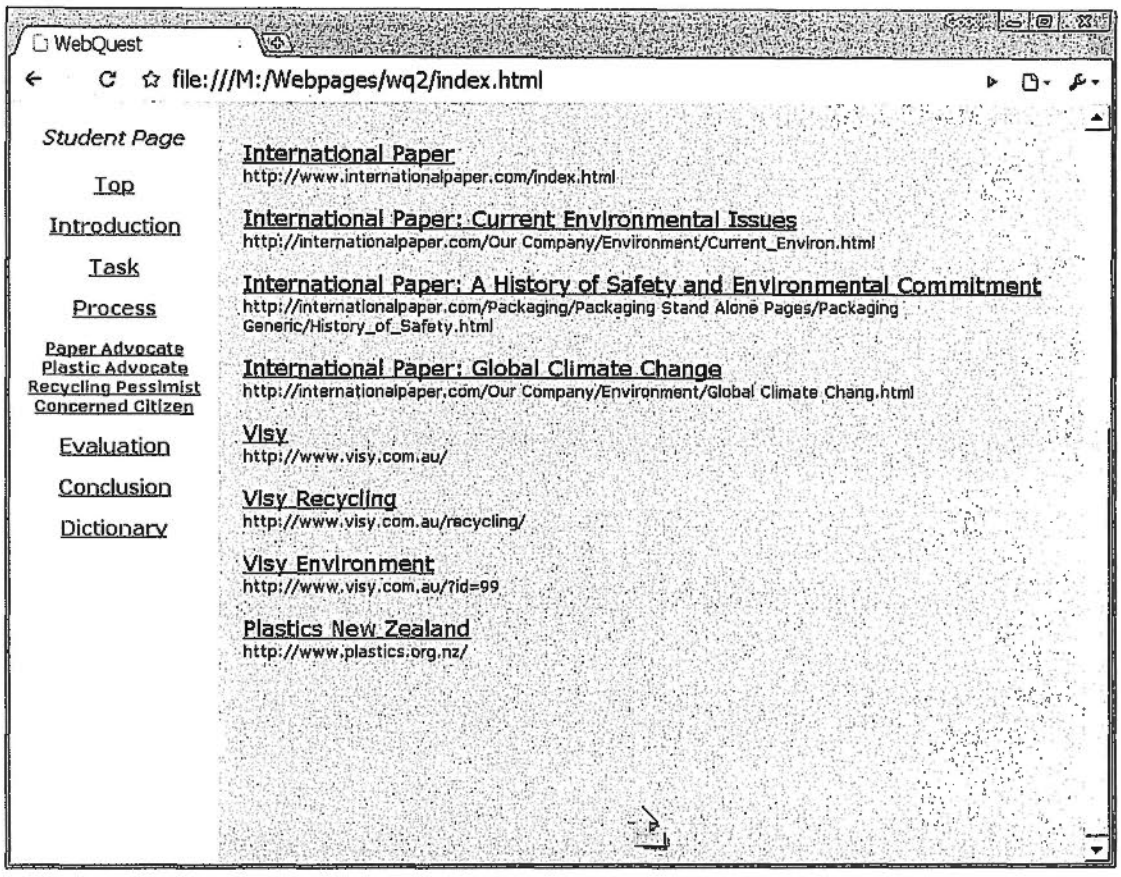
The Concerned Citizen
Use the Internet information linked below to answer these questions specifically related to The Concerned Citizen:
1. What are International Paper and Visy?
2. What do International Paper and Visy do to recycle?
3. What environmental commitments (承诺) or policies (政策) did International Paper and Visy set for themselves?
4. What is being done by the paper industry to reduce the use of non-renewable fossil fuels (化石燃料)?
5. What is being done by the plastics industry to help the problems caused by plastic?
International Paper
http //www internationalpaper com/index html
International Paper· Current Environmental Issues
http //internationalpaper com/Our Company/Environment/Current_Environ html
International Paper: A History of Safety and Environmental Commitment
http //internationalpaper com/Packaging/Packaging Stand Alone Pages/Packaging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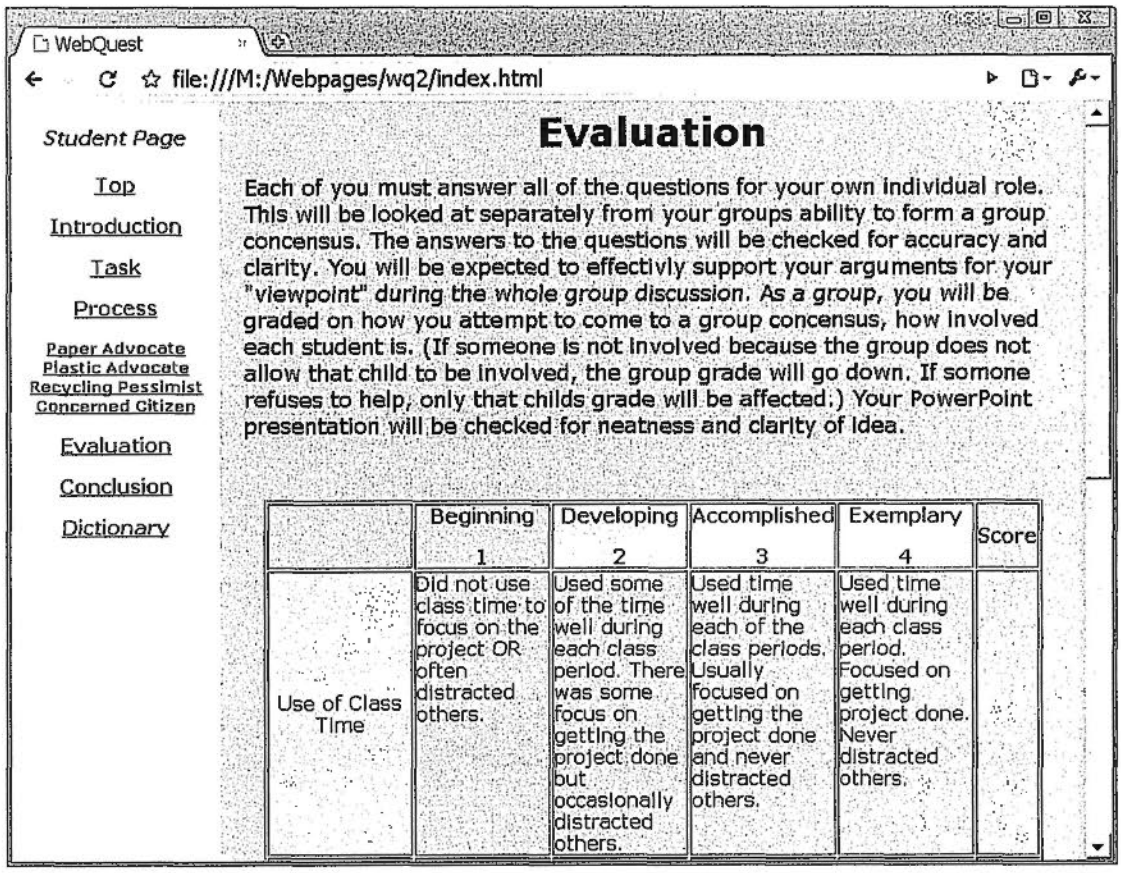
International Paper
http://www.internationalpaper.com/index.html
International Paper: Current Environmental Issues
http://internationalpaper.com/Our Company/Environment/Current_Environ.html
International Paper: A History of Safety and Environmental Commitment
http://internationalpaper.com/Packaging/Packaging Stand Alone Pages/Packaging Generic/History_of_Safety.html
International Paper: Global Climate Change
http://internationalpaper.com/Our Company/Environment/Global Climate Chang.html
Visy
http://www.visy.com.au/
Visy Recycling
http://www.visy.com.au/recycling/
Visy Environment
http://www.visy.com.au/?id=99
Plastics New Zealand
http://www.plastics.org.nz/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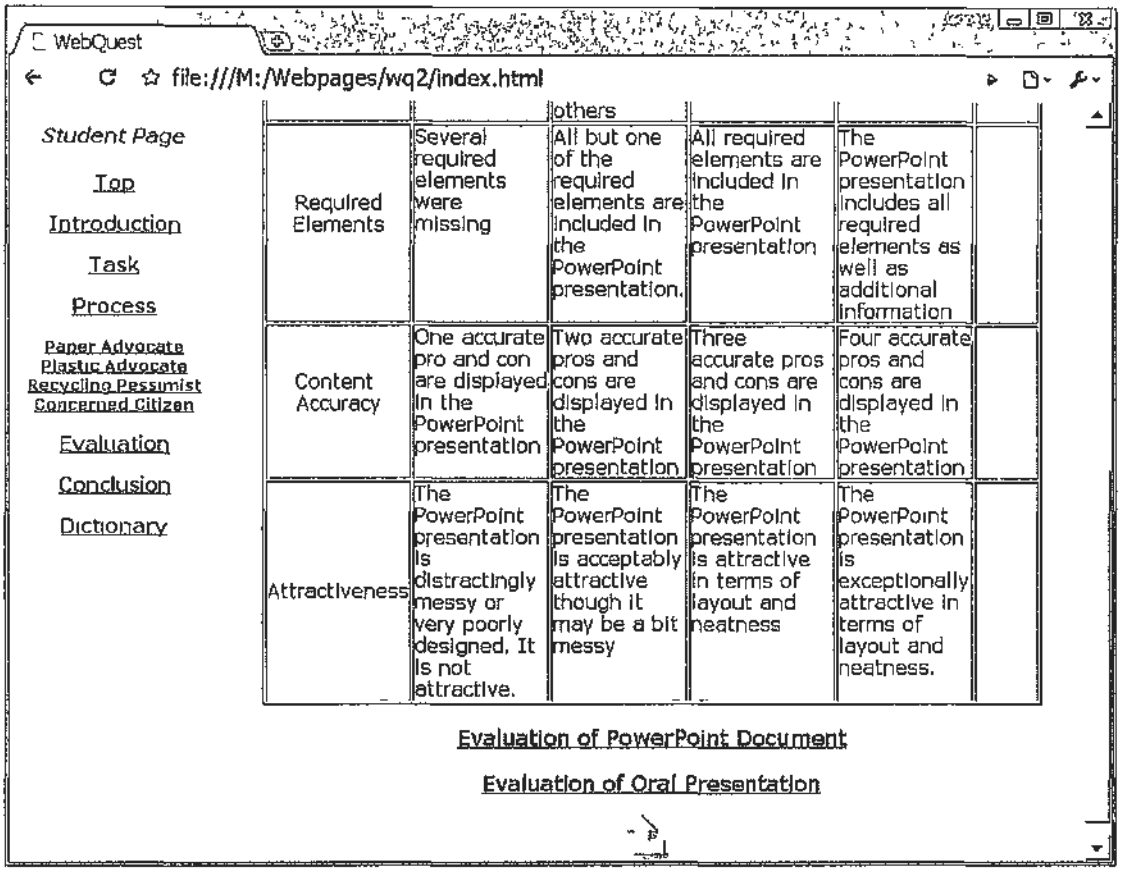
Each of you must answer all of the questions for your own individual role. This will be looked at separately from your groups ability to form a group concensus. The answers to the questions will be checked for accuracy and clarity. You will be expected to effectivly support your arguments for your "viewpoint" during the whole group discussion. As a group, you will be graded on how you attempt to come to a group concensus, how involved each student is. (If someone is not involved because the group does not allow that child to be involved, the group grade will go down. If somone refuses to help, only that childs grade will be affected.) Your PowerPoint presentation will be checked for neatness and clarity of idea.
Beginning 1
Developing 2
Accomplished 3
Exemplary 4
Score
Use of Class Time
Did not use class time to focus on the project OR often distracted others.
Used some of the time well during each class period. There was some focus on getting the project done but occasionally distracted others.
Used time well during each of the class periods. Usually focused on getting the project done and never distracted others.
Used time well during each class period. Focused on getting project done. Never distracted others.



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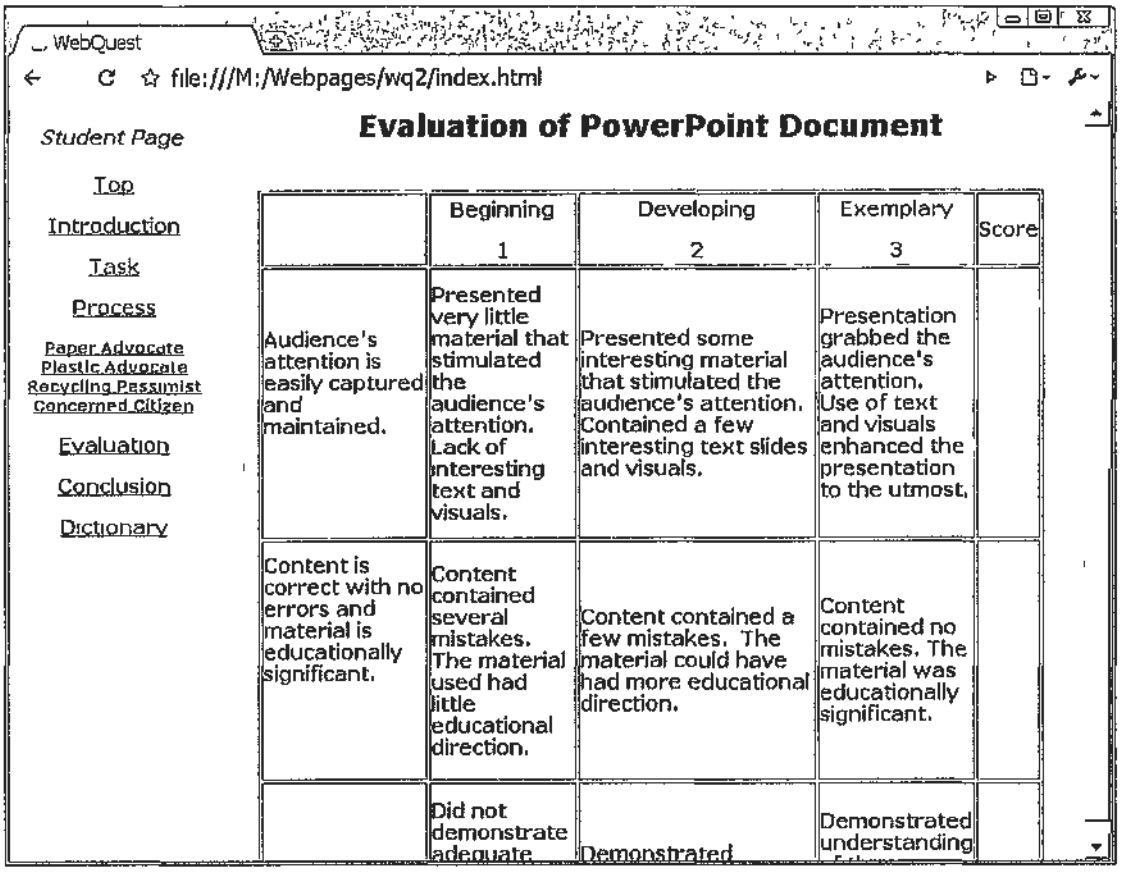
		others			
Required Elements	Several required elements were missing	All but one of the required elements are included in the PowerPoint presentation.	All required elements are included in the PowerPoint presentation	The PowerPoint presentation includes all required elements as well as additional information	
Content Accuracy	One accurate pro and con are displayed in the PowerPoint presentation	Two accurate pros and cons are displayed in the PowerPoint presentation	Three accurate pros and cons are displayed in the PowerPoint presentation	Four accurate pros and cons are displayed in the PowerPoint presentation	
Attractiveness	The PowerPoint presentation is distractingly messy or very poorly designed. It is not attractive.	The PowerPoint presentation is acceptably attractive though it may be a bit messy	The PowerPoint presentation is attractive in terms of layout and neatness	The PowerPoint presentation is exceptionally attractive in terms of layout and neatness.	

Evaluation of PowerPoint Document

Evaluation of Oral Presentation



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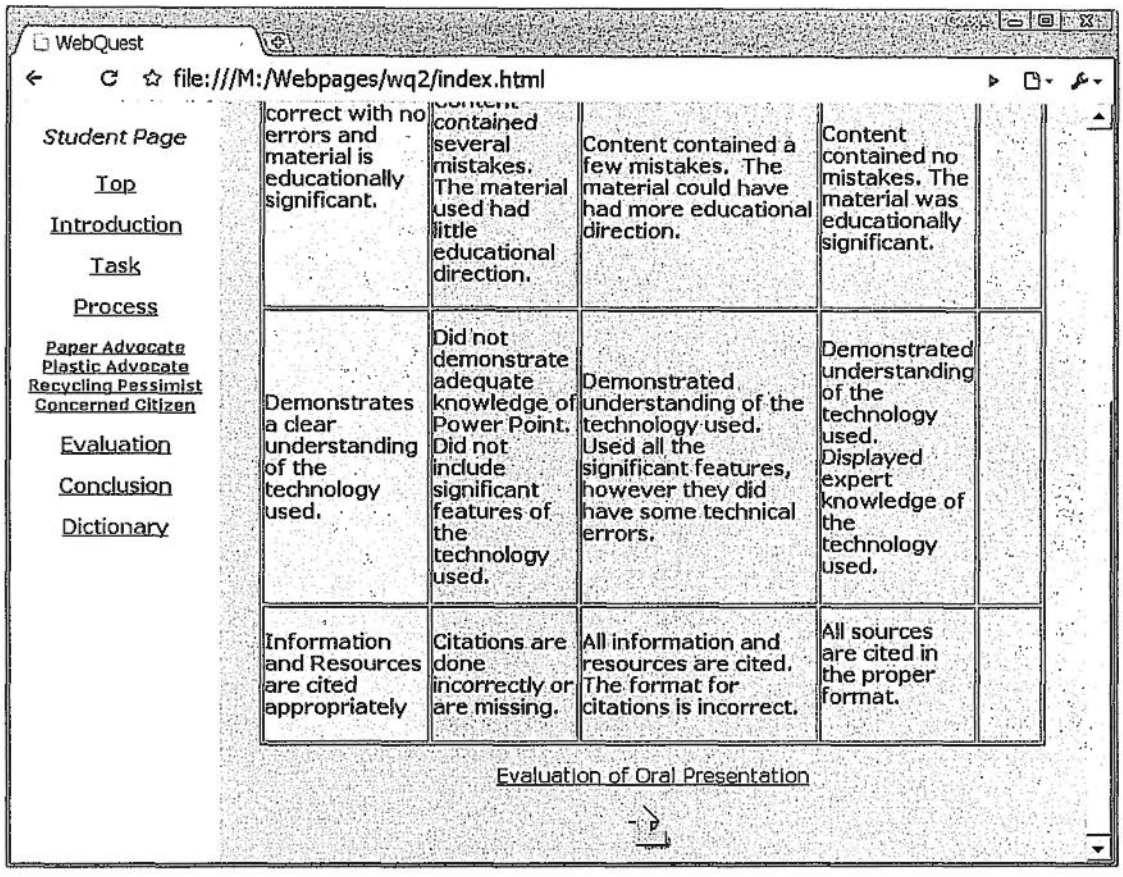
Evaluation of PowerPoint Document

	Beginning 1	Developing 2	Exemplary 3	Score
Audience's attention is easily captured and maintained.	Presented very little material that stimulated the audience's attention. Lack of interesting text and visuals.	Presented some interesting material that stimulated the audience's attention. Contained a few interesting text slides and visuals.	Presentation grabbed the audience's attention. Use of text and visuals enhanced the presentation to the utmost.	
Content is correct with no errors and material is educationally significant.	Content contained several mistakes. The material used had little educational direction.	Content contained a few mistakes. The material could have had more educational direction.	Content contained no mistakes. The material was educationally significant.	
	Did not demonstrate adequate	Demonstrated	Demonstrated understanding	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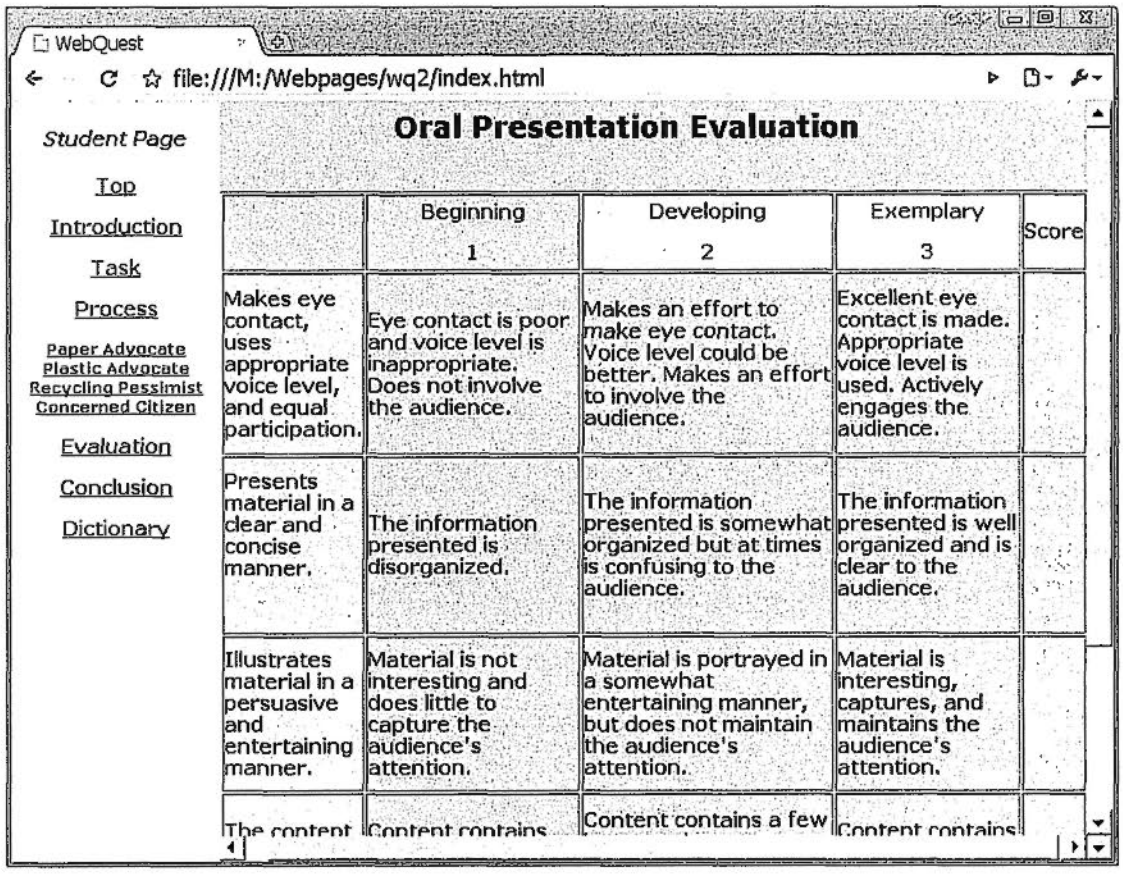
correct with no errors and material is educationally significant.
contained several mistakes. The material used had little educational direction.
Content contained a few mistakes. The material could have had more educational direction.
Content contained no mistakes. The material was educationally significant.
Demonstrates a clear understanding of the technology used.
Did not demonstrate adequate knowledge of Power Point. Did not include significant features of the technology used.
Demonstrated understanding of the technology used. Used all the significant features, however they did have some technical errors.
Demonstrated understanding of the technology used. Displayed expert knowledge of the technology used.
Information and Resources are cited appropriately
Citations are done incorrectly or are missing.
All information and resources are cited. The format for citations is incorrect.
All sources are cited in the proper format.
Evaluation of Oral Presentation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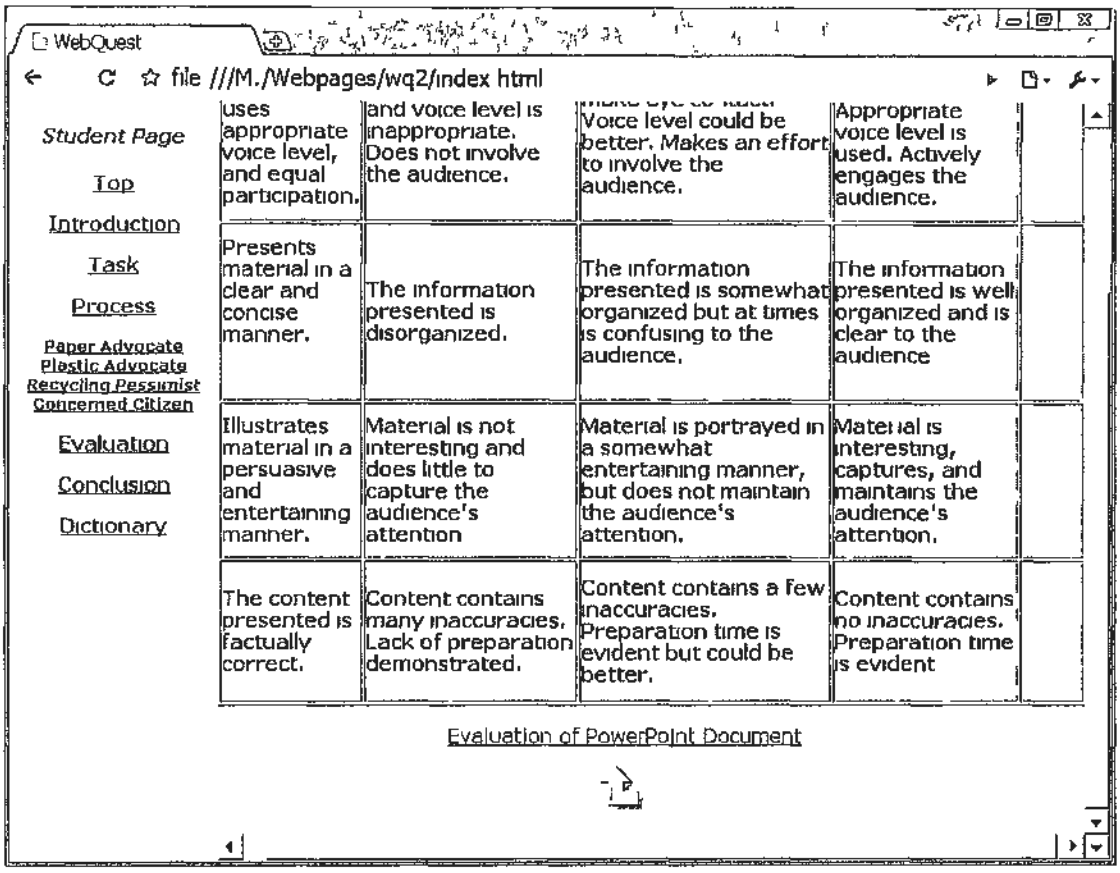
Oral Presentation Evaluation
Beginning 1
Developing 2
Exemplary 3
Score
Makes eye contact, uses appropriate voice level, and equal participation.
Eye contact is poor and voice level is inappropriate. Does not involve the audience.
Makes an effort to make eye contact. Voice level could be better. Makes an effort to involve the audience.
Excellent eye contact is made. Appropriate voice level is used. Actively engages the audience.
Presents material in a clear and concise manner.
The information presented is disorganized.
The information presented is somewhat organized but at times is confusing to the audience.
The information presented is well organized and is clear to the audience.
Illustrates material in a persuasive and entertaining manner.
Material is not interesting and does little to capture the audience's attention.
Material is portrayed in a somewhat entertaining manner, but does not maintain the audience's attention.
Material is interesting, captures, and maintains the audience's attention.
The content
Content contains
Content contains a few
Content contains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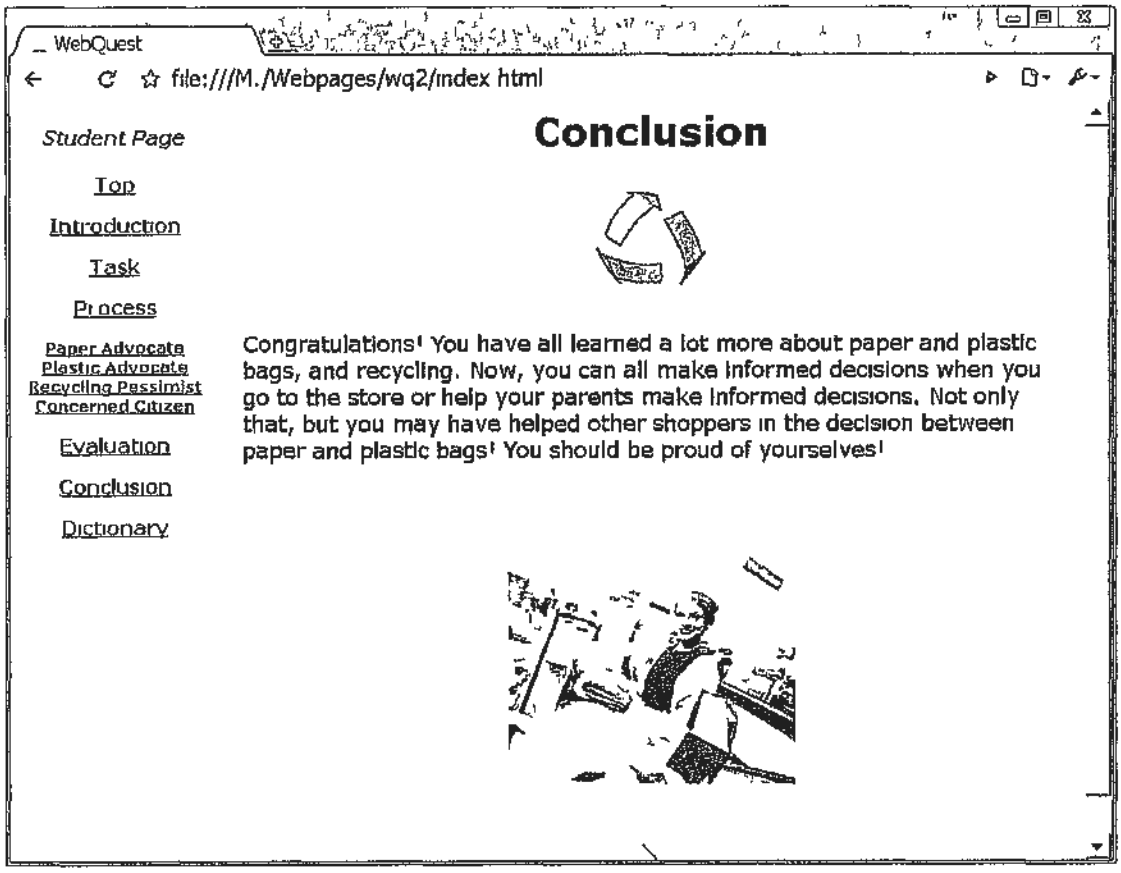
uses appropriate voice level, and equal participation.
and voice level is inappropriate. Does not involve the audience.
Voice level could be better. Makes an effort to involve the audience.
Appropriate voice level is used. Actively engages the audience.
Presents material in a clear and concise manner.
The information presented is disorganized.
The information presented is somewhat organized but at times is confusing to the audience.
The information presented is well organized and is clear to the audience
Illustrates material in a persuasive and entertaining manner.
Material is not interesting and does little to capture the audience's attention
Material is portrayed in a somewhat entertaining manner, but does not maintain the audience's attention.
Material is interesting, captures, and maintains the audience's attention.
The content presented is factually correct.
Content contains many inaccuracies. Lack of preparation demonstrated.
Content contains a few inaccuracies. Preparation time is evident but could be better.
Content contains no inaccuracies. Preparation time is evident
Evaluation of PowerPoint Document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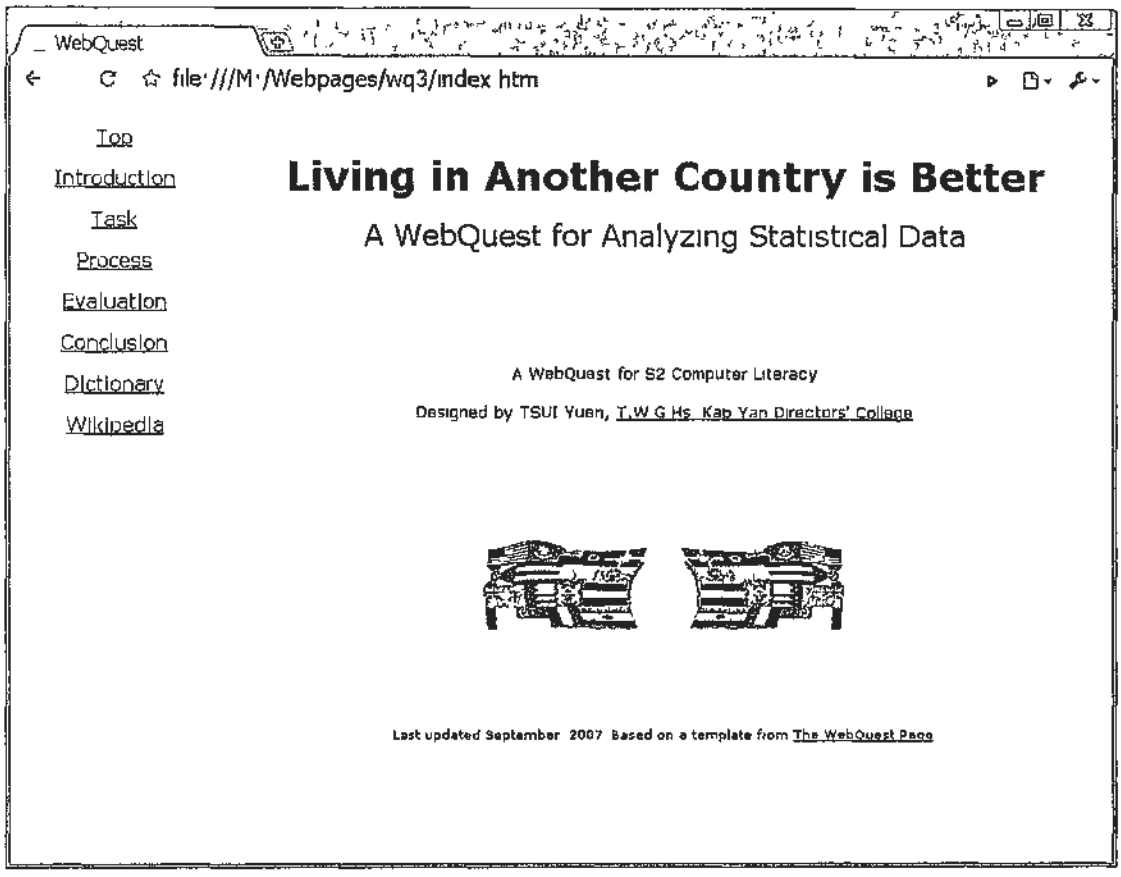
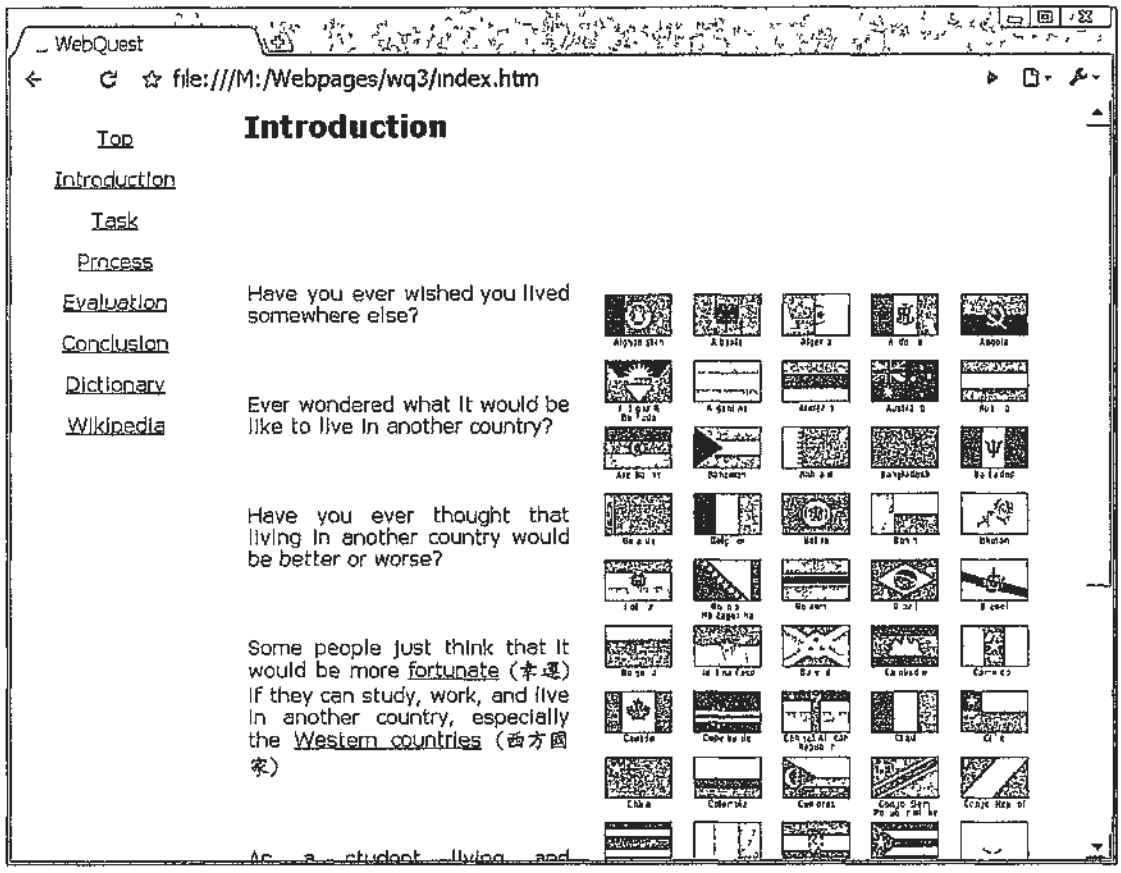
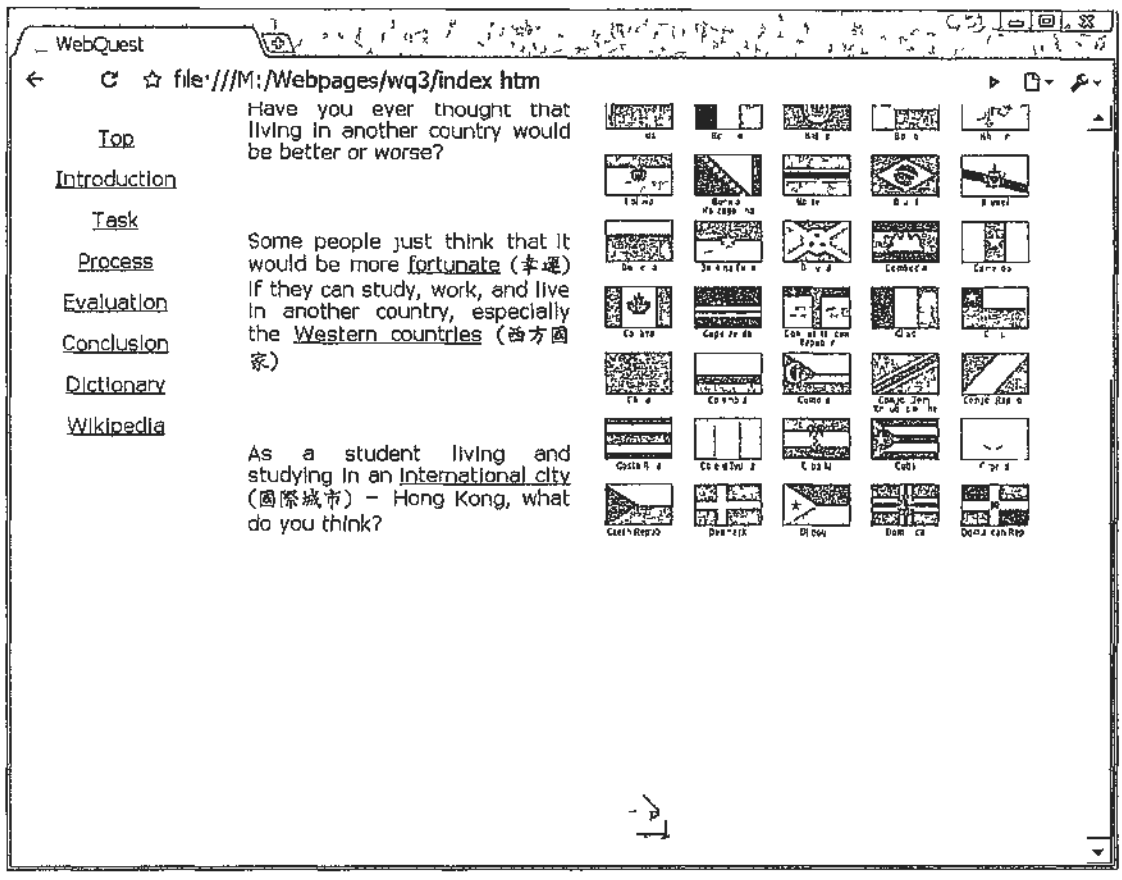
Conclusion
Congratulations! You have all learned a lot more about paper and plastic bags, and recycling. Now, you can all make informed decisions when you go to the store or help your parents make informed decisions. Not only that, but you may have helped other shoppers in the decision between paper and plastic bags! You should be proud of yourselves!

Appendix 7: Screenshots of the WebQuest (*WQ3*)



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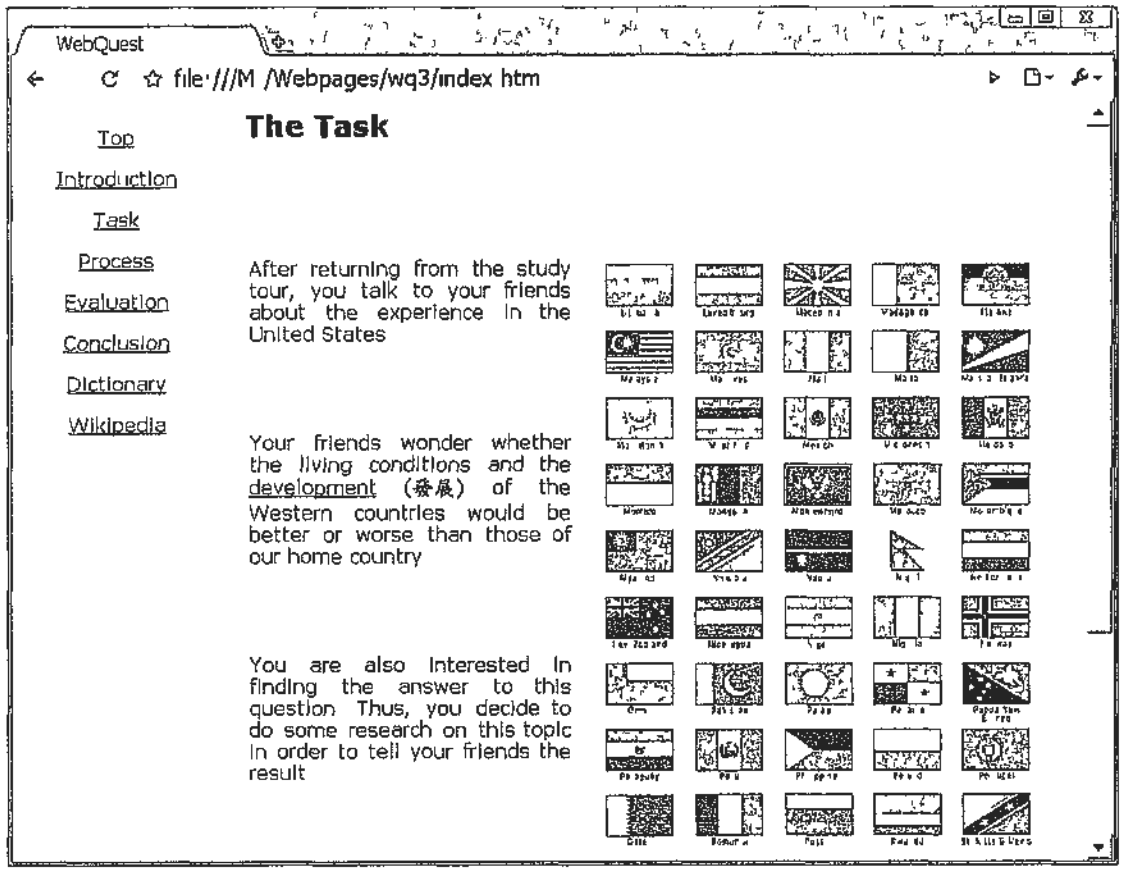
Have you ever thought that living in another country would be better or worse?
Some people just think that it would be more fortunate (幸運) if they can study, work, and live in another country, especially the Western countries (西方國家)
As a student living and studying in an International city (國際城市) – Hong Kong, what do you think?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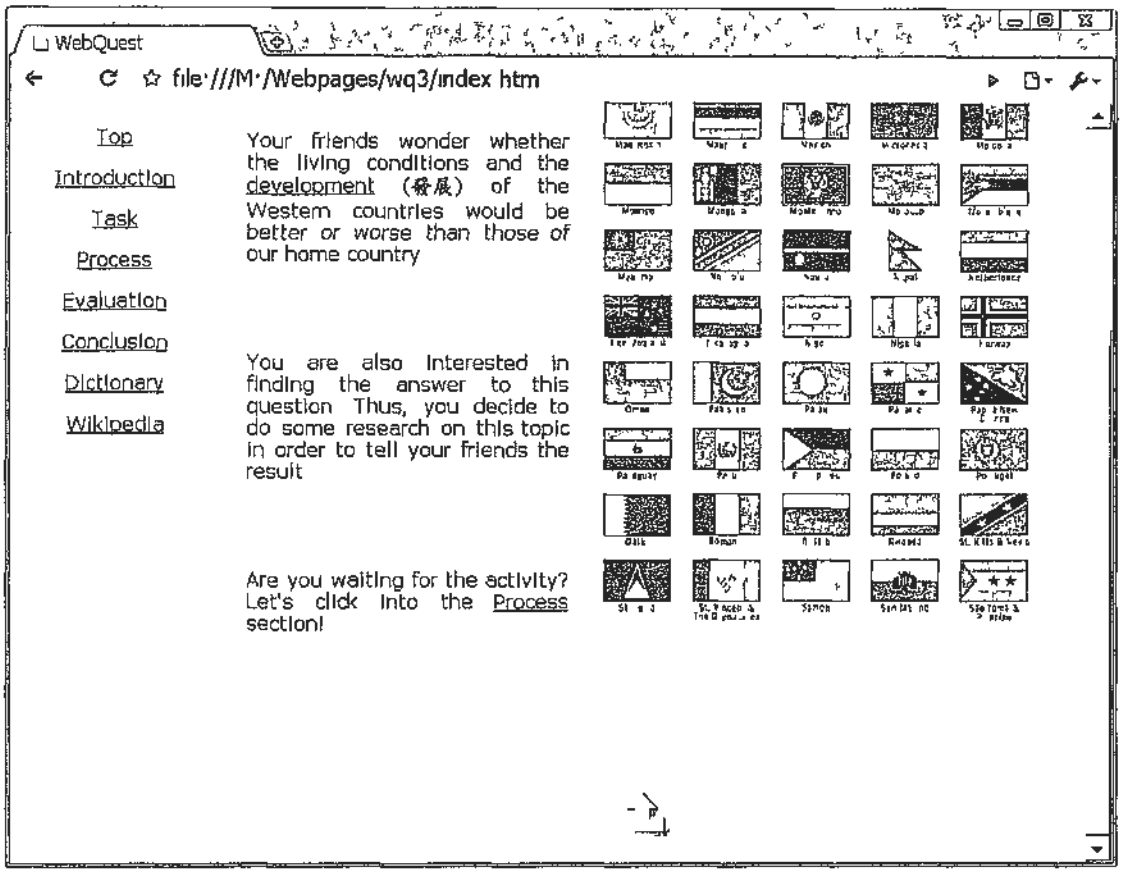
The Task
After returning from the study tour, you talk to your friends about the experience in the United States
Your friends wonder whether the living conditions and the development (發展) of the Western countries would be better or worse than those of our home country
You are also interested in finding the answer to this question Thus, you decide to do some research on this topic in order to tell your friends the result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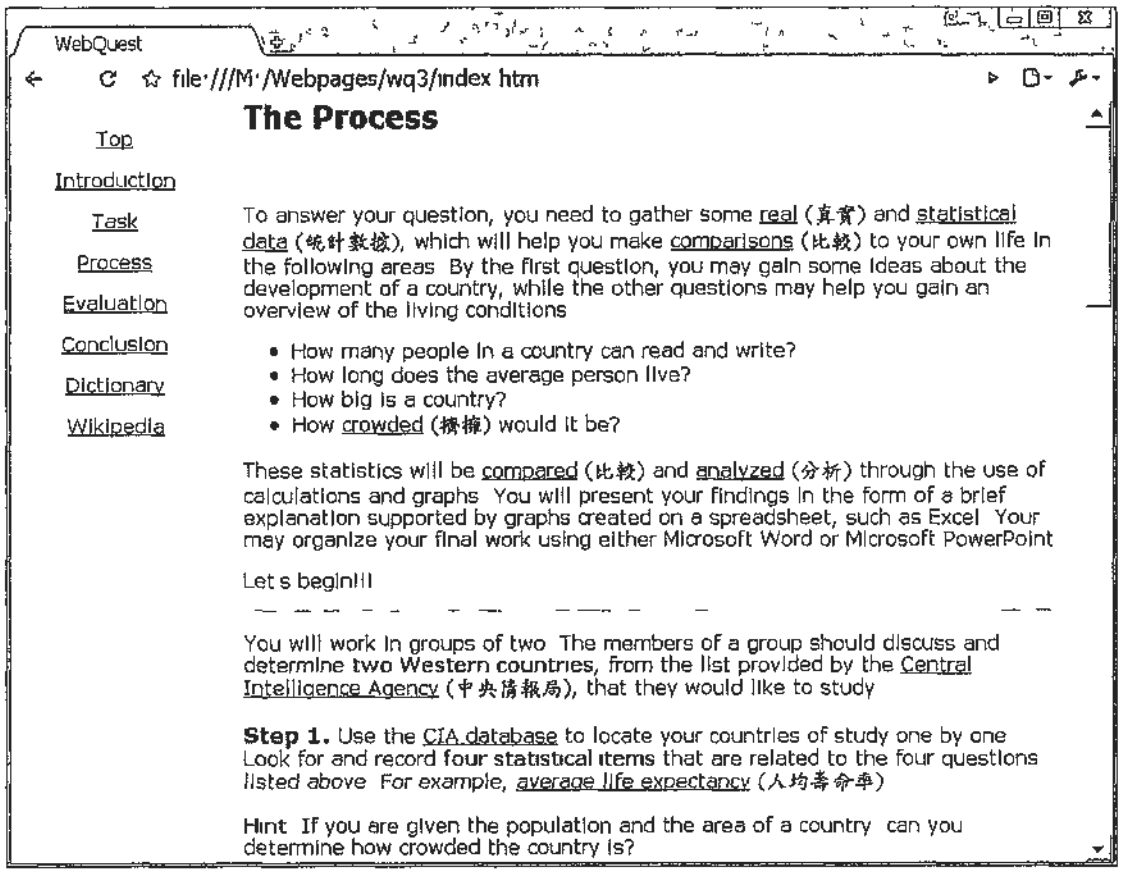
Your friends wonder whether the living conditions and the development (發展) of the Western countries would be better or worse than those of our home country
You are also interested in finding the answer to this question. Thus, you decide to do some research on this topic in order to tell your friends the result
Are you waiting for the activity? Let's click into the Process section!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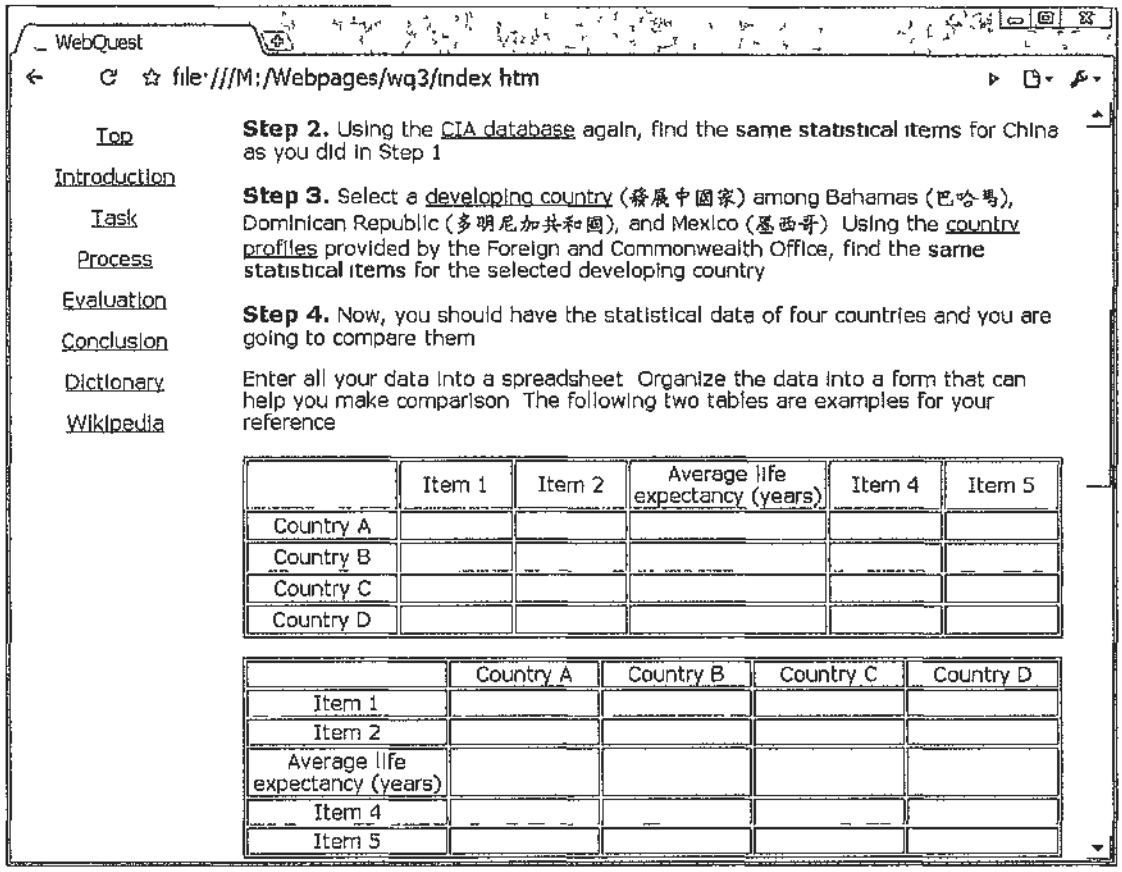
The Process
To answer your question, you need to gather some real (真實) and statistical data (統計數據), which will help you make comparisons (比較) to your own life in the following areas. By the first question, you may gain some ideas about the development of a country, while the other questions may help you gain an overview of the living conditions.
• How many people in a country can read and write?
• How long does the average person live?
• How big is a country?
• How crowded (擁擠) would it be?
These statistics will be compared (比較) and analyzed (分析) through the use of calculations and graphs. You will present your findings in the form of a brief explanation supported by graphs created on a spreadsheet, such as Excel. You may organize your final work using either Microsoft Word or Microsoft PowerPoint.
Let's begin!!!
You will work in groups of two. The members of a group should discuss and determine two Western countries, from the list provided by the Central Intelligence Agency (中央情報局), that they would like to study.
Step 1. Use the CIA database to locate your countries of study one by one. Look for and record four statistical items that are related to the four questions listed above. For example, average life expectancy (人均壽命率).
Hint: If you are given the population and the area of a country, can you determine how crowded the country is?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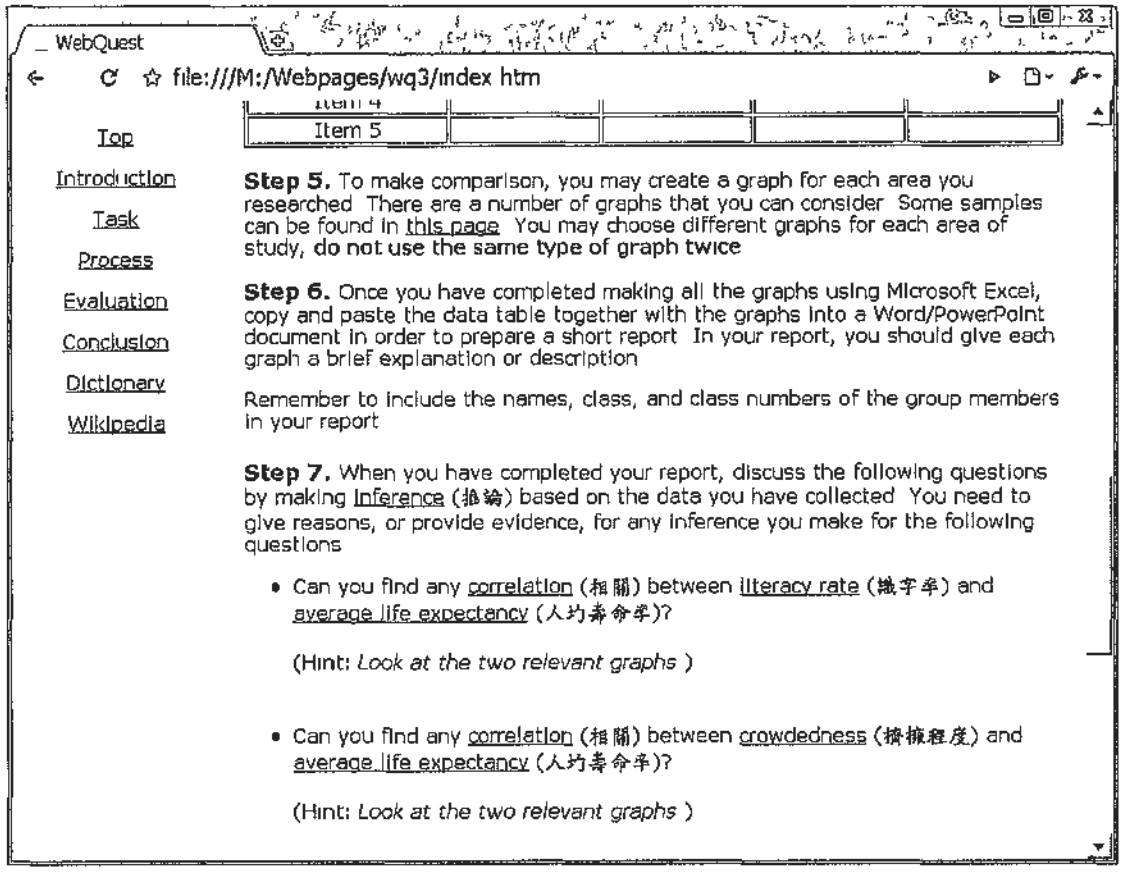
Step 2. Using the CIA database again, find the same statistical items for China as you did in Step 1
Step 3. Select a developing country (發展中國家) among Bahamas (巴哈馬), Dominican Republic (多明尼加共和國), and Mexico (墨西哥) Using the country profiles provided by the Foreign and Commonwealth Office, find the same statistical items for the selected developing country
Step 4. Now, you should have the statistical data of four countries and you are going to compare them
Enter all your data into a spreadsheet Organize the data into a form that can help you make comparison The following two tables are examples for your reference
Item 1
Item 2
Average life expectancy (years)
Item 4
Item 5
Country A
Country B
Country C
Country D
Item 1
Item 2
Average life expectancy (years)
Item 4
Item 5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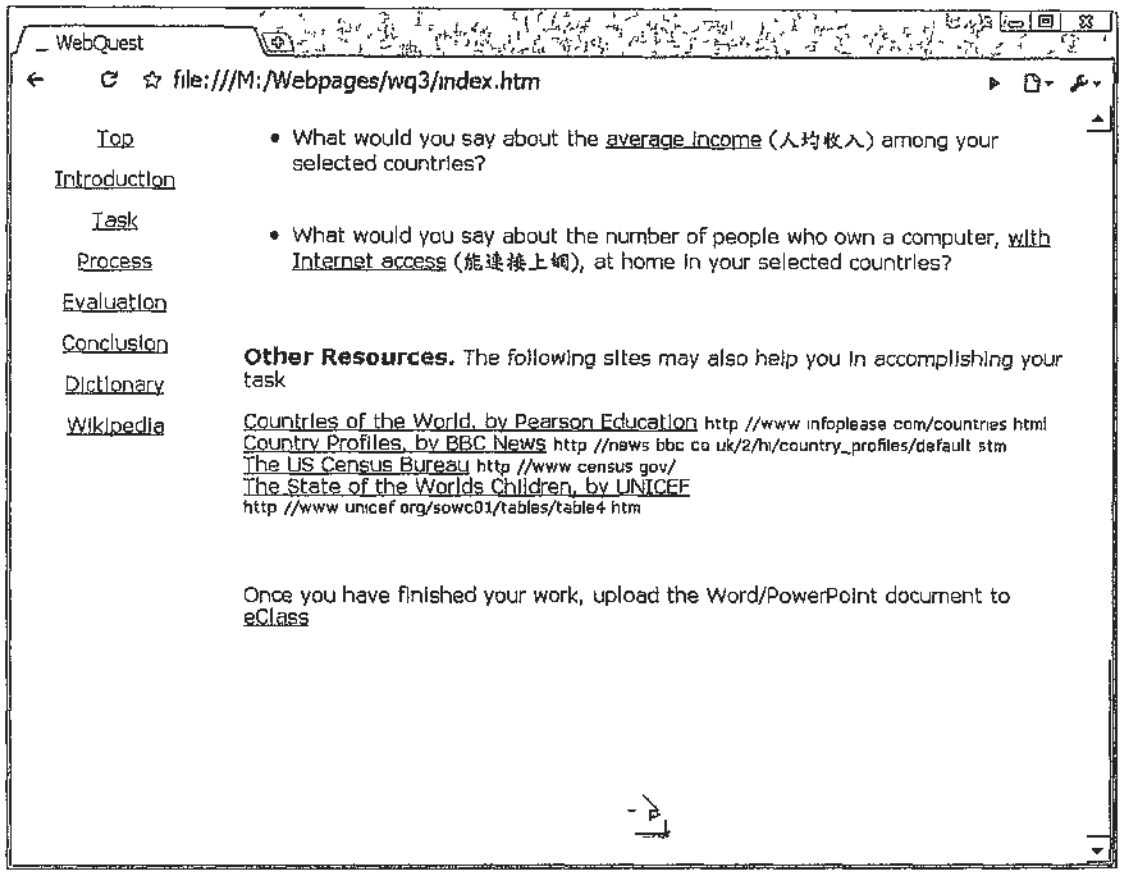
Item 5
Step 5. To make comparison, you may create a graph for each area you researched There are a number of graphs that you can consider Some samples can be found in this page You may choose different graphs for each area of study, do not use the same type of graph twice
Step 6. Once you have completed making all the graphs using Microsoft Excel, copy and paste the data table together with the graphs into a Word/PowerPoint document in order to prepare a short report In your report, you should give each graph a brief explanation or description
Remember to include the names, class, and class numbers of the group members in your report
Step 7. When you have completed your report, discuss the following questions by making Inference (推論) based on the data you have collected You need to give reasons, or provide evidence, for any inference you make for the following questions
Can you find any correlation (相關) between literacy rate (識字率) and average life expectancy (人均壽命率)?
(Hint: Look at the two relevant graphs)
Can you find any correlation (相關) between crowdedness (擠擁程度) and average life expectancy (人均壽命率)?
(Hint: Look at the two relevant graphs)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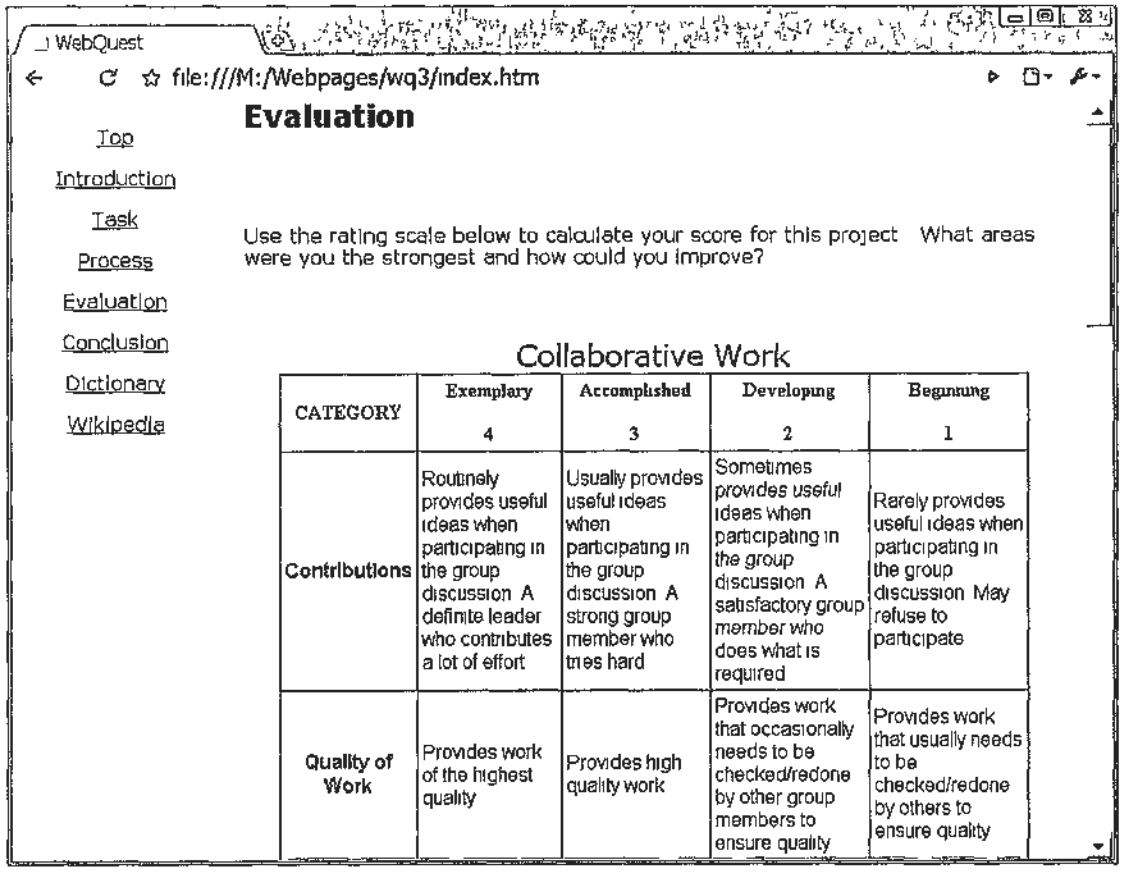
• What would you say about the average income (人均收入) among your selected countries?
• What would you say about the number of people who own a computer, with Internet access (能連接上網), at home in your selected countries?
Other Resources. The following sites may also help you in accomplishing your task
Countries of the World, by Pearson Education http //www infoplease com/countries html
Country Profiles, by BBC News http //news bbc co uk/2/hi/country_profiles/default stm
The US Census Bureau http //www census gov/
The State of the Worlds Children, by UNICEF
http //www unicef org/sowc01/tables/table4 htm
Once you have finished your work, upload the Word/PowerPoint document to eClass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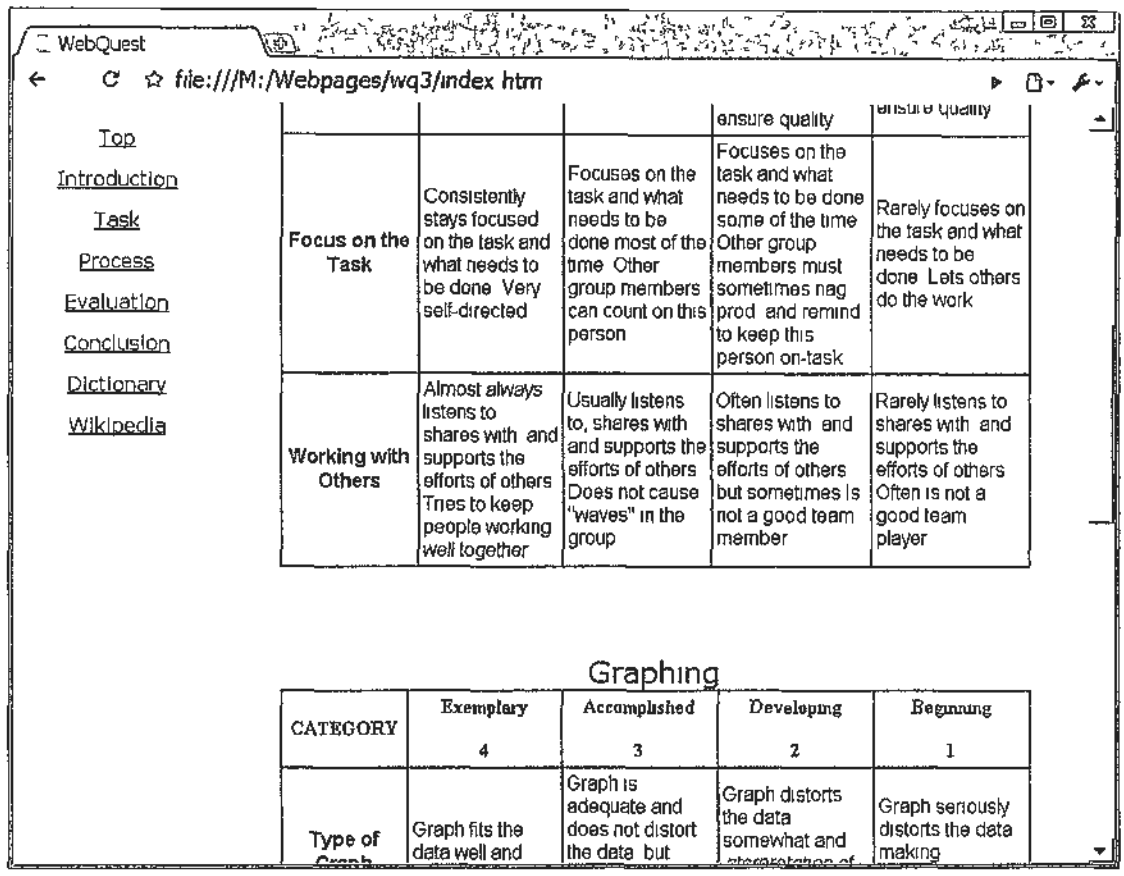
Evaluation
Use the rating scale below to calculate your score for this project What areas were you the strongest and how could you improve?
Collaborative Work
CATEGORY
Exemplary 4
Accomplished 3
Developing 2
Beginning 1
Contributions
Routinely provides useful ideas when participating in the group discussion A definite leader who contributes a lot of effort
Usually provides useful ideas when participating in the group discussion A strong group member who tries hard
Sometimes provides useful ideas when participating in the group discussion A satisfactory group member who does what is required
Rarely provides useful ideas when participating in the group discussion May refuse to participate
Quality of Work
Provides work of the highest quality
Provides high quality work
Provides work that occasionally needs to be checked/redone by other group members to ensure quality
Provides work that usually needs to be checked/redone by others to ensure quality



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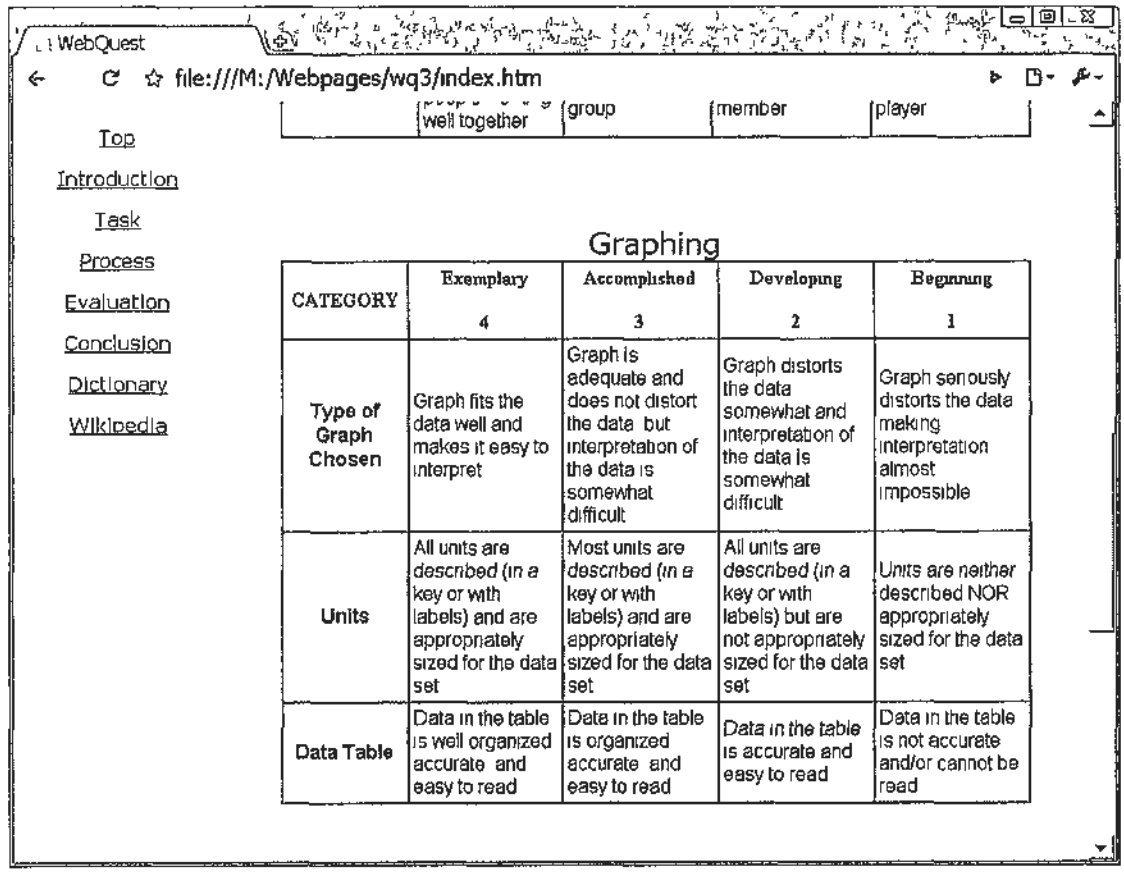
			ensure quality	ensure quality
Focus on the Task	Consistently stays focused on the task and what needs to be done Very self-directed	Focuses on the task and what needs to be done most of the time Other group members can count on this person	Focuses on the task and what needs to be done some of the time Other group members must sometimes nag prod and remind to keep this person on-task	Rarely focuses on the task and what needs to be done Lets others do the work
Working with Others	Almost always listens to shares with and supports the efforts of others Tries to keep people working well together	Usually listens to, shares with and supports the efforts of others Does not cause "waves" in the group	Often listens to shares with and supports the efforts of others but sometimes is not a good team member	Rarely listens to shares with and supports the efforts of others Often is not a good team player

Graphing

CATEGORY	Exemplary 4	Accomplished 3	Developing 2	Beginning 1
Type of Graph	Graph fits the data well and	Graph is adequate and does not distort the data but	Graph distorts the data somewhat and	Graph seriously distorts the data making



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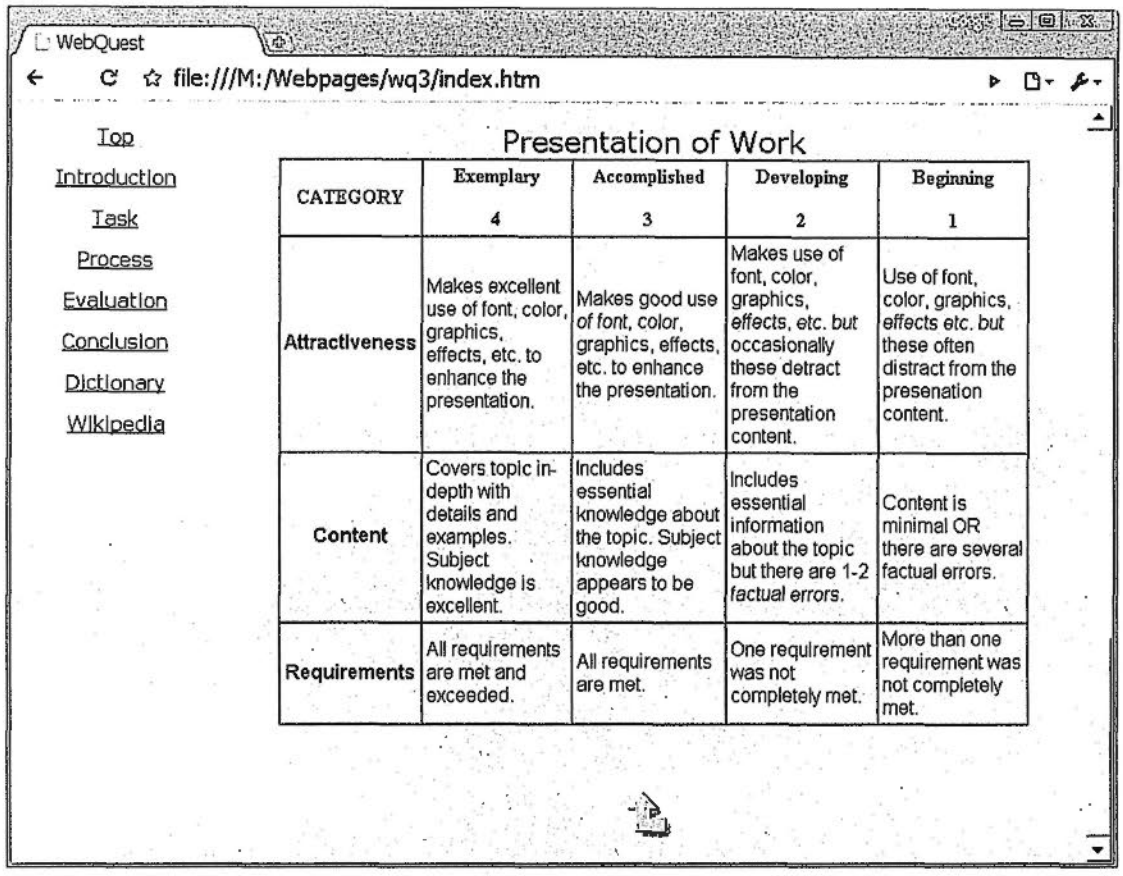
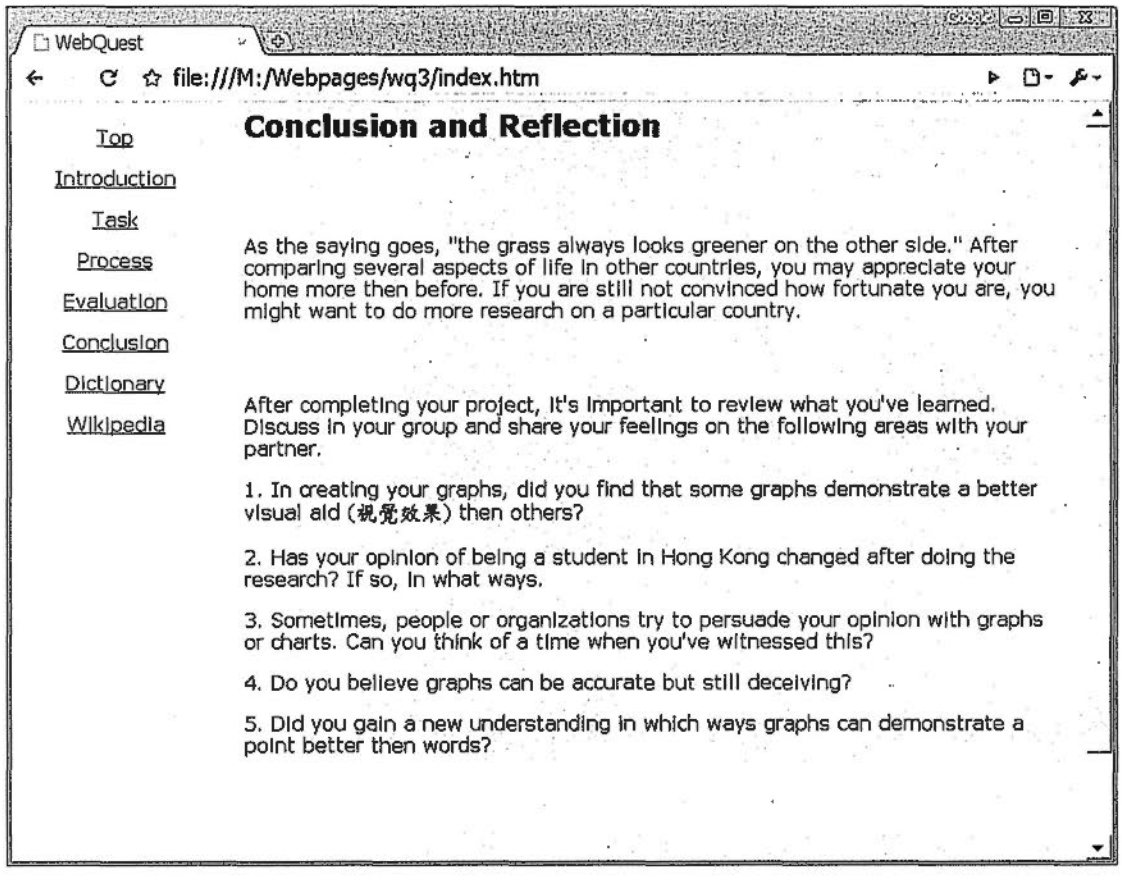
	well together	group	member	player

Graphing

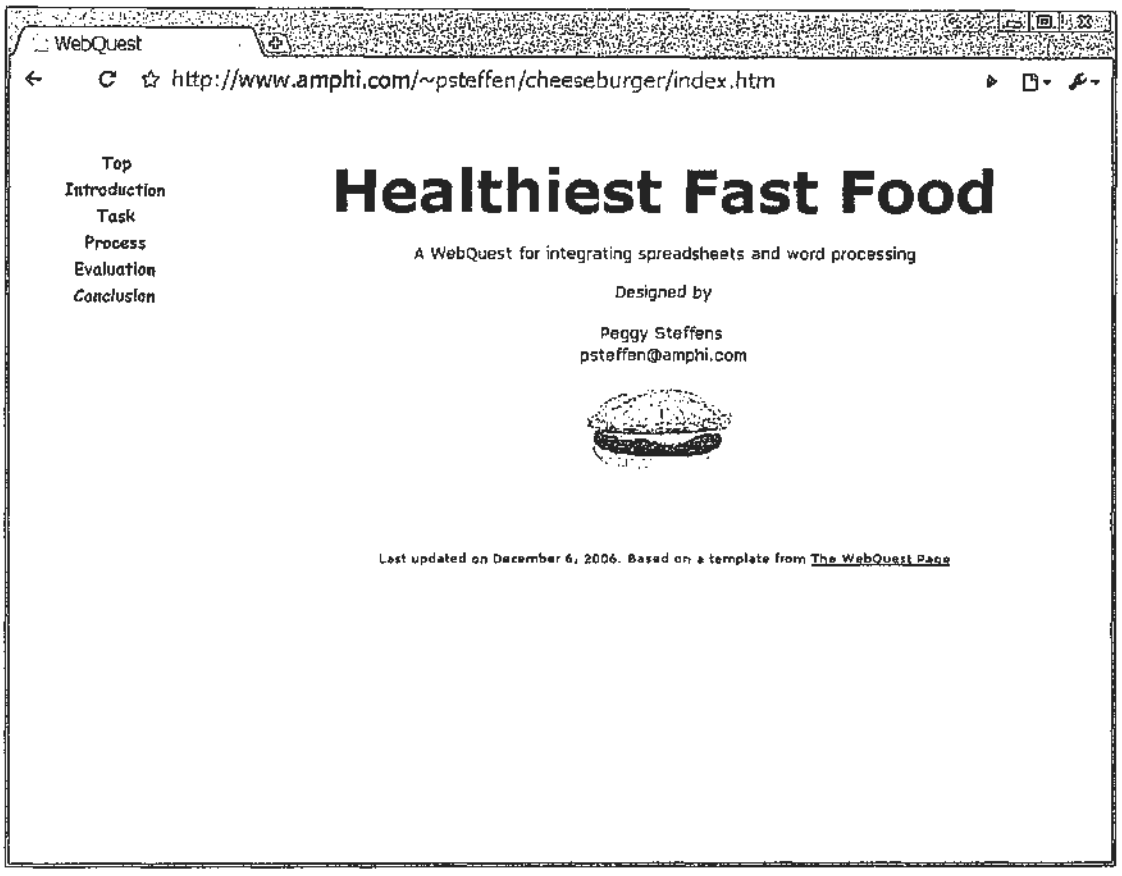
CATEGORY	Exemplary 4	Accomplished 3	Developing 2	Beginning 1
Type of Graph Chosen	Graph fits the data well and makes it easy to interpret	Graph is adequate and does not distort the data but interpretation of the data is somewhat difficult	Graph distorts the data somewhat and interpretation of the data is somewhat difficult	Graph seriously distorts the data making interpretation almost impossible
Units	All units are described (in a key or with labels) and are appropriately sized for the data set	Most units are described (in a key or with labels) and are appropriately sized for the data set	All units are described (in a key or with labels) but are not appropriately sized for the data set	Units are neither described NOR appropriately sized for the data set
Data Table	Data in the table is well organized accurate and easy to read	Data in the table is organized accurate and easy to read	Data in the table is accurate and easy to read	Data in the table is not accurate and/or cannot be read

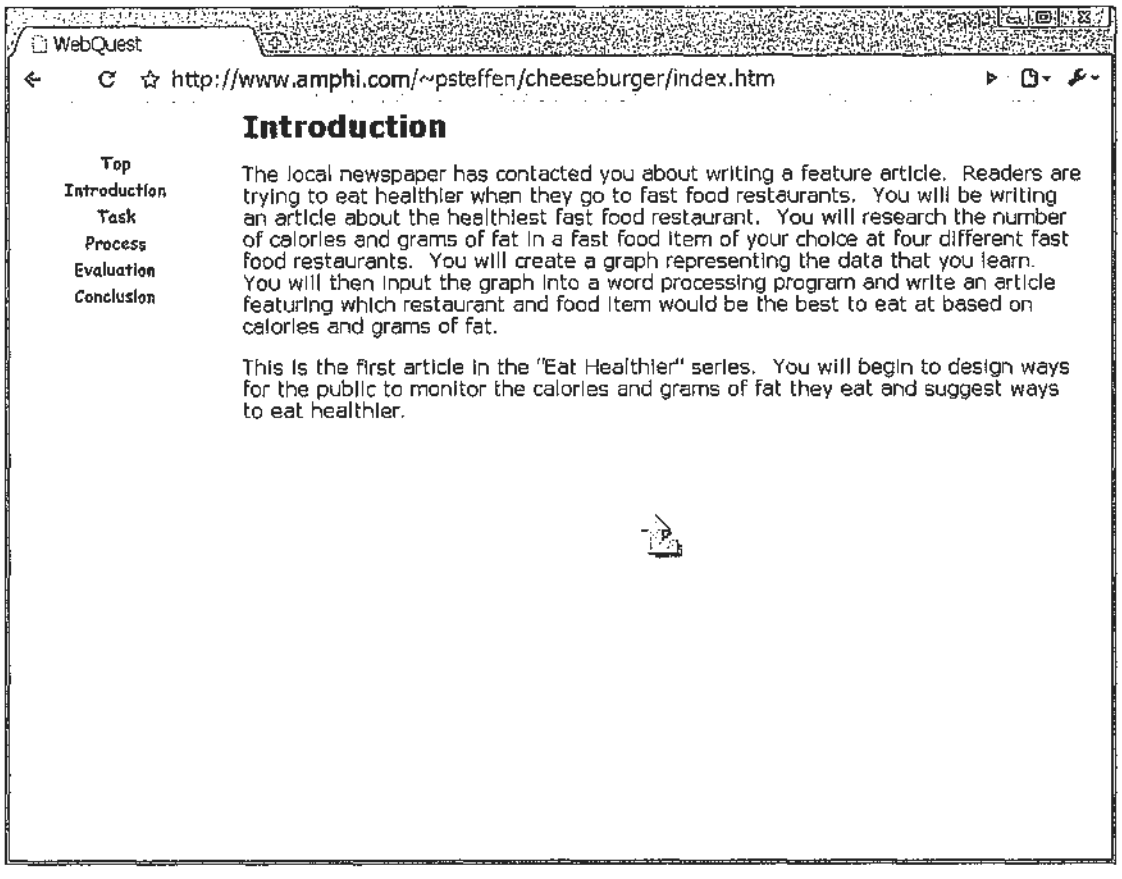


CATEGORY	Exemplary 4	Accomplished 3	Developing 2	Beginning 1
Attractiveness	Makes excellent use of font, color, graphics, effects, etc. to enhance the presentation.	Makes good use of font, color, graphics, effects, etc. to enhance the presentation.	Makes use of font, color, graphics, effects, etc. but occasionally these detract from the presentation content.	Use of font, color, graphics, effects etc. but these often distract from the presenation content.
Content	Covers topic in-depth with details and examples. Subject knowledge is excellent.	Includes essential knowledge about the topic. Subject knowledge appears to be good.	Includes essential information about the topic but there are 1-2 factual errors.	Content is minimal OR there are several factual errors.
Requirements	All requirements are met and exceeded.	All requirements are met.	One requirement was not completely met.	More than one requirement was not completely met.



Appendix 8: Screenshots of the Original WebQuest (*WQ4* before Adaptation)





WebQuest

http //www.amphi.com/~psteffen/cheeseburger/index htm

The Task

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You will be working in groups of two to create an article for the local newspaper on the healthiest fast food restaurant

You will

Determine the number of calories and grams of fat in a food item at four fast food restaurants
Enter the information into a spreadsheet
Create a graph to accurately represent the data
Analyze the information to determine the healthiest restaurant
Create a word processing article with your chart detailing your conclusions
Share your article with the rest of the group

WebQuest

http //www.amphi.com/~psteffen/cheeseburger/index htm

The Process

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You will work in your groups of two.

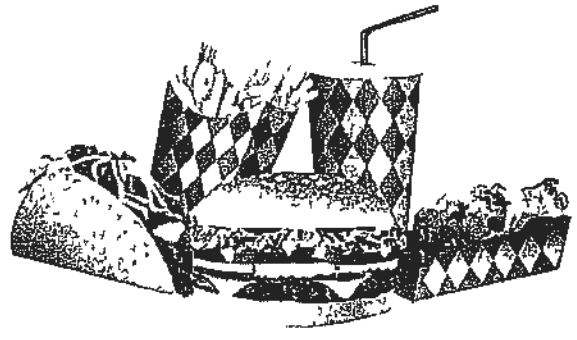
One person will open a Spreadsheet program like Excel
The other person will go to the Washington Post Fast Food Calorie Counter web page.

You will see a screen that looks like this:

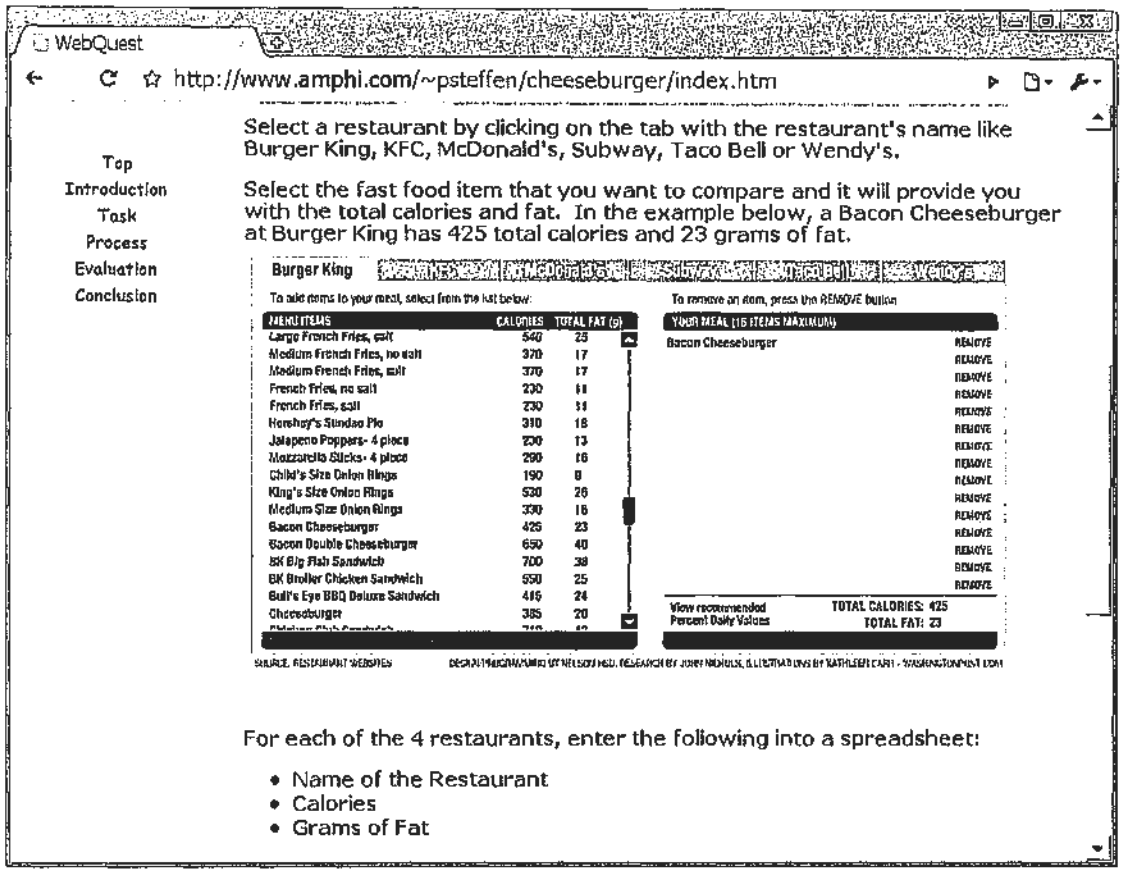
Fast Food Calorie Counter PRINTABLE VERSION

How does your meal add up? Use our fast food calorie counter to calculate the calories and fat you consume when eating at fast food restaurants

Select a menu



Select a restaurant by clicking on the tab with the restaurant's name like Burger King, KFC, McDonald's, Subway, Taco Bell or Wendy's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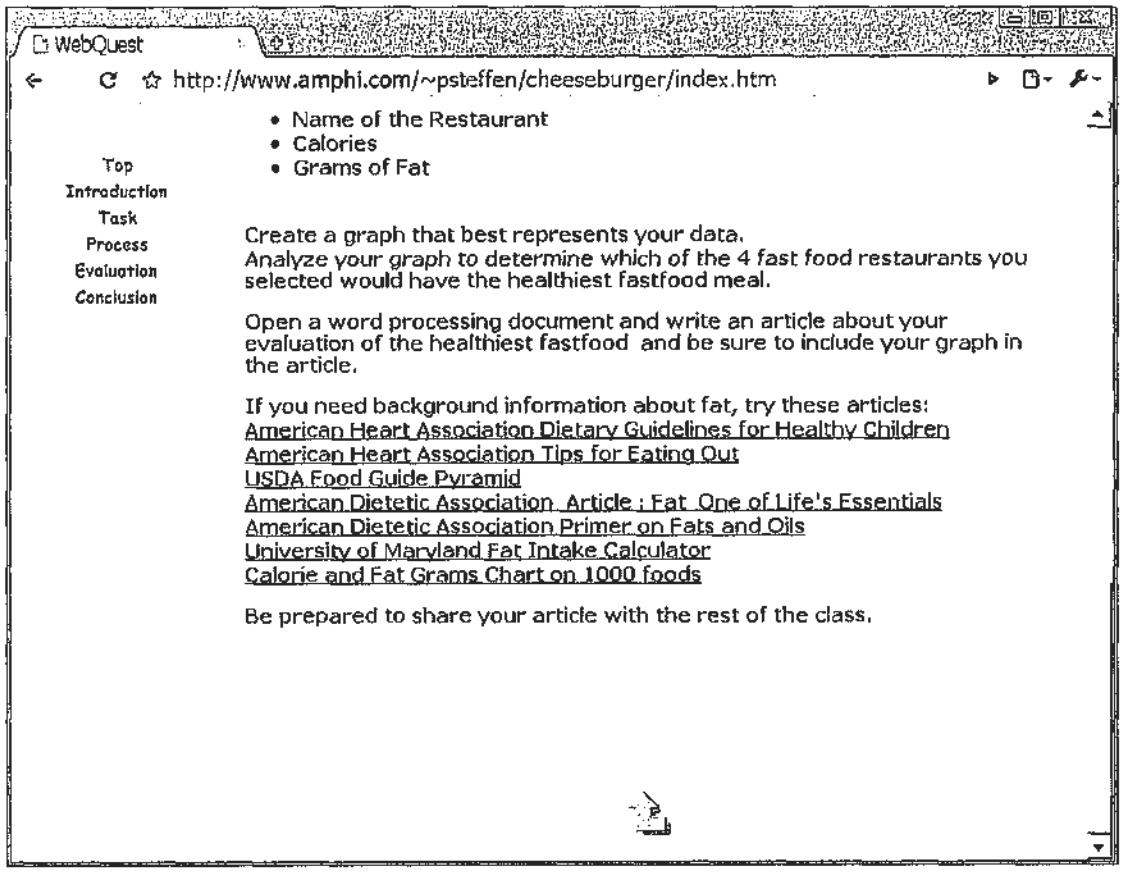
Select a restaurant by clicking on the tab with the restaurant's name like Burger King, KFC, McDonald's, Subway, Taco Bell or Wendy's.
Select the fast food item that you want to compare and it will provide you with the total calories and fat. In the example below, a Bacon Cheeseburger at Burger King has 425 total calories and 23 grams of fat.
Burger King
To add items to your meal, select from the list below:
To remove an item, press the REMOVE button
MENU ITEMS
CALORIES
TOTAL FAT (g)
Large French Fries, salt 540 25
Medium French Fries, no salt 370 17
Medium French Fries, salt 370 17
French Fries, no salt 230 11
French Fries, salt 230 11
Hershey's Sundae Pie 310 16
Jalapeno Poppers- 4 piece 290 13
Mozzarella Sticks- 4 piece 290 16
Child's Size Onion Rings 190 9
King's Size Onion Rings 530 26
Medium Size Onion Rings 330 16
Bacon Cheeseburger 425 23
Bacon Double Cheeseburger 650 40
BK Big Fish Sandwich 700 38
BK Broiler Chicken Sandwich 550 25
Bull's Eye BBQ Deluxe Sandwich 415 24
Cheeseburger 385 20
YOUR MEAL (15 ITEMS MAXIMUM)
Bacon Cheeseburger
REMOVE
View recommended Percent Daily Values
TOTAL CALORIES: 425
TOTAL FAT: 23
For each of the 4 restaurants, enter the following into a spreadsheet:
• Name of the Restaurant
• Calories
• Grams of Fat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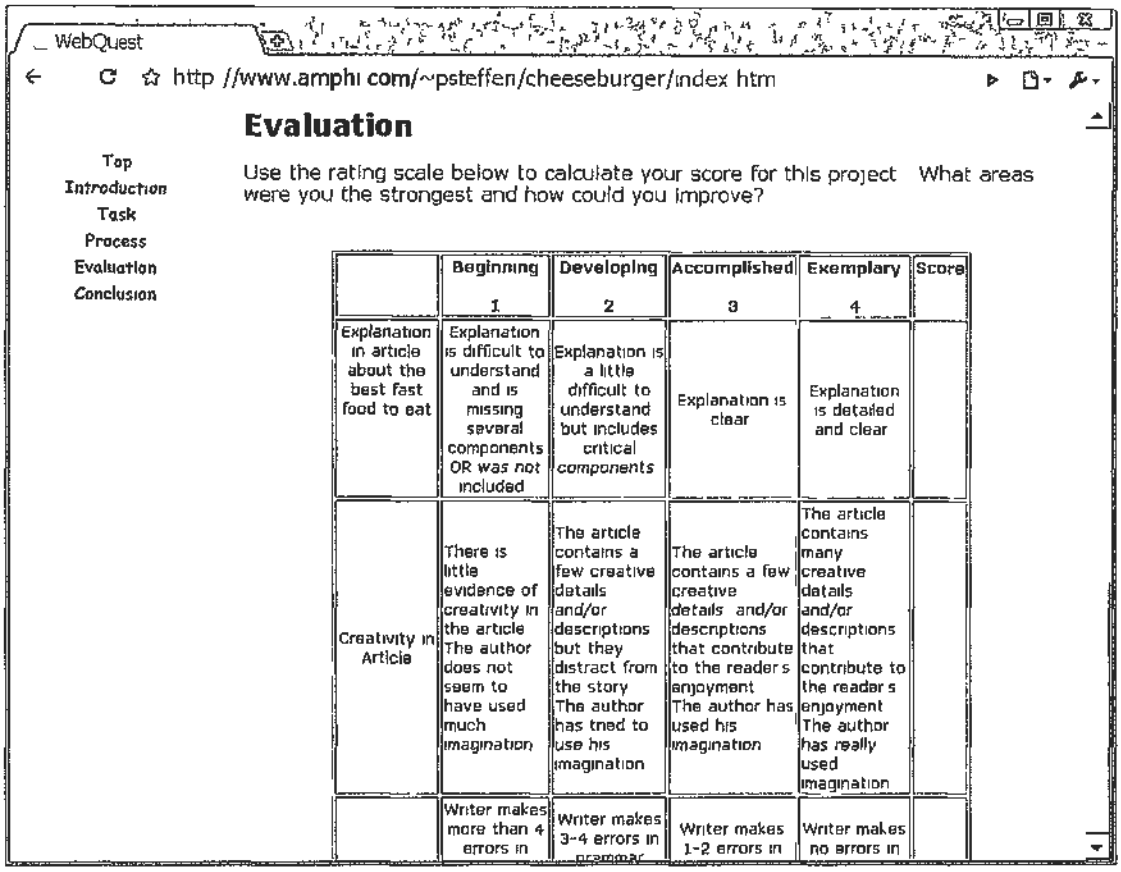
• Name of the Restaurant
• Calories
• Grams of Fat
Create a graph that best represents your data.
Analyze your graph to determine which of the 4 fast food restaurants you selected would have the healthiest fastfood meal.
Open a word processing document and write an article about your evaluation of the healthiest fastfood and be sure to include your graph in the article.
If you need background information about fat, try these articles:
American Heart Association Dietary Guidelines for Healthy Children
American Heart Association Tips for Eating Out
USDA Food Guide Pyramid
American Dietetic Association Article : Fat One of Life's Essentials
American Dietetic Association Primer on Fats and Oils
University of Maryland Fat Intake Calculator
Calorie and Fat Grams Chart on 1000 foods
Be prepared to share your article with the rest of the class.



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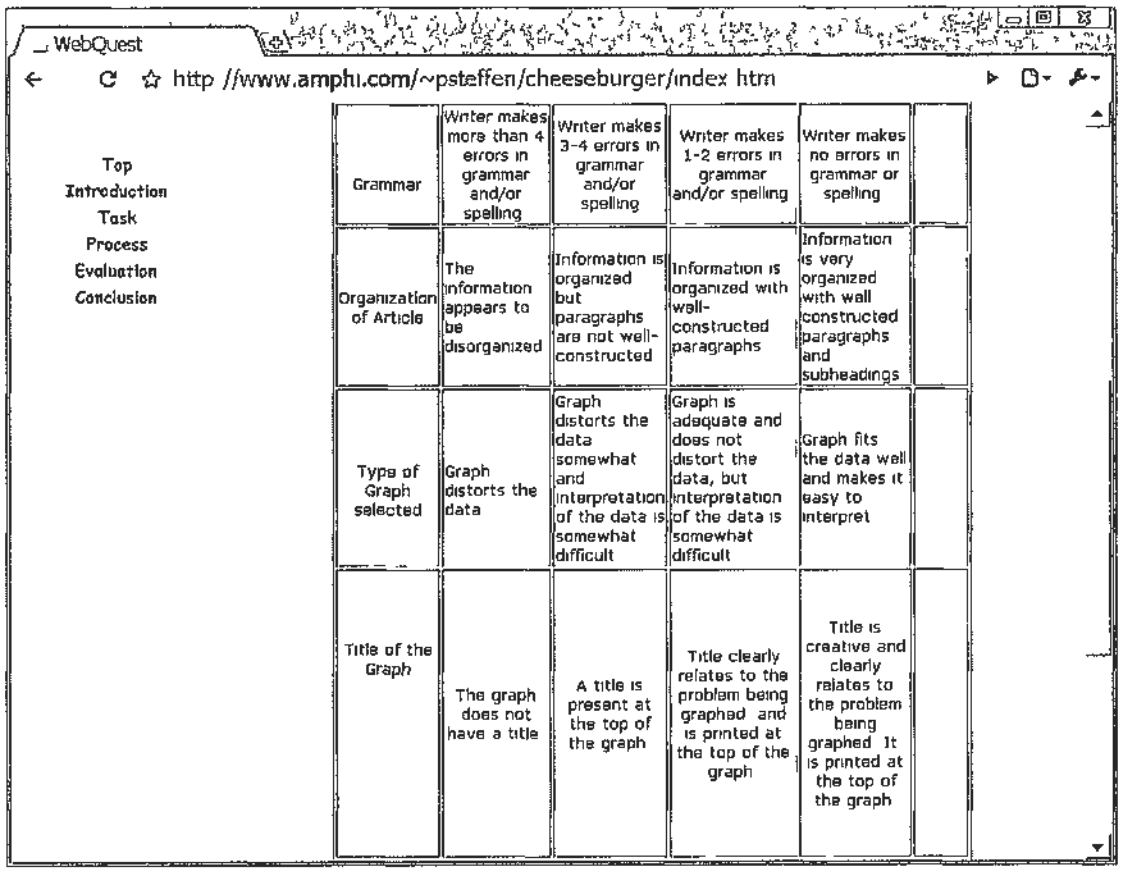
Evaluation

Use the rating scale below to calculate your score for this project What areas were you the strongest and how could you improve?

	Beginning 1	Developing 2	Accomplished 3	Exemplary 4	Score
Explanation in article about the best fast food to eat	Explanation is difficult to understand and is missing several components OR was not included	Explanation is a little difficult to understand but includes critical components	Explanation is clear	Explanation is detailed and clear	
Creativity in Article	There is little evidence of creativity in the article The author does not seem to have used much imagination	The article contains a few creative details and/or descriptions but they distract from the story The author has tried to use his imagination	The article contains a few creative details and/or descriptions that contribute to the reader s enjoyment The author has used his imagination	The article contains many creative details and/or descriptions that contribute to the reader s enjoyment The author has really used imagination	
	Writer makes more than 4 errors in	Writer makes 3-4 errors in grammar	Writer makes 1-2 errors in	Writer makes no errors in	



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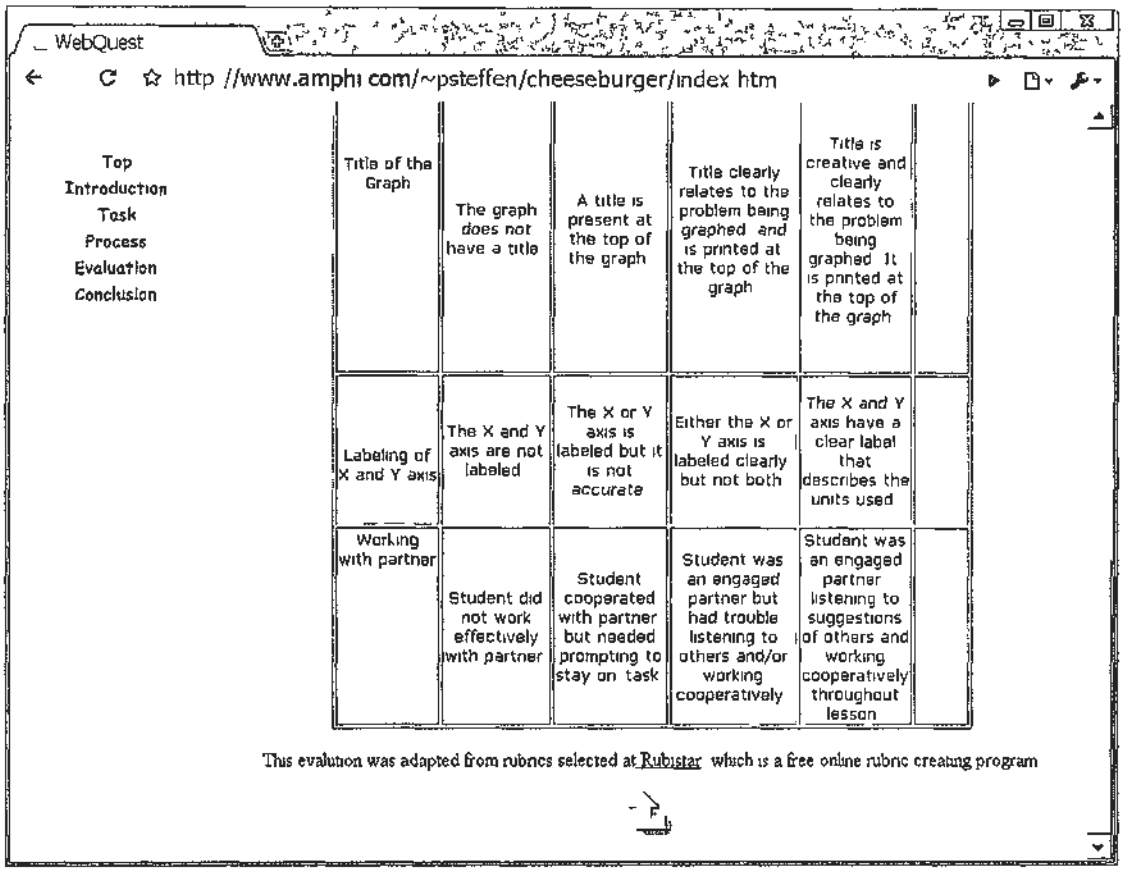
Grammar	Writer makes more than 4 errors in grammar and/or spelling	Writer makes 3-4 errors in grammar and/or spelling	Writer makes 1-2 errors in grammar and/or spelling	Writer makes no errors in grammar or spelling	
Organization of Article	The information appears to be disorganized	Information is organized but paragraphs are not well-constructed	Information is organized with well-constructed paragraphs	Information is very organized with well constructed paragraphs and subheadings	
Type of Graph selected	Graph distorts the data	Graph distorts the data somewhat and interpretation of the data is somewhat difficult	Graph is adequate and does not distort the data, but interpretation of the data is somewhat difficult	Graph fits the data well and makes it easy to interpret	
Title of the Graph	The graph does not have a title	A title is present at the top of the graph	Title clearly relates to the problem being graphed and is printed at the top of the graph	Title is creative and clearly relates to the problem being graphed It is printed at the top of the graph	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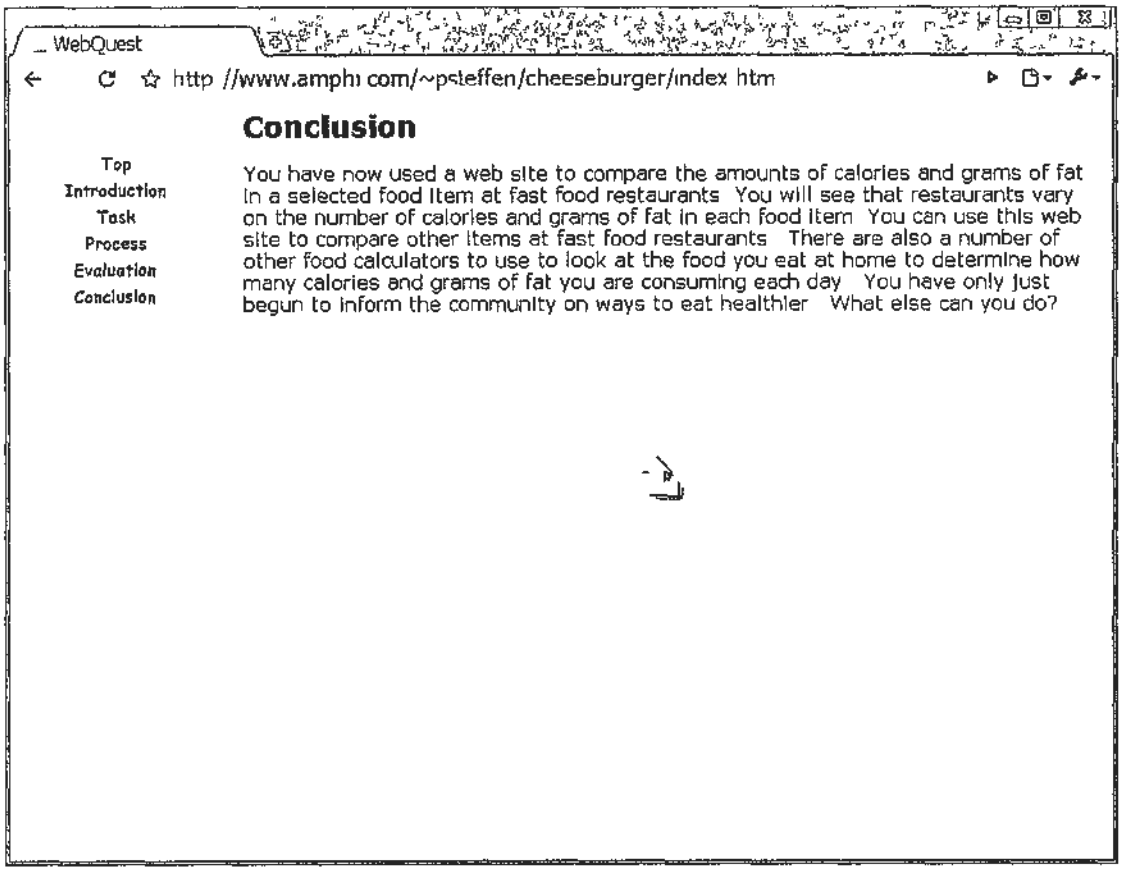
Title of the Graph
The graph does not have a title
A title is present at the top of the graph
Title clearly relates to the problem being graphed and is printed at the top of the graph
Title is creative and clearly relates to the problem being graphed It is printed at the top of the graph
Labeling of X and Y axis
The X and Y axis are not labeled
The X or Y axis is labeled but it is not accurate
Either the X or Y axis is labeled clearly but not both
The X and Y axis have a clear label that describes the units used
Working with partner
Student did not work effectively with partner
Student cooperated with partner but needed prompting to stay on task
Student was an engaged partner but had trouble listening to others and/or working cooperatively
Student was an engaged partner listening to suggestions of others and working cooperatively throughout lesson
This evalution was adapted from rubrics selected at Rubistar which is a free online rubric creating program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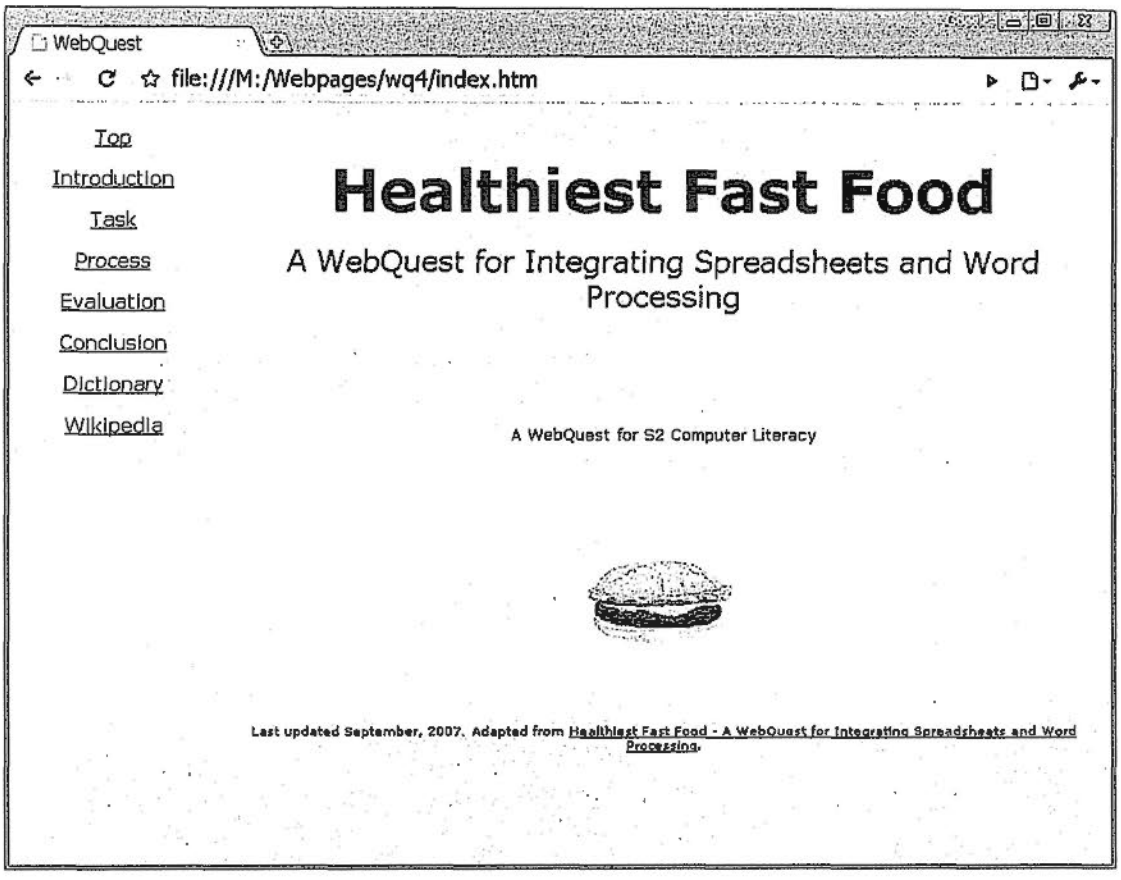
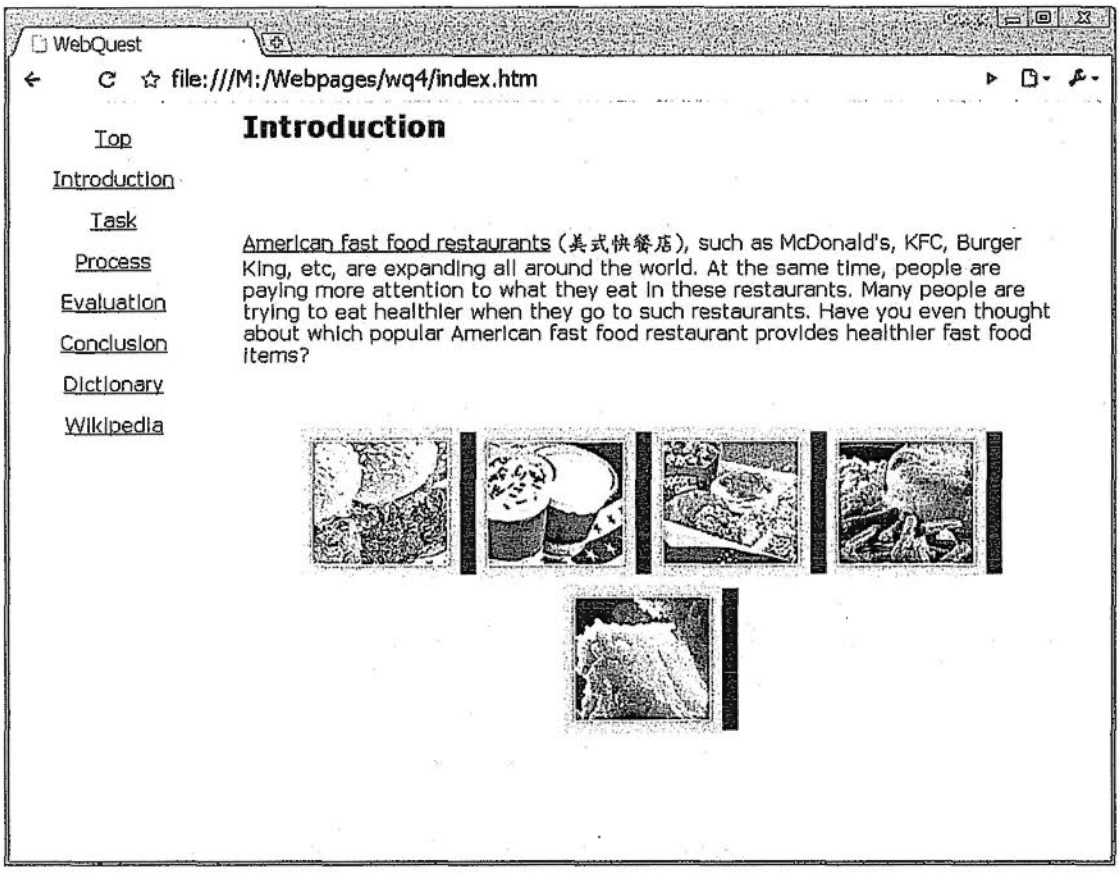
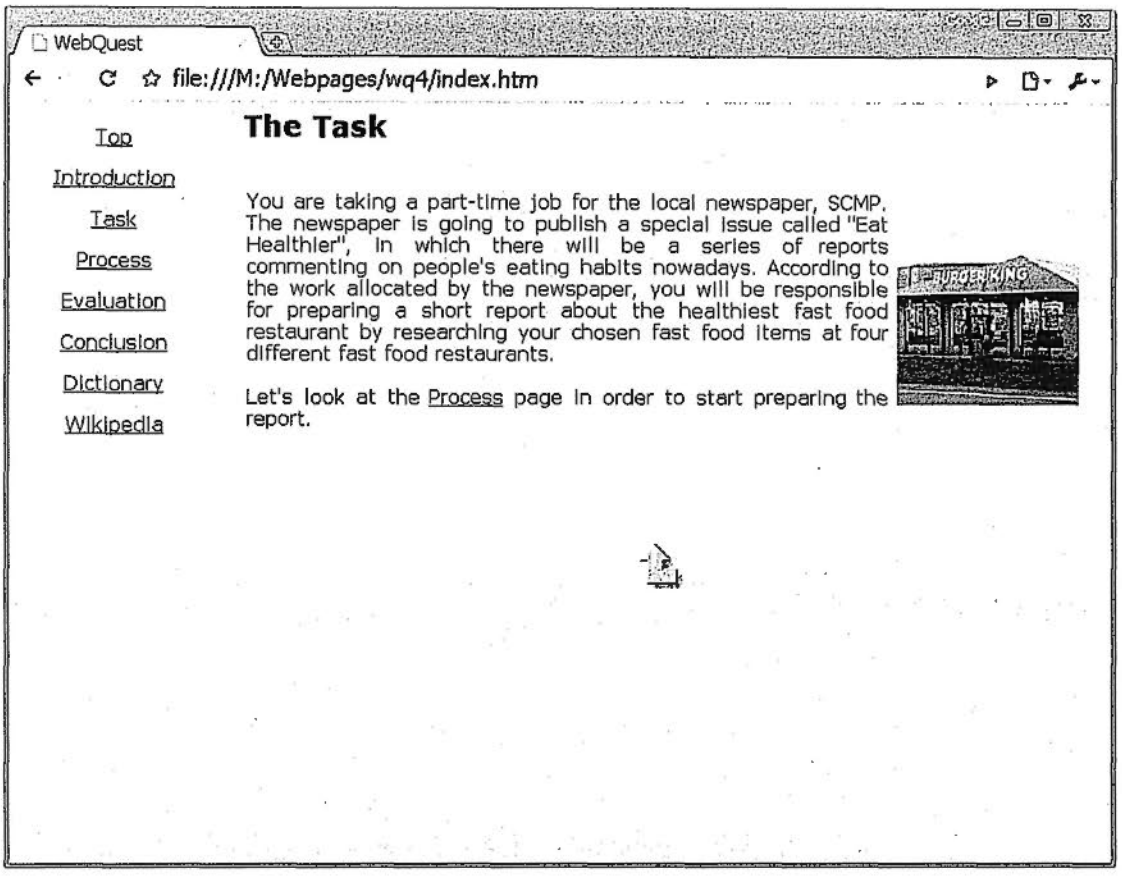
Conclusion
You have now used a web site to compare the amounts of calories and grams of fat in a selected food item at fast food restaurants You will see that restaurants vary on the number of calories and grams of fat in each food item You can use this web site to compare other items at fast food restaurants There are also a number of other food calculators to use to look at the food you eat at home to determine how many calories and grams of fat you are consuming each day You have only just begun to inform the community on ways to eat healthier What else can you do?

Appendix 9: Screenshots of the Modified WebQuest (*WQ4* after Adaptation)



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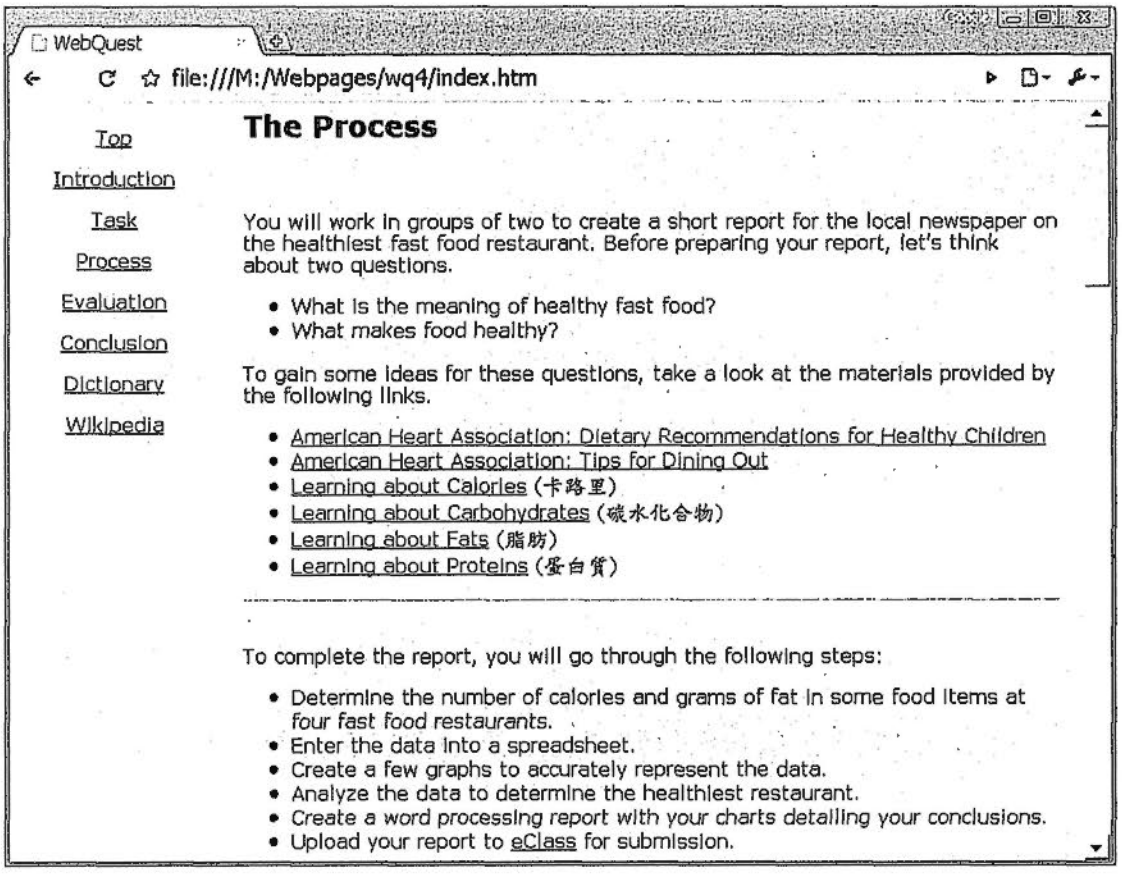
The Task
You are taking a part-time job for the local newspaper, SCMP. The newspaper is going to publish a special issue called "Eat Healthier", in which there will be a series of reports commenting on people's eating habits nowadays. According to the work allocated by the newspaper, you will be responsible for preparing a short report about the healthiest fast food restaurant by researching your chosen fast food items at four different fast food restaurants.
Let's look at the Process page in order to start preparing the report.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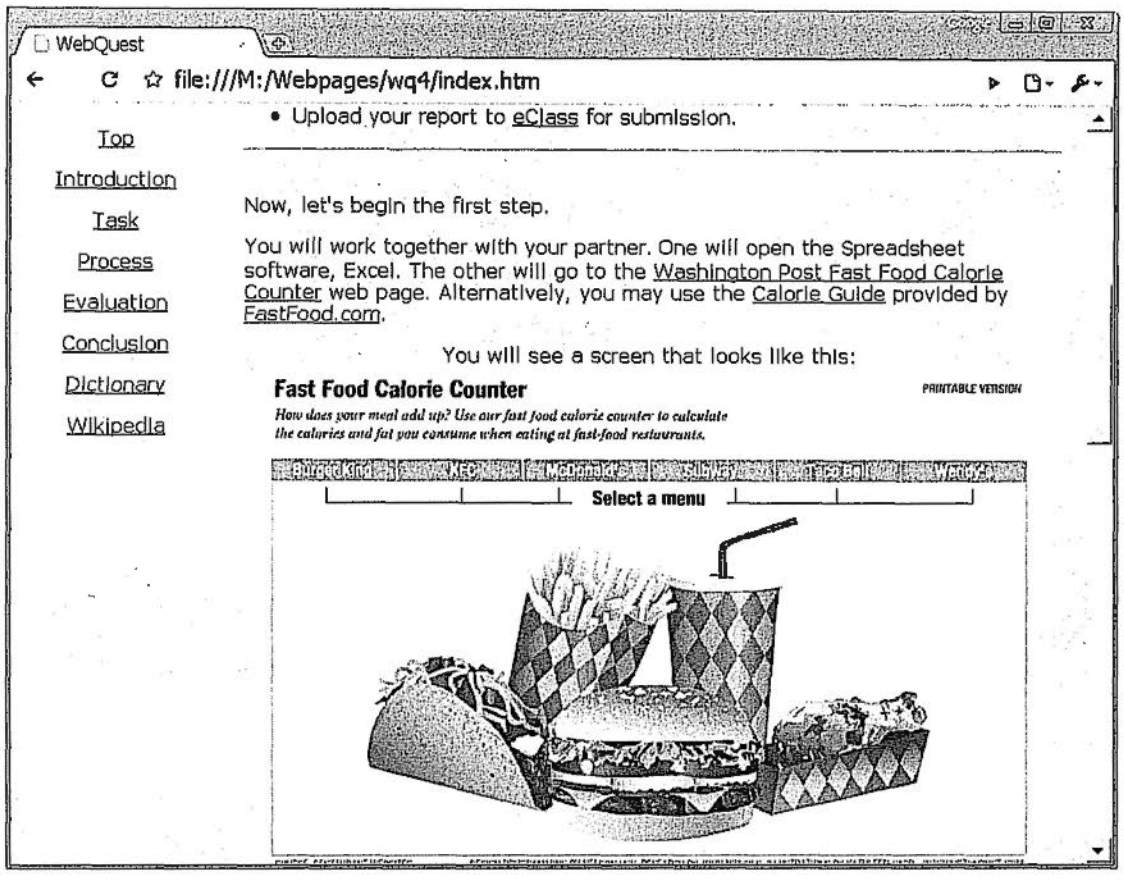
The Process
You will work in groups of two to create a short report for the local newspaper on the healthiest fast food restaurant. Before preparing your report, let's think about two questions.
• What is the meaning of healthy fast food?
• What makes food healthy?
To gain some ideas for these questions, take a look at the materials provided by the following links.
• American Heart Association: Dietary Recommendations for Healthy Children
• American Heart Association: Tips for Dining Out
• Learning about Calories (卡路里)
• Learning about Carbohydrates (碳水化合物)
• Learning about Fats (脂肪)
• Learning about Proteins (蛋白質)
To complete the report, you will go through the following steps:
• Determine the number of calories and grams of fat in some food items at four fast food restaurants.
• Enter the data into a spreadsheet.
• Create a few graphs to accurately represent the data.
• Analyze the data to determine the healthiest restaurant.
• Create a word processing report with your charts detailing your conclusions.
• Upload your report to eClass for submission.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file:///M:/Webpages/wq4/index.htm
• Upload your report to eClass for submission.
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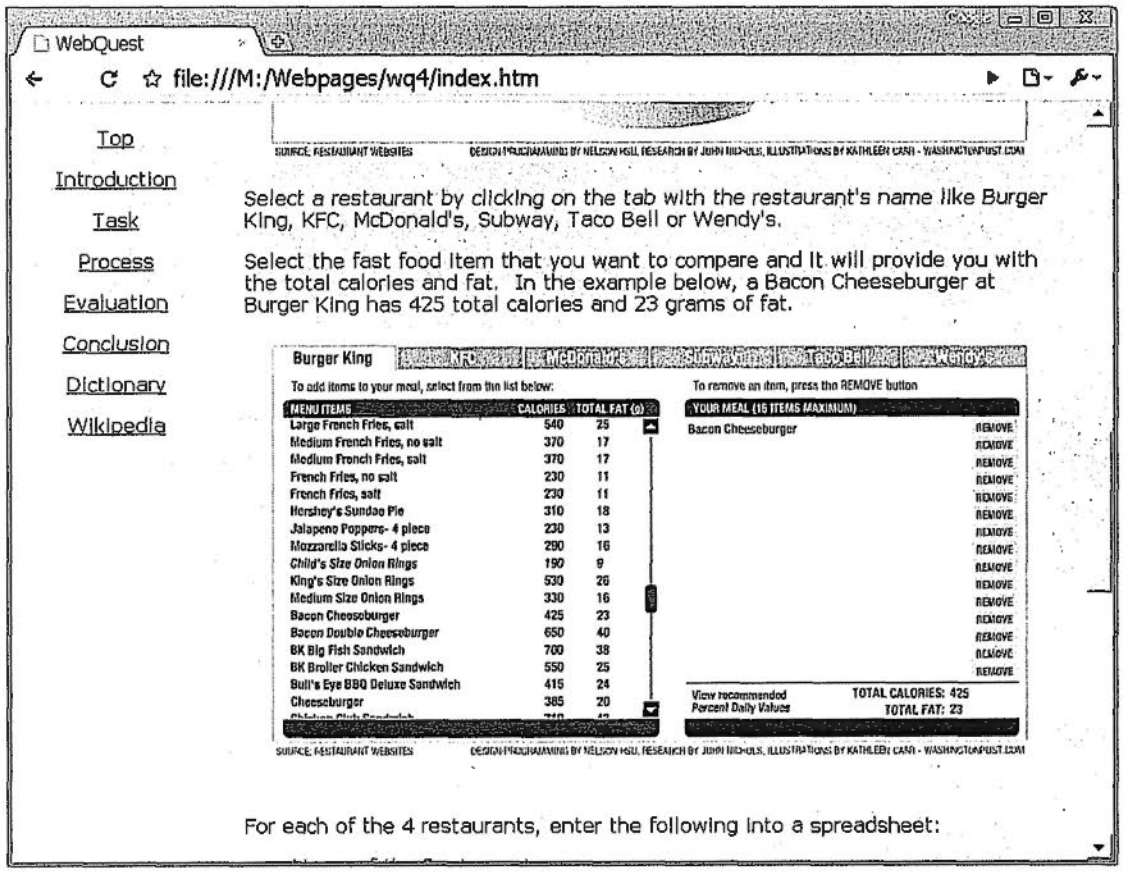
Now, let's begin the first step.
You will work together with your partner. One will open the Spreadsheet software, Excel. The other will go to the Washington Post Fast Food Calorie Counter web page. Alternatively, you may use the Calorie Guide provided by FastFood.com.
You will see a screen that looks like this:
Fast Food Calorie Counter
PRINTABLE VERSION
How does your meal add up? Use our fast food calorie counter to calculate the calories and fat you consume when eating at fast-food restaurants.
Burger King
KFC
McDonald's
Subway
Taco Bell
Wendy's
Select a menu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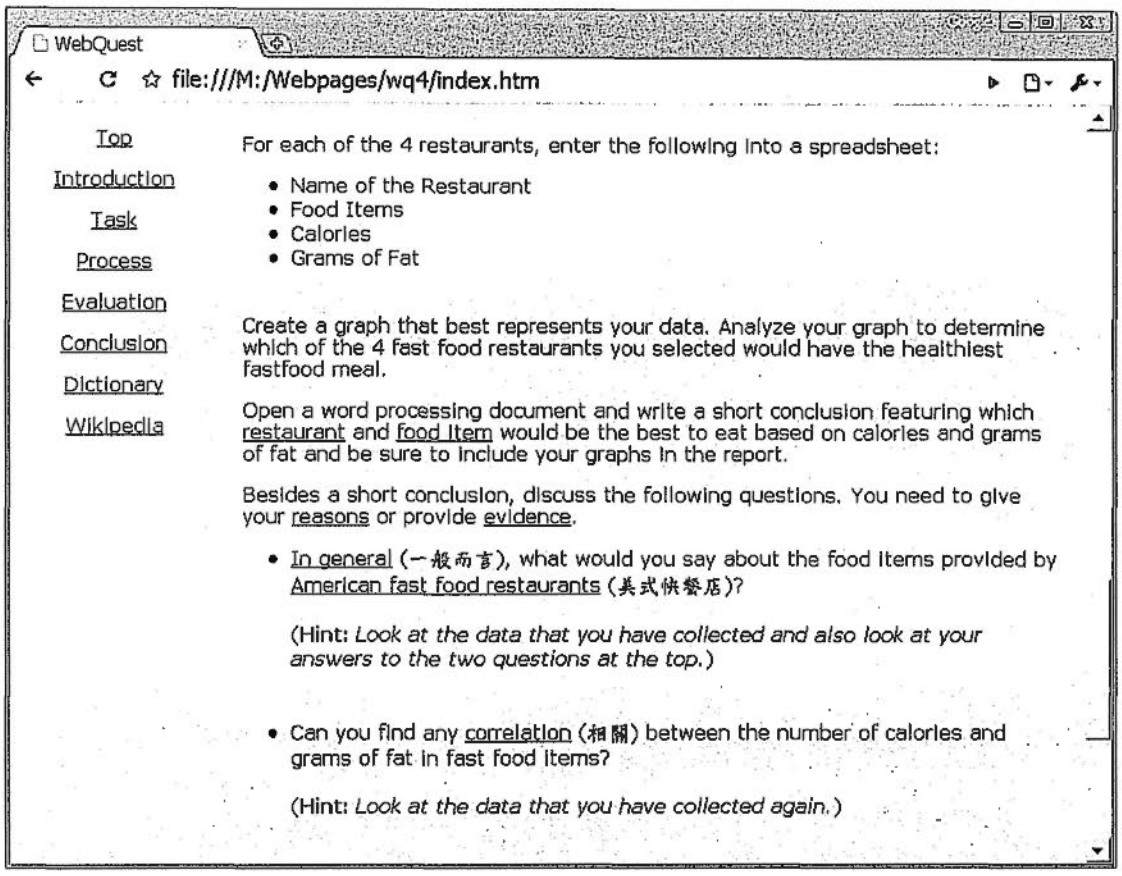
SOURCE: RESTAURANT WEBSITES
Select a restaurant by clicking on the tab with the restaurant's name like Burger King, KFC, McDonald's, Subway, Taco Bell or Wendy's.
Select the fast food item that you want to compare and it will provide you with the total calories and fat. In the example below, a Bacon Cheeseburger at Burger King has 425 total calories and 23 grams of fat.
Burger King
To add items to your meal, select from the list below:
To remove an item, press the REMOVE button
MENU ITEMS
CALORIES
TOTAL FAT (g)
YOUR MEAL (15 ITEMS MAXIMUM)
Large French Fries, salt 540 25
Medium French Fries, no salt 370 17
Medium French Fries, salt 370 17
French Fries, no salt 230 11
French Fries, salt 230 11
Hershey's Sundae Pie 310 18
Jalapeno Poppers- 4 piece 230 13
Mozzarella Sticks- 4 piece 290 16
Child's Size Onion Rings 190 9
King's Size Onion Rings 530 26
Medium Size Onion Rings 330 16
Bacon Cheeseburger 425 23
Bacon Double Cheeseburger 650 40
BK Big Fish Sandwich 700 38
BK Broiler Chicken Sandwich 550 25
Bull's Eye BBQ Deluxe Sandwich 415 24
Cheeseburger 385 20
Bacon Cheeseburger
REMOVE
View recommended Percent Daily Values
TOTAL CALORIES: 425
TOTAL FAT: 23
SOURCE: RESTAURANT WEBSITES
For each of the 4 restaurants, enter the following into a spreadsheet: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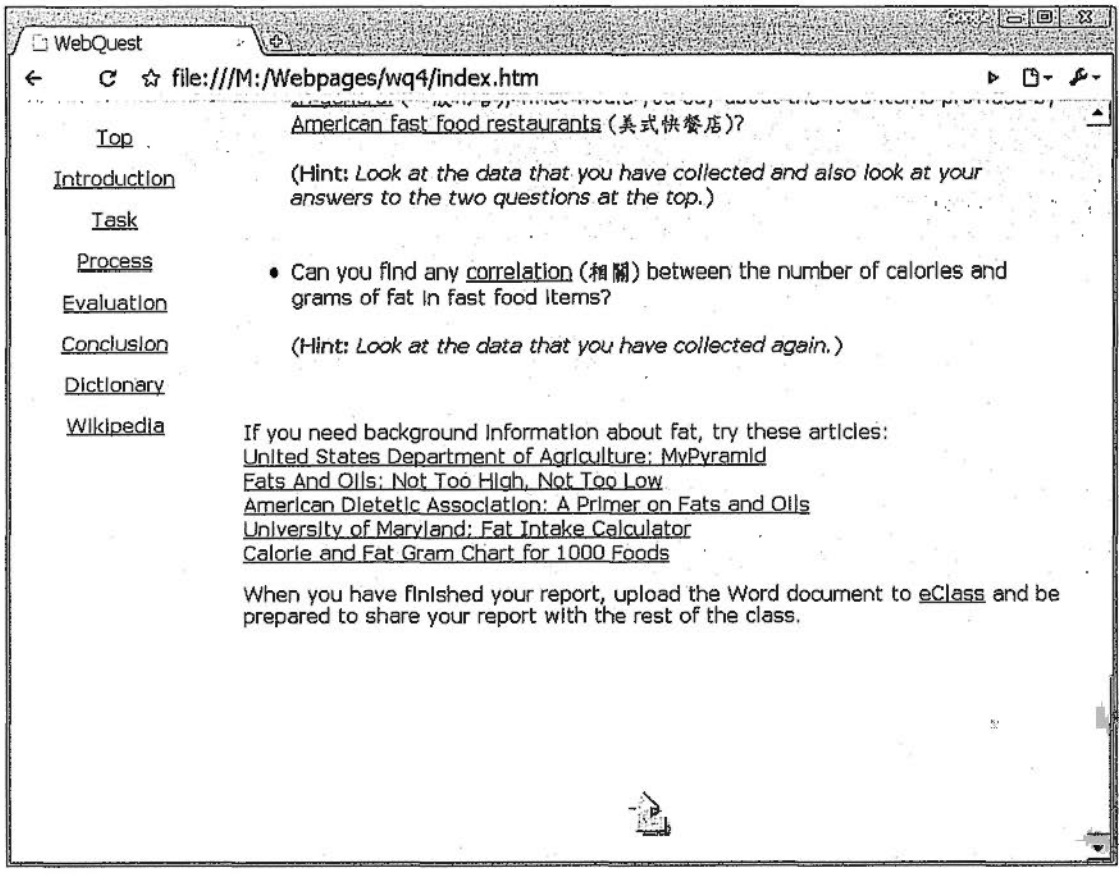
For each of the 4 restaurants, enter the following into a spreadsheet:
• Name of the Restaurant
• Food Items
• Calories
• Grams of Fat
Create a graph that best represents your data. Analyze your graph to determine which of the 4 fast food restaurants you selected would have the healthiest fastfood meal.
Open a word processing document and write a short conclusion featuring which restaurant and food item would be the best to eat based on calories and grams of fat and be sure to include your graphs in the report.
Besides a short conclusion, discuss the following questions. You need to give your reasons or provide evidence.
• In general (一般而言), what would you say about the food items provided by American fast food restaurants (美式快餐店)?
(Hint: Look at the data that you have collected and also look at your answers to the two questions at the top.)
• Can you find any correlation (相關) between the number of calories and grams of fat in fast food items?
(Hint: Look at the data that you have collected again.)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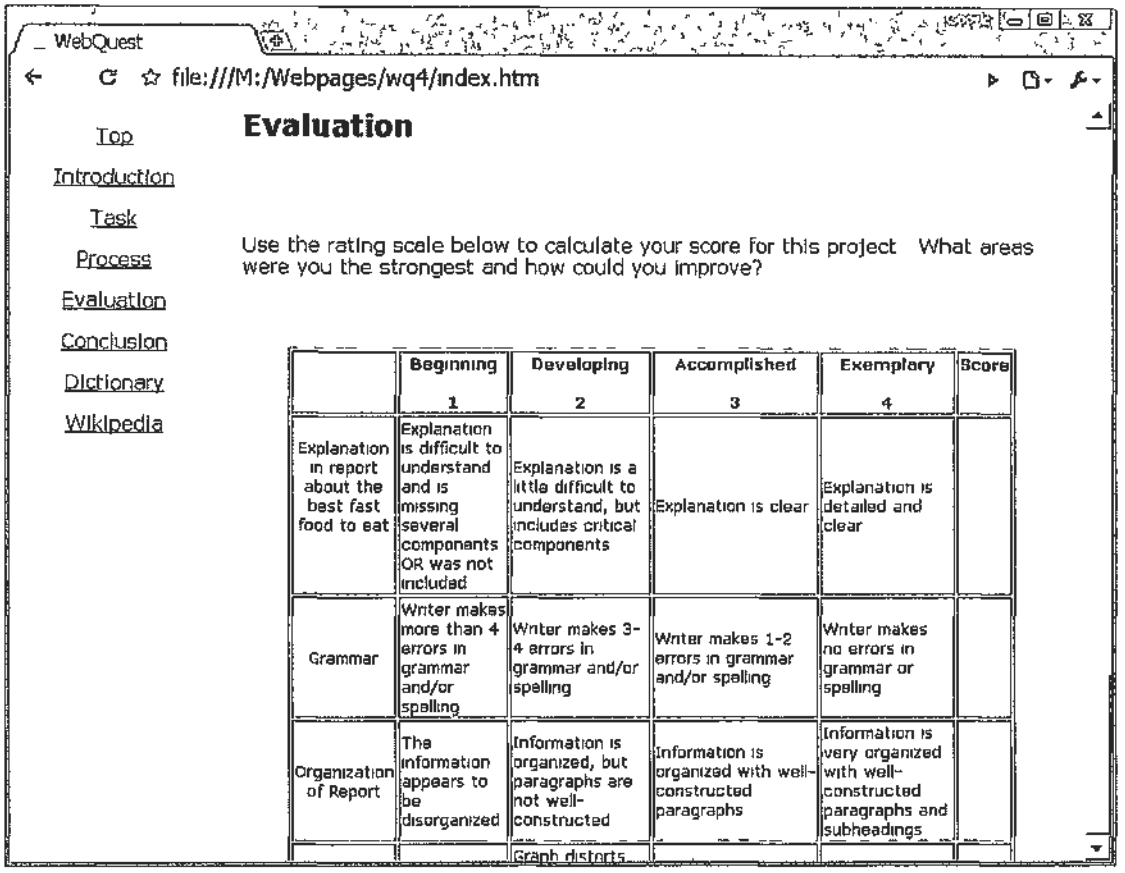
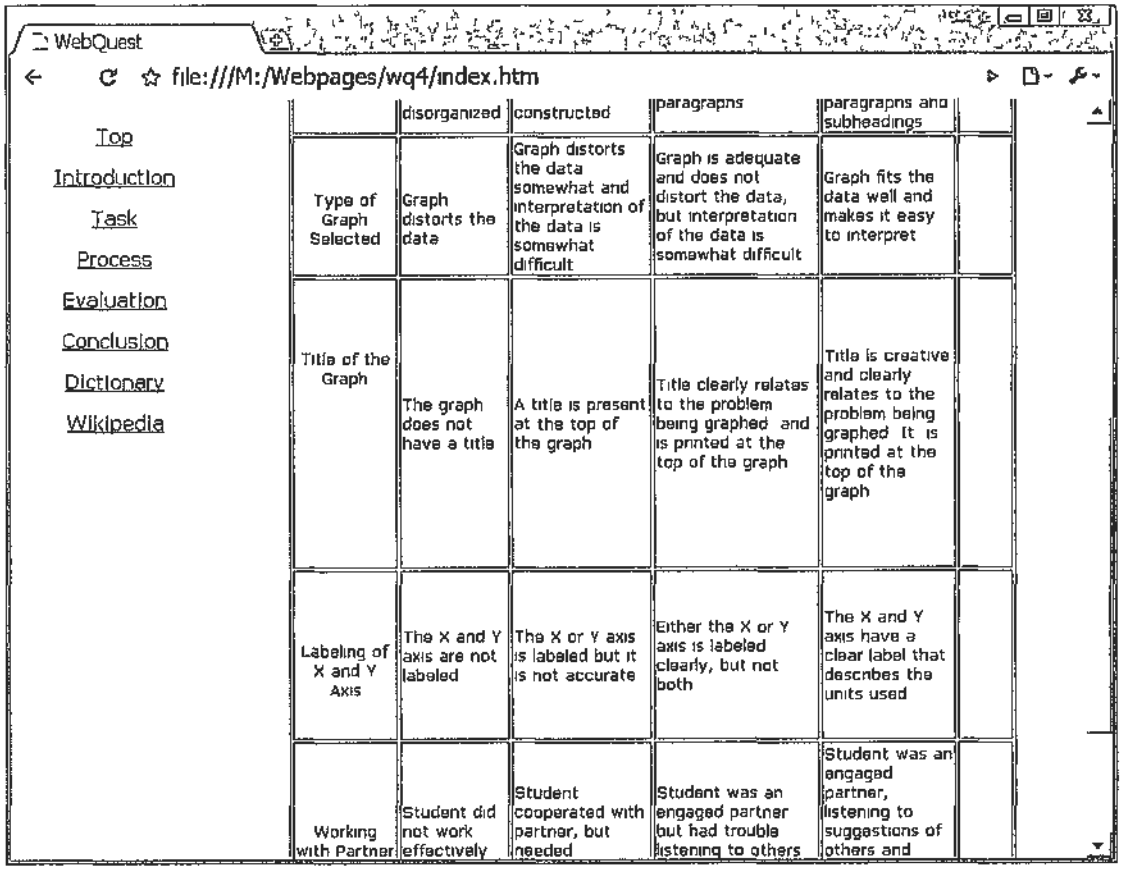
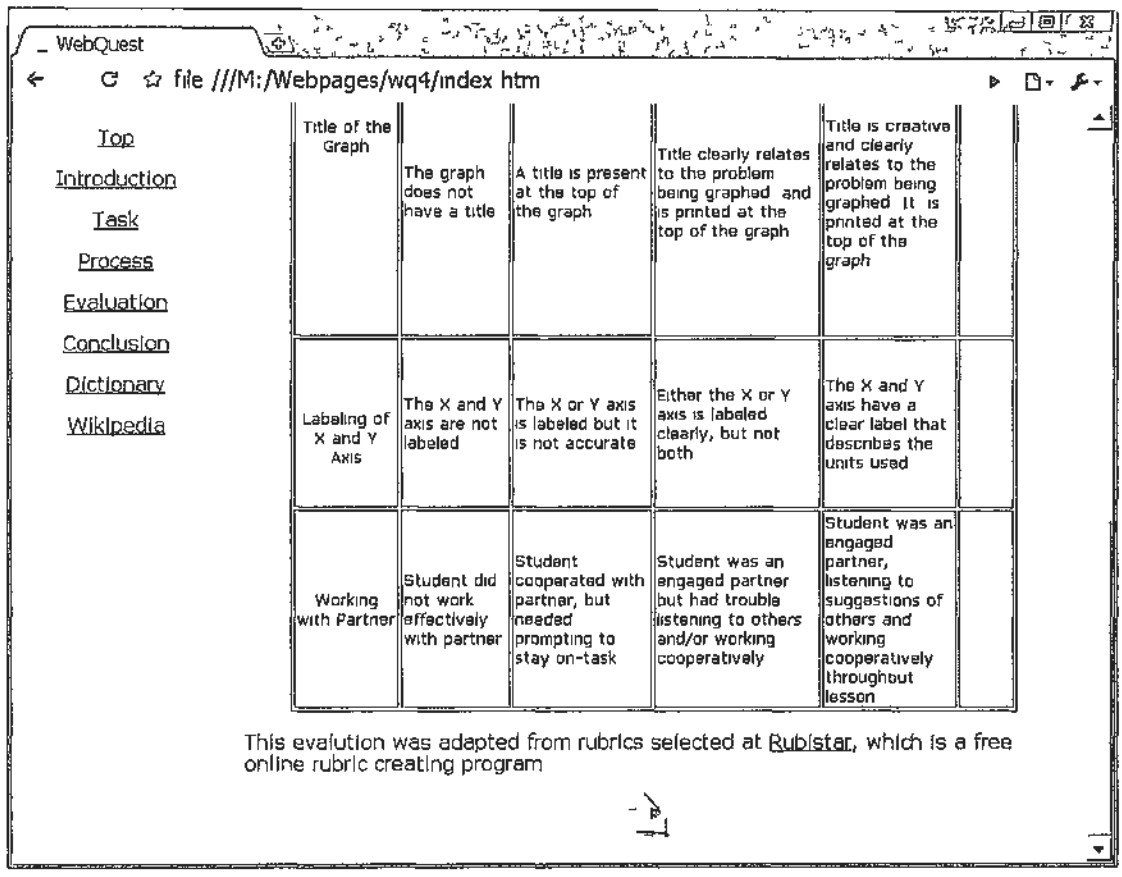
American fast food restaurants (美式快餐店)?
(Hint: Look at the data that you have collected and also look at your answers to the two questions at the top.)
• Can you find any correlation (相關) between the number of calories and grams of fat in fast food items?
(Hint: Look at the data that you have collected again.)
If you need background information about fat, try these articles:
United States Department of Agriculture: MyPyramid
Fats And Oils: Not Too High, Not Too Low
American Dietetic Association: A Primer on Fats and Oils
University of Maryland: Fat Intake Calculator
Calorie and Fat Gram Chart for 1000 Foods
When you have finished your report, upload the Word document to eClass and be prepared to share your report with the rest of the class.

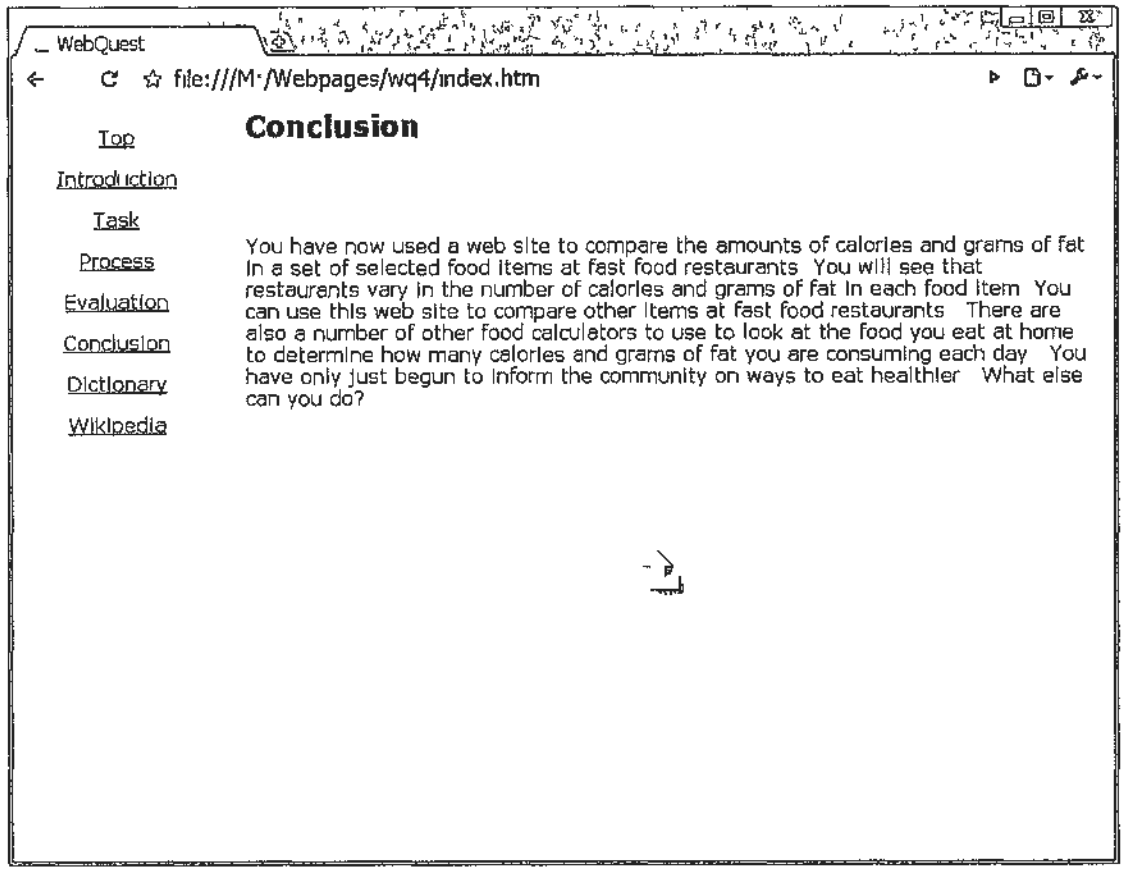


	Beginning 1	Developing 2	Accomplished 3	Exemplary 4	Score
Explanation in report about the best fast food to eat	Explanation is difficult to understand and is missing several components OR was not included	Explanation is a little difficult to understand, but includes critical components	Explanation is clear	Explanation is detailed and clear	
Grammar	Writer makes more than 4 errors in grammar and/or spelling	Writer makes 3-4 errors in grammar and/or spelling	Writer makes 1-2 errors in grammar and/or spelling	Writer makes no errors in grammar or spelling	
Organization of Report	The information appears to be disorganized	Information is organized, but paragraphs are not well-constructed	Information is organized with well-constructed paragraphs	Information is very organized with well-constructed paragraphs and subheadings	
		Graph distorts			

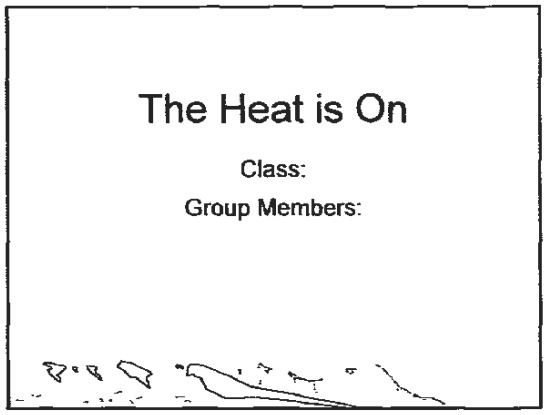


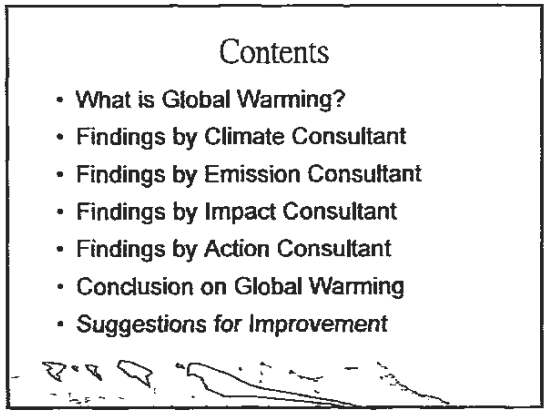
	disorganized	constructed	paragraphs	paragraphs and subheadings	
Type of Graph Selected	Graph distorts the data	Graph distorts the data somewhat and interpretation of the data is somewhat difficult	Graph is adequate and does not distort the data, but interpretation of the data is somewhat difficult	Graph fits the data well and makes it easy to interpret	
Title of the Graph	The graph does not have a title	A title is present at the top of the graph	Title clearly relates to the problem being graphed and is printed at the top of the graph	Title is creative and clearly relates to the problem being graphed It is printed at the top of the graph	
Labeling of X and Y Axis	The X and Y axis are not labeled	The X or Y axis is labeled but it is not accurate	Either the X or Y axis is labeled clearly, but not both	The X and Y axis have a clear label that describes the units used	
Working with Partner	Student did not work effectively	Student cooperated with partner, but needed	Student was an engaged partner but had trouble listening to others	Student was an engaged partner, listening to suggestions of others and	

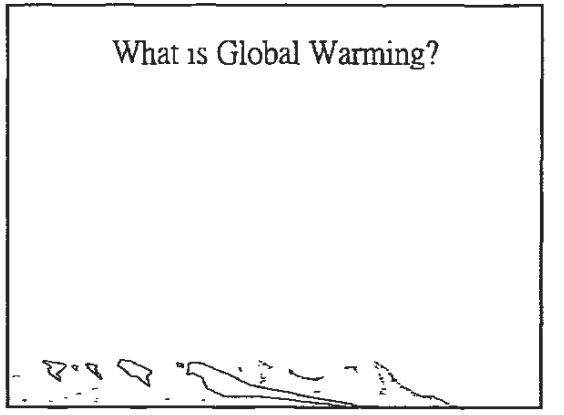

WebQuest
file ///M:/Webpages/wq4/index htm
Top
Introduction
Task
Process
Evaluation
Conclusion
Dictionary
Wikipedia
Title of the Graph
The graph does not have a title
A title is present at the top of the graph
Title clearly relates to the problem being graphed and is printed at the top of the graph
Title is creative and clearly relates to the problem being graphed It is printed at the top of the graph
Labeling of X and Y Axis
The X and Y axis are not labeled
The X or Y axis is labeled but it is not accurate
Either the X or Y axis is labeled clearly, but not both
The X and Y axis have a clear label that describes the units used
Working with Partner
Student did not work effectively with partner
Student cooperated with partner, but needed prompting to stay on-task
Student was an engaged partner but had trouble listening to others and/or working cooperatively
Student was an engaged partner, listening to suggestions of others and working cooperatively throughout lesson
This evalution was adapted from rubrics selected at Rubistar, which is a free online rubric creating program

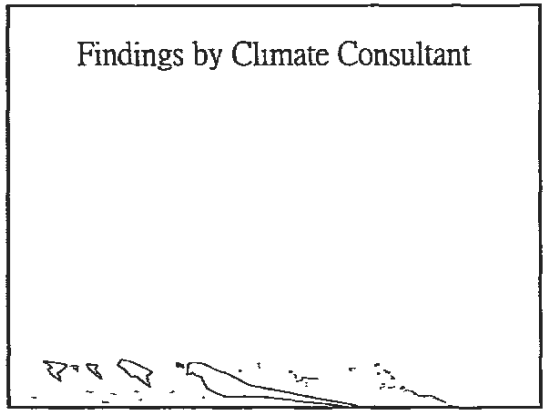

WebQuest
file:///M:/Webpages/wq4/index.htm
Top
Introduction
Task
Process
Evaluation
Conclusion
Dictionary
Wikipedia
Conclusion
You have now used a web site to compare the amounts of calories and grams of fat in a set of selected food items at fast food restaurants You will see that restaurants vary in the number of calories and grams of fat in each food item You can use this web site to compare other items at fast food restaurants There are also a number of other food calculators to use to look at the food you eat at home to determine how many calories and grams of fat you are consuming each day You have only just begun to inform the community on ways to eat healthier What else can you do?

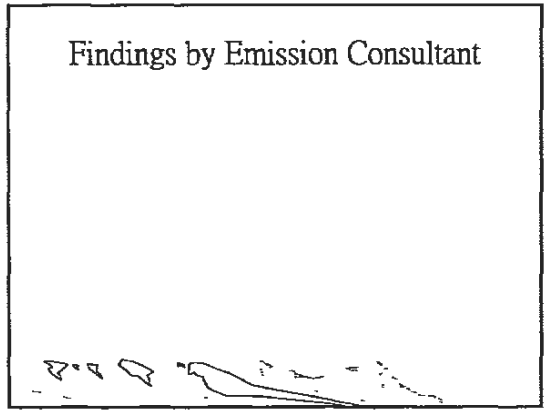
Appendix 10: Presentation Template Provided to Students
During Implementation of WQ1

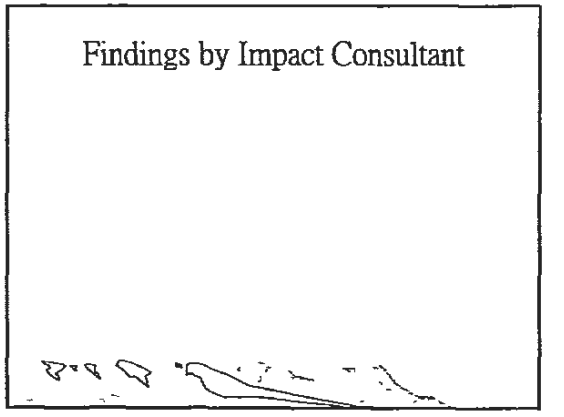




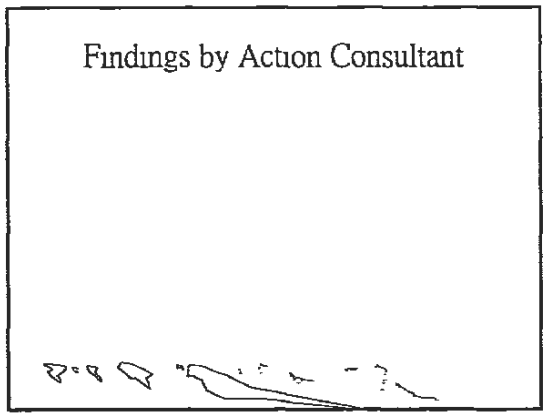


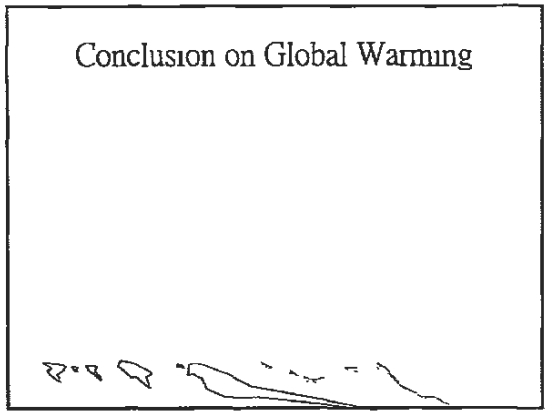


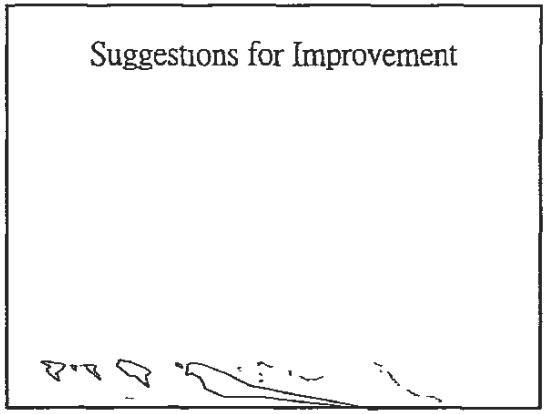




Appendix 10: Presentation Template Provided to Students
During Implementation of WQ1







Appendix 11: Report Template Provided to Students in *WQ3*

WebQuest 3 – Living in Another Country is better
A WebQuest for Analyzing Statistical Data
http://www.twghkyds.edu.hk/~ytsui/wq3/

Name:	Name:
Class No.:	Class No.:
Class:	

Data Table:

Graph 1 (*Comparison of Country Size*):

Brief explanation or description of Graph 1:

Appendix 11: Report Template Provided to Students in *WQ3*

Graph 2 (*Comparison of Population*):

Brief explanation or description of Graph 2:

Graph 3 (*Comparison of Crowdedness*):

Brief explanation or description of Graph 3:

Appendix 11: Report Template Provided to Students in *WQ3*

Graph 4 (*Comparison of Average Life Expectancy*):

Brief explanation or description of Graph 4:

Graph 5 (*Comparison of Literacy Rate*):

Brief explanation or description of Graph 5:

Appendix 11: Report Template Provided to Students in *WQ3*

Questions for Discussion:

1. Can you find any correlation (相關) between literacy rate (識字率) and average life expectancy (人均壽命率)? (***Hint:*** *Look at the two relevant graphs.*)

My Inference (我的推論): Reason/Evidence (原因/證據):

2. Can you find any correlation (相關) between crowdedness (擠擁程度) and average life expectancy (人均壽命率)? (***Hint:*** *Look at the two relevant graphs.*)

My Inference (我的推論): Reason/Evidence (原因/證據):

3. What would you say about the average income (人均收入) among your selected countries?

My Inference (我的推論): Reason/Evidence (原因/證據):

Appendix 11: Report Template Provided to Students in *WQ3*

4. What would you say about the number of people who own a computer, with Internet access (能連接上網), at home in your selected countries?

My Inference (我的推論):   Reason/Evidence (原因/證據):

Appendix 12: Spreadsheet Template Provided to Students in *WQ3*

	Area (sq. km)	Population	Average life expectancy (years)	Literacy rate (%)	Crowdedness (pop./area)
Country A					
Country B					
China					
Country D					

Appendix 13: Report Template Provided to Students in *WQ4*

WebQuest 4 – Healthiest Fast Food
A WebQuest for Integrating Spreadsheets and Word Processing
http://www.twghkyds.edu.hk/~ytsui/wq4/

Name:	Name:
Class No.:	Class No.:
Class:	

Question: What is the meaning of healthy fast food?

Question: What makes food healthy?

- American Heart Association: Dietary Recommendations for Healthy Children
- American Heart Association: Tips for Dining Out
- Learning about Calories (卡路里)
- Learning about Carbohydrates (碳水化合物)
- Learning about Fats (脂肪)
- Learning about Proteins (蛋白質)

Appendix 13: Report Template Provided to Students in *WQ4*

4 Selected Fast Food Restaurants:

-
-
-
-

Data Tables:

Charts:

Conclusion:

*Which **restaurant** and **food item** would be the best to eat? Why?*

Appendix 13: Report Template Provided to Students in *WQ4*

Questions for Discussion:

1. In general (一般而言), what would you say about the food items provided by American fast food restaurants (美式快餐店)?
   (***Hint:*** *Look at the data that you have collected and also look at your answers to the two questions at the top.*)

Reason/Evidence (原因/證據):

2. Can you find any correlation (相關) between the number of calories and grams of fat in fast food items??
   (***Hint:*** *Look at the data that you have collected again.*)

Reason/Evidence (原因/證據):

Appendix 14: Spreadsheet Template Provided to Students in *WQ4*

	Restaurant	
	Calories	Grams of Fat
Food Item		
Food Item		
Food Item		
Food Item		
Food Item		
Food Item		
Total:		

	Restaurant	
	Calories	Grams of Fat
Food Item		
Food Item		
Food Item		
Food Item		
Food Item		
Food Item		
Total:		

	Restaurant	
	Calories	Grams of Fat
Food Item		
Food Item		
Food Item		
Food Item		
Food Item		
Food Item		
Total:		

	Restaurant	
	Calories	Grams of Fat
Food Item		
Food Item		
Food Item		
Food Item		
Food Item		
Food Item		
Total:		

Appendix 14: Spreadsheet Template Provided to Students in *WQ4*

Restaurant	Total Calories	Total Grams of Fat
A		
B		
C		
D		

Appendix 15: Common Storage Space on Network Drive for Group Work

This appendix presents the technical details of the extra storage space provided on a network drive for facilitating students' group work.

In the school, after a student logged on a computer workstation, the workstation connected to a central file server and then there were two network drives, labeled **H:** and **S:**, available on the workstation. *Figure 15.1* shows such a screenshot indicating the two network drives (**H:** and **S:**) available on a student's workstation. The **H:** drive was a central storage space on the file server. It was for the student's private use and thus it was inaccessible to other students. Each student had his/her own **H:** drive that was identified by the login account. Another drive, the **S:** drive, was also a central storage space on the file server. It was for public use and mainly for teachers to deliver electronic materials to students through the school network. Thus, any files or folders stored on the **S:** drive were accessible to all students.

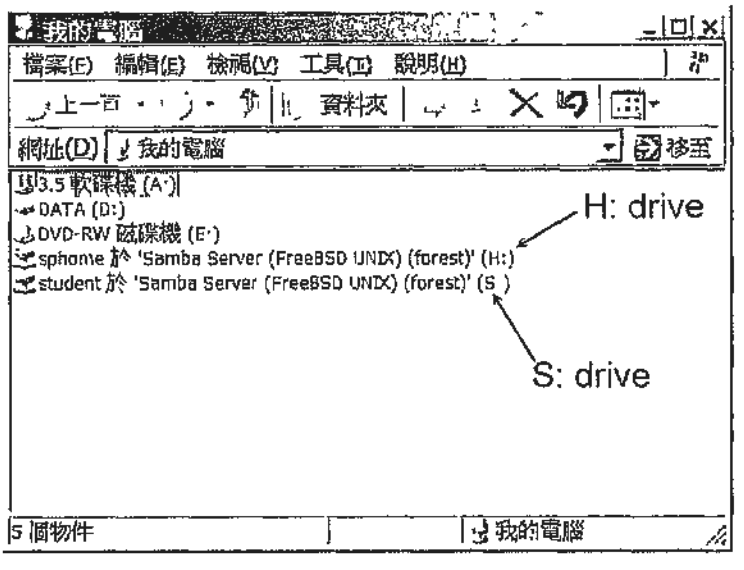


Figure 15.1 Screenshot of a Student's Workstation Indicating Two Network Drives

To facilitate students' group work, four folders, named "WebQuest 1" (for *WQ1*), "WebQuest 2" (for *WQ2*), "WebQuest 3" (for *WQ3*), and "WebQuest 4" (for *WQ4*), were created on the **S:** drive. The folder "WebQuest 1" was created for the implementation of

WQ1, while the folder "WebQuest 2" was created for the implementation of *WQ2*, and so on. *Figure 15.2* shows a screenshot of the four folders on the **S:** drive.

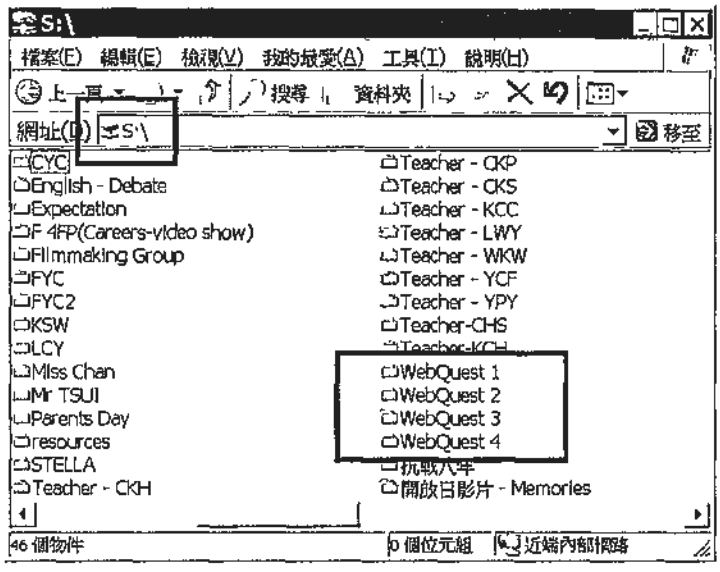


*Figure 15.2: Screenshot of Four Folders Created on the **S:** Drive for WebQuest Implementation*

In each of the four folders created on the **S:** drive, another five folders, named "2A" (for G_a), "2B" (for G_b), "2C" (for G_c), "2D" (for G_d), and "2E" (for G_e), were created. The folder "2A" was dedicated to G_a, while the folder "2B" was dedicated to G_b, and so on. *Figure 15.3* shows a screenshot of the tree structure of the twenty subfolders created on the **S:** drive.

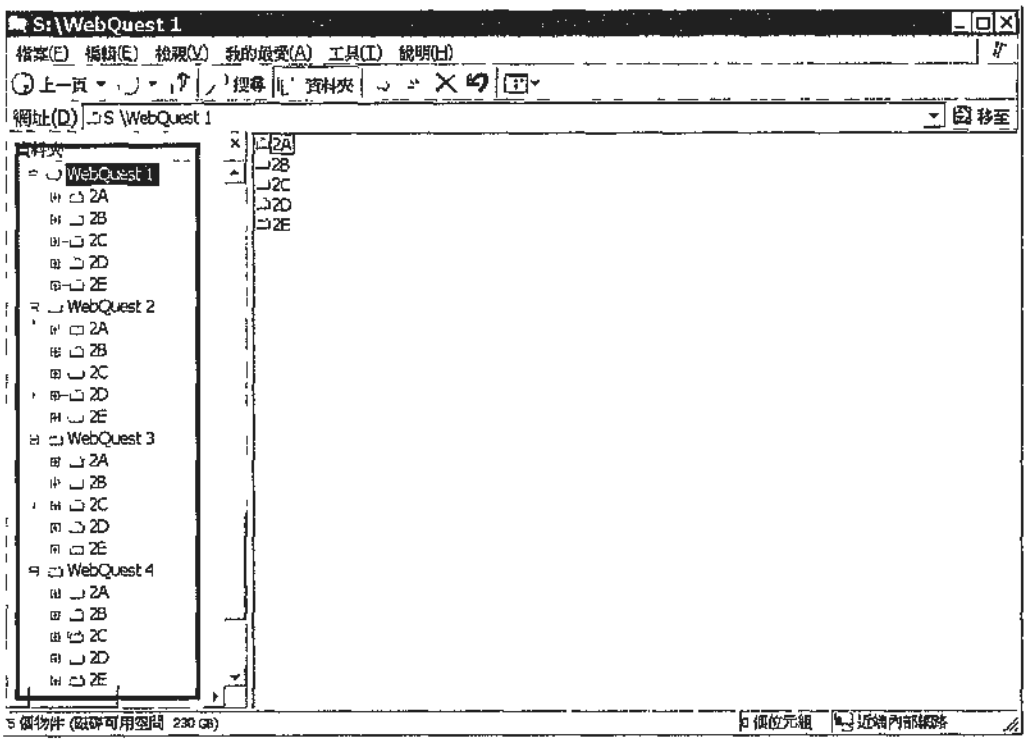


*Figure 15.3: Screenshot of the Tree Structure of Twenty Subfolders Created on the **S:** Drive*

As mentioned, there were five groups of participants (G_a, G_b, G_c, G_d, and G_e) taking part in the study. Each of them consisted of twenty students with mixed ability, representing half of a S.2 class in the school. It is also reported in Section 3.4.1.3 of Chapter 3 that, in *WQ1* and *WQ2*, students were required to work in groups of four to complete the learning tasks.

In this manner, there were five working groups in each of G_a, G_b, G_c, G_d, and G_e during the implementation of *WQ1* and *WQ2*. Each working group consisted of four students for working together towards completion of a learning task. To encourage collaborative work among the members of a working group, a specific folder was created for each working group under the corresponding class folder (i.e. "2A", "2B", "2C", "2D", or "2E"). The specific folder for a working group was accessible to the members of that working group only. Therefore, the four members could store any useful or related files in the specific folder. All files stored in the specific folder could be retrieved by any members of the working group.

Figure 15.4 shows a screenshot of the five specific folders created for G_a for the implementation of *WQ1*, while *Figure 15.5* shows the corresponding screenshot for the implementation of *WQ2*. As shown in *Figure 15.4*, there were five subfolders created inside the folder "S:\WebQuest 1\2A". The name of each subfolder indicated the working group number and the class numbers of the four group members. For example, in *Figure 15.4*, the folder, named "Group 1 (1 17 37 39)", was created for a working group of four students in class 2A, where the class numbers of the four members were 1, 17, 37, and 39 respectively. Only the four students, with class numbers 1, 17, 37 and 39, in class 2A and the teacher gained access right to that folder. Access to the folder by the others was denied.

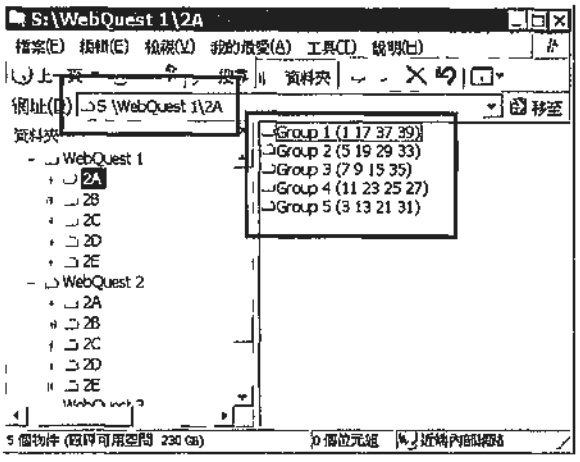


Figure 15 4 Screenshot of Five Specific Folders created for G_a for Implementation of WQ1

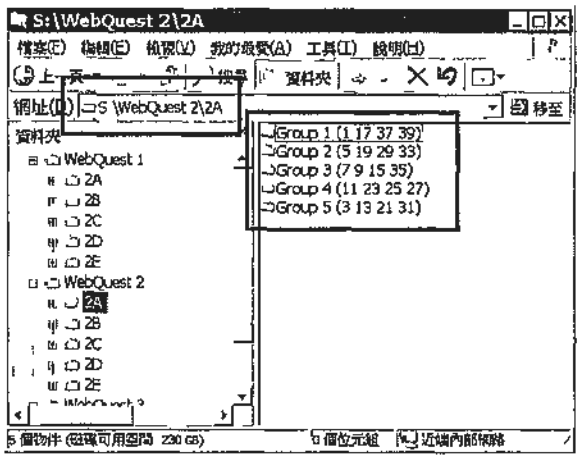


Figure 15 5 Screenshot of Five Specific Folders created for G_a for Implementation of WQ2

As discussed, three 70-minute lessons were allocated to each of *WQ1* and *WQ2* for its implementation. Upon completion of individual research in the first lesson, each student was required to upload his/her research report to the school intranet system. After that, the teacher downloaded all research reports submitted by the participants from the intranet system, and then classified the reports according to the working groups of each class. Prior to the beginning of the second lesson, the teacher stored the four research reports from the same working group in the specific folder for that group. In such case, in the second lesson, the four members of a working group were able to share and exchange the findings brought by each other. They could also make use of the common storage space to store and share other useful materials for their group product. *Figure 15 6* shows a screenshot of the four research reports stored in the specific folder for a working group in class 2A (i.e. G_a) before the second lesson for *WQ1*, while *Figure 15 7* shows the corresponding screenshot for *WQ2*.

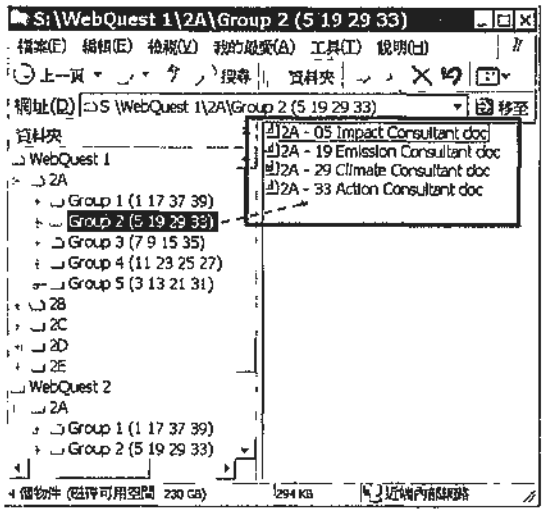


Figure 15.6: Screenshot of Four Research Reports stored in the Folder for a Working Group in G_a prior to the 2nd Lesson for WQ1

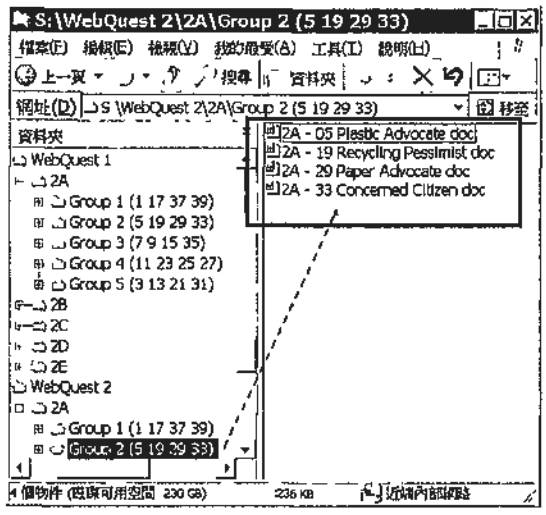


Figure 15.7: Screenshot of Four Research Reports stored in the Folder for a Working Group in G_a prior to the 2nd Lesson for WQ2

In addition to using the group folder for sharing research reports and storing useful materials, each working group was required by the teacher to store the final learning product (i.e. the PowerPoint document) in the specific folder for the group. It was also required by the teacher that the final learning product of each working group should be saved in the specific group folder with a particular filename "Final.ppt". In such case, the teacher could identify the final learning product stored in the specific folder of each working group. Besides, in the third lesson, each working group could open the learning product directly from the group folder for oral presentation.

Figure 15.8 shows a screenshot of the contents of the specific folder for a working group in class 2A (i.e. G_a) upon completion of the second lesson for *WQ1*, where there were a number of PowerPoint documents created by different members and the final learning product was named "Final.ppt". *Figure 15.9* shows the corresponding screenshot for *WQ2*, where there were a number of PowerPoint documents and digital images created and saved by different members, and the final learning product was named "Final.ppt".

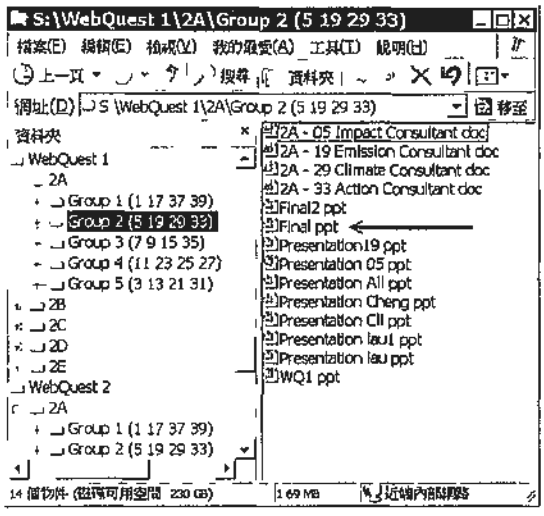


Figure 15 8 Screenshot of Files in a Specific Folder for a Working Group in G_a upon Completion of the 2nd Lesson for WQ1

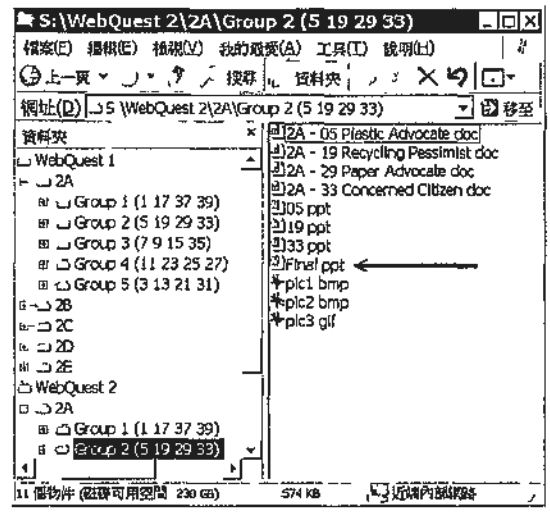


Figure 15 9 Screenshot of Files in a Specific Folder for a Working Group in G_a upon Completion of the 2nd Lesson for WQ2

The practice for *WQ3* and *WQ4* was similar to that for *WQ1* and *WQ2*. In *WQ3* and *WQ4*, students were required to work in groups of two to complete the learning tasks. Moreover, as discussed, there was only one 70-minute lesson allocated to each of *WQ3* and *WQ4* for its implementation. In this manner, there were ten working groups in each of G_a, G_b, G_c, G_d, and G_e during the implementation of *WQ3* and *WQ4*. Each working group consisted of two students for working together towards completion of a learning task. Similarly, a specific folder was created for each working group under the corresponding class folder (i.e. "2A", "2B", "2C", "2D", or "2E"). The specific folder for a working group was accessible to the two members of that working group only. Therefore, the two members could have a common storage space for storing related materials for their group product, such as data files, spreadsheets, or reports.

Figure 15 10 shows a screenshot of the ten specific folders created for G_c for the implementation of *WQ3*, while *Figure 15 11* shows the corresponding screenshot for the implementation of *WQ4*. As shown in *Figure 15 10*, there were ten subfolders created inside the folder "S:\WebQuest 3\2C". The name of each subfolder indicated the working group

number and the class numbers of the four group members. For example, in *Figure 15.10*, the folder, named "Group 5b (7 33)", was created for a working group of two students in class 2C, where the class numbers of the two members were 7 and 33 respectively. Only the two students, with class numbers 7 and 33, in class 2C and the teacher gained access right to that folder. Access to the folder by the others was denied.

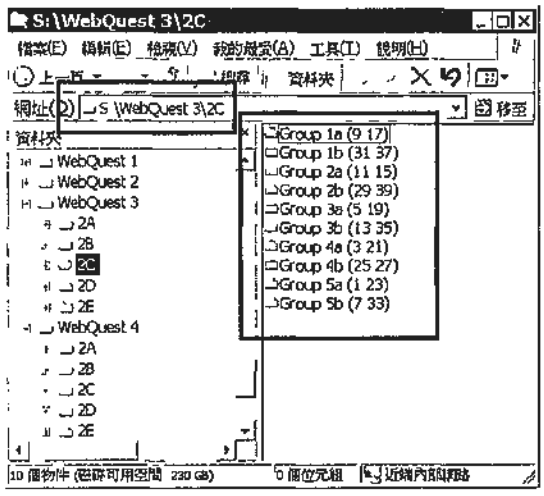


Figure 15.1: Screenshot of Ten Specific Folders created for G_c for Implementation of WQ3

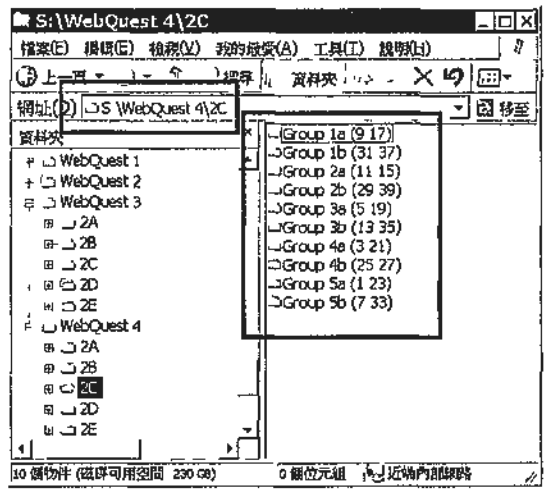


Figure 15.12: Screenshot of Ten Specific Folders created for G_c for Implementation of WQ4

Like the practice for *WQ1* and *WQ2*, upon completion of the lesson for *WQ3* or *WQ4*, each working group was required by the teacher to store the final learning product (i.e. the Word document) in the specific folder for the group with a particular filename "Final.doc". Therefore, the teacher could identify the final learning product stored in the specific folder of each working group.

Figure 15.12 shows a screenshot of the contents of the specific folder for a working group in class 2C (i.e. G_c) upon completion of the lesson for *WQ3*, where there were a number of Word documents and Excel documents created by the two members and the final learning product was named "Final.doc". *Figure 15.13* shows the corresponding screenshot for *WQ4*, where there were also a number of Word documents and Excel documents created by the two members and the final learning product was named "Final.doc".

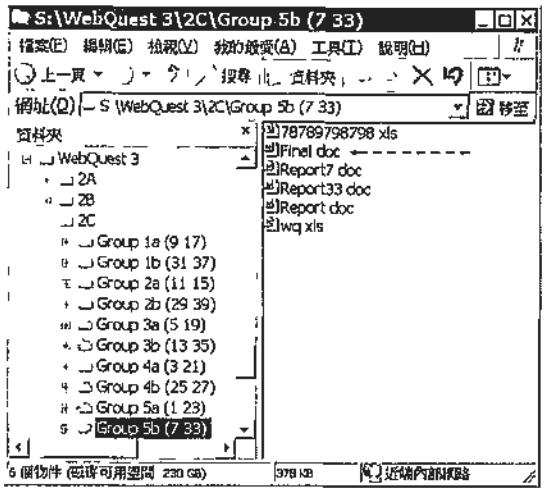


Figure 15.3: Screenshot of Files in a Specific Folder for a Working Group in G_t upon Completion of the Lesson for WQ3

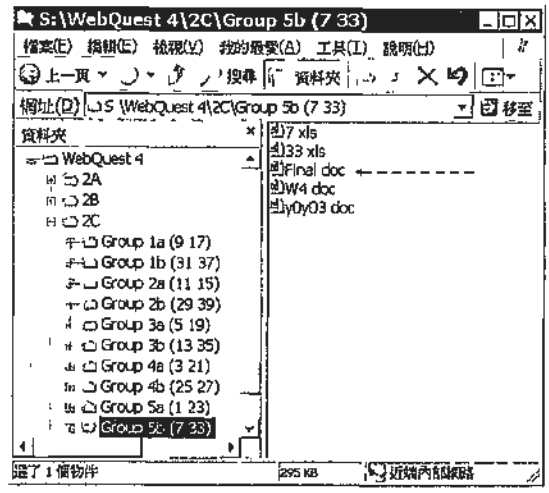


Figure 15.4: Screenshot of Files in a Specific Folder for a Working Group in G_c upon Completion of the Lesson for WQ4

Appendix 16: March's (2007) Evaluation Rubric for Assessing Well-designed WebQuests

Assessing Best WebQuests

Evaluation matrix / rubric for assessing WebQuests

	Low	Medium	High
Engaging Opening	No attempt made to appeal to learners.	Honestly attempts to appeal to student interests.	Has that something that compels attention.
The Question / Task	Fuzzy Question or Task. Maybe what's asked for is lower level thinking.	The Question and Task target higher order thinking, but may not be totally clear.	Clear Question and Task. These naturally flow from the introduction and signal a direction for sophisticated learning.
Background for Everyone	No attempt to access prior learning or build common background.	Some mention of addressing a common body of knowledge. (May not happen within the activity.)	Clearly calls attention to the need for a common foundation of knowledge and provides needed (Web?) resources.
Roles / Expertise	Roles are artificial and may lack inherent conflicts of interest.	Roles are clear and realistic. They may be limited in scope, but do evoke conflict.	Roles match the issues and resources. The roles provide multiple perspectives from which to view the topic.
Use of the Web	This activity could probably be done better without the Web.	Some resources reflect features of the Web that make it particularly useful.	Uses the Web to access at least some of the following: interactivity, multiple perspectives, current information, etc.

Transformative Thinking	No Transformative thinking. (This is not a WebQuest, but may be a good Knowledge Hunt).	Higher level thinking is required, but the process for students may not be clear.	Higher level thinking is required to construct new meaning. *Scaffolding* is provided to support student achievement.
Real World Feedback	No feedback loop included.	The learning product could easily be used for authentic assessment although this may not be addressed.	A feedback loop is included in the Web page and an evaluation rubric is probably provided (early on!).
Conclusion	Minimal conclusion. No mention of student thinking or symmetry to intro.	Returns to the intro ideas. May sum up the experiences and learning that was undertaken.	Clear tie-in to the intro. Makes the students' cognitive tasks overt and suggests how this learning could transfer to other domains/issues.

Note -

Values in the assessment matrix are:

- low = 1 each
- medium = 2 each
- high = 3 each

12 - 15 = 

16 - 19 = 

20 - 24 = 

Retrieved October 21, 2007.

Appendix 17a: Invitation to Three Experts for the Evaluation of the WebQuests

Dear Alex, Yuxia, and Winnie,

I need your help. I really need your help. Could you please do me a favor?

In my research, I have a part called "Expert Review" that would invite a group of experts, who are familiar with WebQuest, to evaluate the four WebQuests I used in my experiment.

I wanted to ask you for help a few months ago but kept waiting until now, since I think you may relatively have more time in July.

The four WebQuests were the collaborative work of a group of experienced teachers and me. Three of them were found from various online collections. They were further adapted and modified by the group of teachers and me. The remaining WebQuest was initiated and developed by us.

After we had developed the four WebQuests, they were presented to Prof. Lee for inspection. In fact, the four WebQuests were checked and inspected by Prof. Lee several times. They were also modified a number of times according to his comments. However, as a formal procedure, I must invite a group of experts to evaluate the four WebQuests. Could you please do me this favor? Thank you very much for your help.

Altogether, there are three parts for the evaluation. Part I and Part II are not difficult. I am so sorry that Part III might give you much trouble. I have typed all the necessary steps in the file called "Readme.doc". As the evaluation work would take time, I have never dared to expect a prompt return. I would be most grateful if you could send me your review by the end of July.

I know this will cause you much trouble. May I treat you a good meal in the summer vacation? Also, if there is anything I can help for your research, please feel free to let me know. I will try my best to help. Once again, thank you very much for your help.

Regards,
Kurtin

Appendix 17b: WORD Document Containing Four Duplicated Copies of March's (2007) Evaluation Rubric (for WebQuest Expert)

Evaluation matrix / rubric for assessing

WQ1 -- http://www.twghkyds.edu.hk/~ytsui/wq1

	Low (Score: 1)	Medium (Score: 2)	High (Score: 3)	Score
Engaging Opening	No attempt made to appeal to learners.	Honestly attempts to appeal to student interests.	Has that something that compels attention.	
The Question / Task	Fuzzy Question or Task. Maybe what's asked for is lower level thinking.	The Question and Task target higher order thinking, but may not be totally clear.	Clear Question and Task. These naturally flow from the introduction and signal a direction for sophisticated learning.	
Background for Everyone	No attempt to access prior learning or build common background.	Some mention of addressing a common body of knowledge. (May not happen within the activity.)	Clearly calls attention to the need for a common foundation of knowledge and provides needed (Web?) resources.	
Roles / Expertise	Roles are artificial and may lack inherent conflicts of interest.	Roles are clear and realistic. They may be limited in scope, but do evoke conflict.	Roles match the issues and resources. The roles provide multiple perspectives from which to view the topic.	
Use of the Web	This activity could probably be done better without the Web.	Some resources reflect features of the Web that make it particularly useful.	Uses the Web to access at least some of the following: interactivity, multiple perspectives, current information, etc.	

Transformative Thinking	No Transformative thinking. (This is not a WebQuest, but may be a good Knowledge Hunt).	Higher level thinking is required, but the process for students may not be clear.	Higher level thinking is required to construct new meaning. Scaffolding is provided to support student achievement.	
Real World Feedback	No feedback loop included.	The learning product could easily be used for authentic assessment although this may not be addressed.	A feedback loop is included in the Web page and an evaluation rubric is probably provided (early on!).	
Conclusion	Minimal conclusion. No mention of student thinking or symmetry to intro.	Returns to the intro ideas. May sum up the experiences and learning that was undertaken.	Clear tie-in to the intro. Makes the students' cognitive tasks overt and suggests how this learning could transfer to other domains/issues.	

Evaluation matrix / rubric for assessing

WQ2 -- http://www.twghkyds.edu.hk/~ytsui/wq2

	Low (Score: 1)	Medium (Score: 2)	High (Score: 3)	Score
Engaging Opening	No attempt made to appeal to learners.	Honestly attempts to appeal to student interests.	Has that something that compels attention.	
The Question / Task	Fuzzy Question or Task. Maybe what's asked for is lower level thinking.	The Question and Task target higher order thinking, but may not be totally clear.	Clear Question and Task. These naturally flow from the introduction and signal a direction for sophisticated learning.	
Background for Everyone	No attempt to access prior learning or build common background.	Some mention of addressing a common body of knowledge. (May not happen within the activity.)	Clearly calls attention to the need for a common foundation of knowledge and provides needed (Web?) resources.	
Roles / Expertise	Roles are artificial and may lack inherent conflicts of interest.	Roles are clear and realistic. They may be limited in scope, but do evoke conflict.	Roles match the issues and resources. The roles provide multiple perspectives from which to view the topic.	
Use of the Web	This activity could probably be done better without the Web.	Some resources reflect features of the Web that make it particularly useful.	Uses the Web to access at least some of the following: interactivity, multiple perspectives, current information, etc.	
Transformative Thinking	No Transformative thinking. (This is not a WebQuest, but may be a good Knowledge Hunt).	Higher level thinking is required, but the process for students may not be clear.	Higher level thinking is required to construct new meaning. Scaffolding is provided to support student achievement.	

Real World Feedback	No feedback loop included.	The learning product could easily be used for authentic assessment although this may not be addressed.	A feedback loop is included in the Web page and an evaluation rubric is probably provided (early on!).	
Conclusion	Minimal conclusion. No mention of student thinking or symmetry to intro.	Returns to the intro ideas. May sum up the experiences and learning that was undertaken.	Clear tie-in to the intro. Makes the students' cognitive tasks overt and suggests how this learning could transfer to other domains/issues.	

Evaluation matrix / rubric for assessing

WQ3 -- http://www.twghkyds.edu.hk/~ytsui/wq3

	Low (Score: 1)	Medium (Score: 2)	High (Score: 3)	Score
Engaging Opening	No attempt made to appeal to learners.	Honestly attempts to appeal to student interests.	Has that something that compels attention.	
The Question / Task	Fuzzy Question or Task. Maybe what's asked for is lower level thinking.	The Question and Task target higher order thinking, but may not be totally clear.	Clear Question and Task. These naturally flow from the introduction and signal a direction for sophisticated learning.	
Background for Everyone	No attempt to access prior learning or build common background.	Some mention of addressing a common body of knowledge. (May not happen within the activity.)	Clearly calls attention to the need for a common foundation of knowledge and provides needed (Web?) resources.	
Roles / Expertise	Roles are artificial and may lack inherent conflicts of interest.	Roles are clear and realistic. They may be limited in scope, but do evoke conflict.	Roles match the issues and resources. The roles provide multiple perspectives from which to view the topic.	
Use of the Web	This activity could probably be done better without the Web.	Some resources reflect features of the Web that make it particularly useful.	Uses the Web to access at least some of the following: interactivity, multiple perspectives, current information, etc.	
Transformative Thinking	No Transformative thinking. (This is not a WebQuest, but may be a good Knowledge Hunt).	Higher level thinking is required, but the process for students may not be clear.	Higher level thinking is required to construct new meaning. Scaffolding is provided to support student achievement.	

Real World Feedback	No feedback loop included.	The learning product could easily be used for authentic assessment although this may not be addressed.	A feedback loop is included in the Web page and an evaluation rubric is probably provided (early on!).	
Conclusion	Minimal conclusion. No mention of student thinking or symmetry to intro.	Returns to the intro ideas. May sum up the experiences and learning that was undertaken.	Clear tie-in to the intro. Makes the students' cognitive tasks overt and suggests how this learning could transfer to other domains/issues.	

Evaluation matrix / rubric for assessing

WQ4 -- http://www.twghkyds.edu.hk/~ytsui/wq4

	Low (Score: 1)	Medium (Score: 2)	High (Score: 3)	Score
Engaging Opening	No attempt made to appeal to learners.	Honestly attempts to appeal to student interests.	Has that something that compels attention.	
The Question / Task	Fuzzy Question or Task. Maybe what's asked for is lower level thinking.	The Question and Task target higher order thinking, but may not be totally clear.	Clear Question and Task. These naturally flow from the introduction and signal a direction for sophisticated learning.	
Background for Everyone	No attempt to access prior learning or build common background.	Some mention of addressing a common body of knowledge. (May not happen within the activity.)	Clearly calls attention to the need for a common foundation of knowledge and provides needed (Web?) resources.	
Roles / Expertise	Roles are artificial and may lack inherent conflicts of interest.	Roles are clear and realistic. They may be limited in scope, but do evoke conflict.	Roles match the issues and resources. The roles provide multiple perspectives from which to view the topic.	
Use of the Web	This activity could probably be done better without the Web.	Some resources reflect features of the Web that make it particularly useful.	Uses the Web to access at least some of the following: interactivity, multiple perspectives, current information, etc.	
Transformative Thinking	No Transformative thinking. (This is not a WebQuest, but may be a good Knowledge Hunt).	Higher level thinking is required, but the process for students may not be clear.	Higher level thinking is required to construct new meaning. Scaffolding is provided to support student achievement.	

Real World Feedback	No feedback loop *included.*	The learning product could easily be used for authentic assessment although this may not be addressed.	A feedback loop is included in the Web page and an evaluation rubric is probably provided (early on!).	
Conclusion	Minimal conclusion. No mention of student thinking or symmetry to intro.	Returns to the intro ideas. May sum up the experiences and learning that was undertaken.	Clear tie-in to the intro. Makes the students' cognitive tasks overt and suggests how this learning could transfer to other domains/issues.	

Appendix 17c: WORD Document Indicating the Relation between the Target Learning Outcomes and the Set of WebQuests (for WebQuest Expert)

Target Learning Outcomes	WQ1	WQ2	WQ3	WQ4
Make judgments and draw conclusions from research to solve problems [C6.1]	1. ☑	2. ☑	3. ☑	4. ☑
Draw conclusion from the information collected and apply the knowledge to solve problems of similar nature [C7.1]	5. ☑	6. ☑	7. ☑	8. ☑
Use multiple keywords or phrases to label information; categorize and connect the concepts derived from information [C8.1]	9. ☑	10. ☑	11. ☑	12. ☑
Integrate the agreement and disagreement among sources [C8.2]	13. ☑	14. ☑	15.	16.
Make inferences and simple generalizations from the evidence collected [C11.1]	17.	18.	19. ☑	20. ☑

Please complete the following table by indicating whether you agree with the tick or no tick in each grid.

1. Agree/Disagree	2. Agree/Disagree	3. Agree/Disagree	4. Agree/Disagree
5. Agree/Disagree	6. Agree/Disagree	7. Agree/Disagree	8. Agree/Disagree
9. Agree/Disagree	10. Agree/Disagree	11. Agree/Disagree	12. Agree/Disagree
13. Agree/Disagree	14. Agree/Disagree	15. Agree/Disagree	16. Agree/Disagree
17. Agree/Disagree	18. Agree/Disagree	19. Agree/Disagree	20. Agree/Disagree

Appendix 17d: WORD Document Explaining the Relation between the Target Learning Outcomes and the Set of WebQuests (for WebQuest Expert)

Target Learning Outcomes	WQ1	WQ2	WQ3	WQ4
[C6.1] make judgments and draw conclusions from research to solve problems	• Before joining the group for combining the findings brought by the four different roles, each group member needs to complete individual research on his/her assigned role. As a consultant in a particular area, the member would need to conclude the findings, about the current global conditions and the effects of human behaviors on the world, of that area based upon his/her individual research. So that, when the four members come together to prepare an informational presentation, he/she could contribute to the group by bring an overview of the area to the other	• Each group member needs to carry out individual research according to an assigned viewpoint. After that, the four members come together to get a better understanding of the topic and decide what might be the best answer to the question 'Paper or Plastic?' • In such case, they would need to use their findings from the different viewpoints for not only reaching a consensus on the answer to the given question but also making an informed decision for the issue.	• Through gathering some real, statistical items about the development and living conditions of their home country and three other countries, the students need to compare several aspects of life in four different countries. After that, they would apply such information (comparison) to determine whether living in another country would be better. • From the data gathered, the students might also have conclusions about the correlation between literacy rate and average life expectancy, and that between crowdedness and average life expectancy.	• Through gathering the amounts of calories and grams of fat in a set of chosen fast food items at four different fast food restaurants, the students need to analyze the data and use the results (comparison) to determine which of the four fast food restaurants they selected would have the healthiest fast food meal, so as to determine the healthiest fast food restaurant. • From the data gathered, the students might also have conclusions about the correlation between the number of calories and grams of fat in fast food items.

	members. • Using the information brought by the four members, the group would need to determine 1) what were the causes and effects of global warming in the past, and 2) how human behaviors will affect the global conditions in the future.			
[C7.1] draw conclusion from the information collected and apply the knowledge to solve problems of similar nature	• Through individual inquiry, the student could gather information and acquire knowledge, about the theme of the WebQuest, in the area of his/her role. The student could also apply such information or knowledge, or even the Web resources provided in the WebQuest, to the study of similar topics, such as environment, natural resources, modernization, and other current global issues. • Through the WebQuest activity, the students would be informed that a global issue, like the theme of the WebQuest, is complicated.	• Through individual inquiry, the student could gather information and acquire knowledge, about the theme of the WebQuest, in the area of his/her assigned viewpoint. The student could also apply such information or knowledge, or even the Web resources provided in the WebQuest, to the study of similar topics, such as environment, energy sources, renewable and nonrenewable resources, etc. • Through the WebQuest activity, the students would be informed that people from different background may hold different	• In the WebQuest, the students need to collect information regarding the development and living conditions of different countries using the *CIA World Factbook* and the country profiles provided by FCO, BBC, UNICEF, etc. These online resources contain massive real and statistical data about countries and regions in the world. The students could acquire some basic knowledge about a country through exploring in these databases. They could also apply such knowledge, or even these	• In the WebQuest, the students would acquire some knowledge about healthy fast food by, first, 1) thinking about two questions on this topic using the relevant Web materials provided, and, then, 2) gathering and analyzing the amounts of calories and grams of fat in a set of chosen fast food items using the Washington Post Fast Food Calorie Counter or the Calorie Guide provided by FastFood.com. They could also apply the knowledge and information acquired, or other calorie counters or fat intake

	Collecting information from multiple roles and areas is required for the consideration of such an issue. As a result, this way of handling a real-life problem might influence the students that they would apply it to other issues or problems with similar nature.	attitudes and viewpoints towards a real-world issue. Thus, collecting information from people with different viewpoints is required for the consideration of such an issue. As a result, this way of handling a real issue might influence the students that they would make use of it to deal with other real-world issues with similar nature.	Web resources, to the study of other areas and subjects, like economy, government, geography, history, etc. • Through the WebQuest activity, the students could experience the use of tables and graphs for facilitating data comparison and also the use of graphs for demonstrating points or supporting explanation. As a result, this might influence how they would perform other similar tasks for data analysis and explanation. • In creating the graphs, the students might 1) find that some graphs demonstrate a better visual aid then others, and 2) gain a new understanding in which ways graphs can demonstrate a point better then words. These might also influence how they would make use of graphs to deal with problems with similar nature.	calculators provided in the WebQuest, to looking at issues with similar nature, such as comparing other items at fast food restaurants or looking at the food they eat in order to determine how many calories and grams of fat they consume each day. • Through the WebQuest activity, the students could experience the use of tabular form and chart to represent and analyze data. As a result, this might influence how they would perform other similar tasks for data representation and analysis.

[C8.1] use multiple keywords or phrases to label information; categorize and connect the concepts derived from information	• During individual inquiry, each role is prompted by a set of guiding questions helping the student make use of the role-specific Web resources to develop expertise in that particular field. Once any useful information is found from the Web resources, the student would need to use certain means to record or mark the information, as well as its source, so as to answer the guiding questions or facilitate further retrieval. • To answer the questions, the student would need to categorize the concepts derived from the information, such as climate, weather, human health, food supply, greenhouse, fossil fuels, etc, according to the focus of each question. Some questions would also require the student to connect different concepts derived from the information. For example, climate and weather, global warming and	• During individual inquiry, each role is prompted by a set of guiding questions helping the student make use of the role-specific Web resources to acquire useful information from that particular viewpoint. Once any useful information is found from the Web resources, the student would need to use certain means to record or mark the information, as well as its source, so as to answer the guiding questions or facilitate further retrieval. • To answer the questions, the student would need to categorize the concepts derived from the information, such as reuse, paper recycling, plastic recycling, paper industry, recycling processes, types of plastics, environment friendly, environmental policies, fossil fuels, etc, according to the focus of each question. Some questions would also require the	• After gathering the required statistical items from the CIA database, the students need to label them in a spreadsheet by relevant keywords, like size, population, average life expectancy, literacy rate, and crowdedness. The students would also categorize the statistical items in different rows or columns of the spreadsheet according to their types. • To analyze the statistical items, the students would need to connect some concepts derived from the information. For example, the crowdedness of a country could not be found from the CIA database. Thus, the students would need to, and they are also hinted to, construct an approximation of such item using the population and the area of a country. Besides, to study any correlation between two items	• At the beginning, the students are prompted by two questions asking what is meant by healthy fast food and what makes food healthy. To gain some ideas for the questions, the students would need to look at the Web materials provided. Once any useful information is found from the Web resources, the students would need to use certain means to record or mark the information, as well as its source, so as to answer the questions and facilitate further retrieval. • To answer the questions, the students would need to categorize the concepts derived from the information, such as diet, nutrition, health, etc. They would also make connections between the concepts. For example, nutrition and diet, nutrition and health. • Subsequently, after gathering the required numerical data from the

	sea level, atmosphere and greenhouse, fossil fuels and pollution. • Upon completion of individual inquiry, the four members come together to get into a group process, where they would not only categorize the information brought by the different roles but also attempt to combine the information so as to prepare their learning product.	student to connect different concepts derived from the information. For example, paper bags and reuse/recycling, plastic bags and reuse/recycling, paper industry and environment friendly, types of plastics and recycling, plastic recycling and recycling processes, paper industry and fossil fuels, paper/plastic industry and environmental policies.	(e.g. literacy rate and average life expectancy), the students would need to connect the concepts derived from the items as well. • In order to make inference on an item with no information (e.g. average income or number of people who own computer at home) from other relevant items they have collected (e.g. literacy rate), the students would need to connect the concepts derived from these items (e.g. using literacy rate to infer average income).	online fast food calorie counter, the students need to label them in a spreadsheet by relevant keywords, like number of calories, and grams of fat. The students would also categorize the data in different rows or columns of the spreadsheet according to their types. • To facilitate data comparison, the students would need to connect the two concepts, nutrition and health, again that were derived from the information for the two questions at the beginning. • To study any correlation between the number of calories and grams of fat in fast food items, the students would need to connect the concepts derived from the relevant data.
[C8.2] integrate the agreement and disagreement among	• During individual research, the four members of a group take on different roles of consultants and	• The four members of a group assume the roles from four different viewpoints. Each of them		

sources	are provided with different, specific Web resources for inquiry. Afterwards, the group would need to combine the findings brought by the four roles. For a particular point regarding the theme of the WebQuest, the four roles might vary in the arguments on that point owing to the different sources of information. In such case, the students would need to bring the agreement and disagreement from information sources together for completing their learning product.	is provided with a set of role-specific Web resources for individual inquiry. Subsequently, they would need to use their findings for discussing and debating among the four viewpoints in order to reach a consensus to be presented in their learning product. Since the four members vary in their viewpoints of the topic, they would need to integrate both agreement and disagreement for the topic, which came from different information sources supporting different viewpoints, in the process of reaching consensus.		
[C11.1] make inferences and simple generalizations from the evidence collected			• Upon completion of the report, the students are given four questions for discussion. In responding to the questions, they would need to give their inferences by referring to the data that they have analyzed, including the graphs, in the report.	• Upon completion of the report, the students are given two questions for discussion. In responding to the questions, they would need to make simple generalizations and give their inferences by referring to 1) their answers to the two

			• The first two questions ask the students if they could find any correlation between literacy rate and average life expectancy, and that between crowdedness and average life expectancy. To tell the correlations, the students would need to 1) study the relevant graphs, 2) discover any similar patterns from the graphs, and 3) attempt to arrive at a conclusion based on the limited data set. • The third and the fourth questions ask the students what they could tell about the average income among their selected countries and the number of people who own a computer, with Internet access, at home in the selected countries. Since the students are not provided with these two items of information throughout the activity, they would need to make inferences from the relevant items, like inferring average income from	questions prompted at the beginning, and 2) the data that they have analyzed, including the charts, in the report. • The first discussion question asks the students, in general, what they could tell about the food items provided by American fast food restaurants. In such case, the students would need to derive some common characteristics of American fast food items from the particular data set that they have collected in the report together with the use of the knowledge or information about healthy fast food that they have acquired through the activity. • The second discussion question asks the students if they could find any correlation between the number of calories and grams of fat in fast food items. To tell the correlation, the students would need to 1) study the relevant

			literacy rate, and then inferring the number of people who own computer at home from average income together with literacy rate.	charts, 2) discover any similar patterns from the charts, and 3) attempt to arrive at a conclusion based on the limited data set.

Appendix 17e: WORD Document Containing the Instructions, for the Evaluation Process, to Three WebQuest Experts

The four WebQuests are located at:

WQ1 – http://www.twghkyds.edu.hk/~ytsui/wq1
WQ2 – http://www.twghkyds.edu.hk/~ytsui/wq2
WQ3 – http://www.twghkyds.edu.hk/~ytsui/wq3
WQ4 – http://www.twghkyds.edu.hk/~ytsui/wq4

Part I:

1. Please look at the above WebQuests one by one.
2. Please evaluate each of them using March's (2003) rubric, as shown in the WORD document called "Part I -- Evaluation Rubric.doc".
3. For each WebQuest, please score it in accordance with the eight aspects and the three scoring levels in the rubric. Please simply enter the scores in the right most column of the rubric.

Part II:

1. The four WebQuests are designed to help students achieve five learning outcomes in the area of information literacy.
2. These learning outcomes are listed in the WORD document called "Part II -- Correlation with Learning Outcomes.doc".
3. The WORD document also indicates which WebQuest targets for which learning outcomes (i.e. the relation between the target learning outcomes and the four WebQuests).
4. Please **examine and determine** the relation on your own. In other words, please state whether **you think** each WebQuest can help students achieve the target learning outcomes (i.e. those checked with ticks).
5. In the table, if there is a tick, that means the WebQuest is designed for that particular learning outcome. If there is no tick, that means the WebQuest does not target for that particular learning outcome. All the ticks in the table are identified by the group of experienced teachers who developed the four WebQuests and me.
6. Please feel free to comment on the relation by completing the table below the relation (i.e. simply indicating that you agree or disagree with the ticks).

Part III:

1. This is the most time-consuming part.
2. The WORD document called "Part III -- Explanation of Correlation.doc" contains detailed explanation of the relation between the target learning outcomes and the WebQuests (i.e. explaining those ticks in Part II in details).
3. Please examine the explanation and give your comments on the explanation. You can draw some text boxes on the corresponding points or paragraphs and give descriptive comments in the text boxes.

Upon completion of your evaluation, please send the three WORD documents to me. Once again, thank you very much for your help!!!

Name: _____ (____) Class: _____ Time Allowed: 50 minutes

*Please use a **black or dark blue ball pen** to complete this test. Try your best to complete all the tasks.*

Appendix 18: Pre-test Paper

You are going to have a research (研究) about volcano (火山). To start your research, you would like to get three kinds of information (資料) about the topic. They are:

1. Historical Information 歷史方面的資料,
2. Scientific Information 科學方面的資料, and
3. Information about Emergencies 危機方面的資料.

You are given two websites (*Appendix 1* and *Appendix 2*), which will provide some historical and scientific information (歷史性及科學性資料) about volcanoes (火山) in the world.

Task 1:	For each given website, please use **at most five** sets of key words or phrases, in Chinese or English, to label/record the key information of that site. 請用不多於五組關鍵字或片語，標記或記錄各網站所包含的重要資訊。中英均可。
Hints 提示:	Do **NOT** read the websites line by line. Just skim (略讀) a page to get its key information (重要資訊). *Suggested Time: 8 minutes*

Website (網站名稱) – [科學人雜誌網站：自我重建的火山]
URL (網址) – http://sa.ylib.com/news/newsshow.asp?FDocNo=730&CL=32#dic ← [*Appendix 1*]

No More than 5 Sets of Key Words/Phrases (不多於五組關鍵字或片語):

Website (網站名稱) – [Volcano World | 火山世界]
URL (網址) – http://volcano.und.edu/ ←———— [*Appendix 2*]

No More than 5 Sets of Key Words/Phrases (不多於五組關鍵字或片語):

You talk to your teacher about your research (研究). Your teacher gives you the following for study.

Question:

What effects can an eruption have on the environment and habitats surrounding it?
火山爆發會對周圍的環境及動植物棲息地帶來什麼影響？

After looking at some useful websites, you have collected the following 24 items of information about the effects of volcanoes and eruptions (廿四項資料關於火山及火山爆發的影響).

Please read the following 24 items carefully and then complete **Task 2** and **Task 3**.
請細心查看下列廿四項資料，然後完成工作二及工作三。

1. Eruptions can influence bird migration, roosting, and feeding activity.
   火山爆發可能影響鳥類的遷移、棲息及覓食活動。

2. Gases commonly emitted by volcanoes can cause acid rain.
   火山釋放出來的氣體能導致酸雨。

3. Pumice and volcanic ash are used as abrasives, mostly in hand soaps and household cleaners.
   火山的浮石及灰燼能製成肥皂及家居清潔劑。

4. Livestock and other mammals are killed by lava flows.
   熔岩流會殺死家畜及其他哺乳類動物。

5. Heavy ashfall can make people impossible to breathe.
   大量降下火山灰能使人無法呼吸。

6. Volcanoes create new environments for plants and animals to migrate into.
   火山能創造新的環境讓動植物遷入作居所。

7. Forest fires and earthquakes are caused by or related to eruptions.
   火山爆發會引發山火及地震。

8. Eruption provides nutrients to the surrounding and thus produces very rich soils for farming.
   火山爆發會為周遭的土壤提供營養，從而產生肥沃的耕地。

9. Ash is bad for jet aircraft engines.
   火山灰對飛機引擎有不良影響。

10. Volcanoes help cool off the earth by removing heat from its interior.
    火山有助於除去地球內部的熱量，從而使地球降溫。

11. Eruption can create economic mineral deposits.
火山爆發能創造有經濟價值的含礦沉澱物。

12. Plants are destroyed over a wide area by eruption.
火山爆發會摧毀大片範圍的植物。

13. Ash can be very abrasive to bird's wings and thus affect flying ability.
火山灰能使雀鳥的翅膀磨損，從而影響其飛行能力。

14. Volcanoes provide refuges for rare plants and animals from the ravages of humans and livestock.
火山為罕有的動植物提供避難所，免受人類及其他動物的摧毀。

15. Heavy ashfall affects visibility.
大量降下火山灰會影響能見度。

16. Eruption produces spectacular scenery and beautiful landscapes.
火山爆發會形成壯麗的景象。

17. Lava flows destroy houses, roads, and any other structures.
熔岩流會摧毀房屋、道路及其他建築。

18. Weather right near a volcano is that there is often a lot of rain, lightning, and thunder during an eruption.
火山爆發時常引發大雨、打雷及閃電。

19. Eruption can create new islands and land.
火山爆發能創造新的島嶼與陸地。

20. Volcanism produces large amount of carbon dioxide (CO_2).
火山活動製造出大量二氧化碳。

21. Volcanic deposits are used as building materials.
火山的沉澱物能用作建築材料。

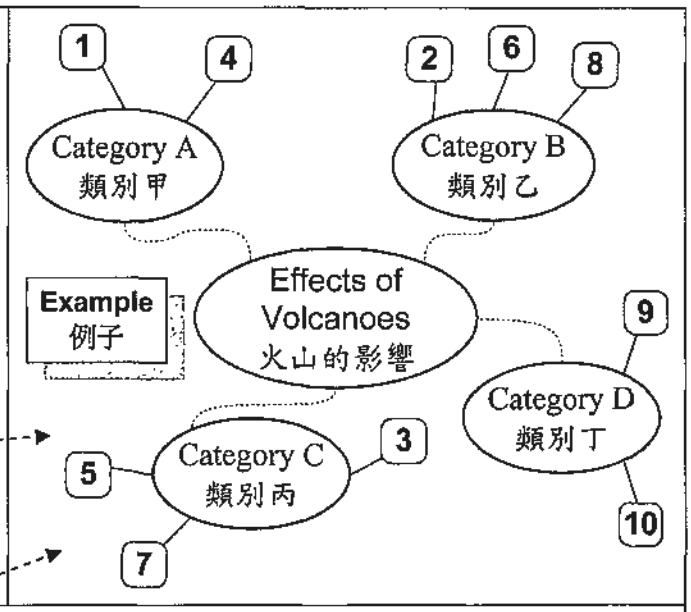
22. Explosive eruptions near water can generate tsunami.
水底火山爆發能引起海嘯。

23. Volcanic emissions produce the atmosphere and the water of the oceans.
火山釋放出來的物質會產生大氣層及製造海水。

24. Explosive eruptions can make lahars and mudflows that flood valleys.
火山爆發引起的泥石流會淹沒低窪地方。

Task 2:

Please **categorize** the above 24 items by **drawing a mind map** in the following box. There is **no limit** on the number of categories. In you mind map, there is **no need** to name each category. You can simply use a bubble to represent a category and **connect the appropriate items** to the category by indicating the numbers of the items. An example is given on the right. If necessary, you may add sub-categories under certain categories.



請在以下空格內畫一幅腦圖，用來將以上廿四項資料作分類。腦圖內的類別數目不限，你亦不用為每個類別寫上名稱，只須以橢圓形來表示一種類別，並把適當資料項目的號碼連至該類別便可。例子如上。如有需要，你可以在某些類別下，新增子類別。

Suggested Time: 10 minutes

Effects of Volcanoes
火山的影響

Task 3:	Please give simple **illustration and conclusion** on the effects brought by volcanoes by **integrating** the 24 items shown on P.2 and P.3. Please write, in Chinese or English, on the lines provided in the following box. 試綜合頁二及頁三內的廿四項資料，並在下列方格內簡單說明及總結火山帶來的影響。中英均可。 *Suggested Time: 8 minutes*

Effects Brought by Volcanoes (火山帶來的影響):

Task 4:	From an international research report, you get the following table, which shows the deadly eruptions in the history **since A.D.** Using the information given in the **following table** and the **24 items** shown on P.2 and P.3, answer the true/false questions on next page. 從一份國際性研究報告，你獲得以下表格內的資料。該等資料顯示自公元以來史上嚴重致命的火山爆發記錄。請根據下列資料，加上頁二及頁三所提供的廿四項影響，回答下頁的是非題。 *Suggested Time: 8 minutes*

Deaths 死亡人數	Volcano 火山	Year 年份	Major Cause of Death 主要致命原因
92,000	Tambora, Indonesia (印尼)	1815	Starvation 飢荒
36,417	Krakatau, Indonesia (印尼)	1883	Tsunami 海嘯
29,025	Mt. Pelee, Martinique (加勒比海群島)	1902	Ash flows 火山灰流
25,000	Ruiz, Colombia (哥倫比亞)	1985	Mudflows 泥石流
14,300	Unzen, Japan (日本)	1792	Volcano collapse, tsunami 火山崩潰、海嘯
9,350	Laki, Iceland (冰島)	1783	Starvation 飢荒
5,110	Kelut, Indonesia (印尼)	1919	Mudflows 泥石流
4,011	Galunggung, Indonesia (印尼)	1882	Mudflows 泥石流
3,500	Vesuvius, Italy (意大利)	1631	Mudflows, lava flows 泥石流、熔岩流
3,360	Vesuvius, Italy (意大利)	79	Ash flows and falls 火山灰流及降火山灰
2,957	Papandayan, Indonesia (印尼)	1772	Ash flows 火山灰流
2,942	Lamington, Papua N.G. (巴布亞新畿內亞)	1951	Ash flows 火山灰流
2,000	El Chichon, Mexico (墨西哥)	1982	Ash flows 火山灰流
1,680	Soufriere, St Vincent (加勒比海群島)	1902	Ash flows 火山灰流
1,475	Oshima, Japan (日本)	1741	Tsunami 海嘯
1,377	Asama, Japan (日本)	1783	Ash flows, mudflows 火山灰流、泥石流
1,335	Taal, Philippines (菲律賓)	1911	Ash flows 火山灰流
1,200	Mayon, Philippines (菲律賓)	1814	Mudflows 泥石流
1,184	Agung, Indonesia (印尼)	1963	Ash flows 火山灰流
1,000	Cotopaxi, Ecuador (厄瓜多爾)	1877	Mudflows 泥石流
800	Pinatubo, Philippines (菲律賓)	1991	Roof collapses and disease 屋頂倒塌及疾病
700	Komagatake, Japan (日本)	1640	Tsunami 海嘯
700	Ruiz, Colombia (哥倫比亞)	1845	Mudflows 泥石流
500	Hibok-Hibok, Philippines (菲律賓)	1951	Ash flows 火山灰流

Please put a tick in the appropriate boxes. 請在適當空格內加上✓號。		True 正確	Mostly True 大致正確	Cannot Decide 未能斷定	False 不正確
1.	The deadliest eruption on record killed about 92,000 people. 自有記錄以來，最嚴重的火山爆發令約九萬二千人致命。	☐	☐	☐	☐
2.	The number of deadly eruptions in the 19th century (i.e. 18XX) was more than that in the 18th century (i.e. 17XX), while that in the 20th century (i.e. 19XX) is again more than that in the 19th century (i.e. 18XX). Thus, we infer that there will be even more in the 21st century (i.e. 20XX). 在十九世紀發生致命火山爆發的次數比十八世紀為多，二十世紀的次數又比十九世紀為多，由此推論，廿一世紀將發生比二十世紀更多次數的致命火山爆發。	☐	☐	☐	☐
3.	In 1883, there was large amount of carbon dioxide over Indonesia. 一八八三年，印尼上空曾出現大量二氧化碳。	☐	☐	☐	☐
4.	There are some active volcanoes in Indonesia and Japan. 印尼及日本擁有一些活火山。	☐	☐	☐	☐
5.	Both Indonesia and Japan are threatened by volcanoes. 印尼及日本皆受火山威脅。	☐	☐	☐	☐
6.	The number of deaths caused by volcano eruptions in Asia is more than that in Europe. 在亞洲，因火山爆發而致命的人數比歐洲為多。	☐	☐	☐	☐
7.	There are more dangerous volcanoes in Asia than that in Europe. 亞洲比歐洲有較多具危險性的火山。	☐	☐	☐	☐
8.	The effects of volcanoes on Asia are worse than that on Europe. 火山對亞洲的影響較對歐洲的影響為嚴重。	☐	☐	☐	☐
9.	In 79 A.D., the eruption in Italy affected visibility and thus caused difficulty in escaping. 公元七九年，意大利發生火山爆發，曾影響能見度，導致逃生困難。	☐	☐	☐	☐
10.	Mudflows and ash are the major causes of deaths. 泥石流及火山灰為主要致命的原因。	☐	☐	☐	☐
11.	There is potential for Indonesia to develop volcanic tourism. 印尼具備發展火山旅遊業的潛在條件。	☐	☐	☐	☐
12.	In 1783, there was starvation somewhere in Iceland that caused thousands of deaths. 冰島某處曾於一七八三年缺乏糧食，導致數以千人死亡。	☐	☐	☐	☐
13.	In 1902, there was large amount of carbon dioxide over Caribbean. 一九零二年，加勒比海群島上空曾出現大量二氧化碳。	☐	☐	☐	☐
14.	In the 18th century (i.e. 17XX), there were at least two eruptions underwater in Japan. 在十八世紀，日本曾發生至少兩次水底火山爆發。	☐	☐	☐	☐

15.	In the 19th century (i.e. 18XX), the population of Indonesia decreased by more than one hundred thousand. 在十九世紀，印尼減少了十多萬人口。	☐	☐	☐	☐
16.	In 1991, the eruption in Philippines destroyed a number of houses. 一九九一年，菲律賓發生火山爆發，摧毀了不少房屋。	☐	☐	☐	☐
17.	In 1985, the mudflows from the eruption in Colombia flooded a number of valleys. 一九八五年，哥倫比亞多處低窪地方被泥石流淹沒。	☐	☐	☐	☐
18.	Indonesia is the country that has the most number of deaths caused by eruptions. 印尼是全球因火山爆發而導致死亡人數最多的國家。	☐	☐	☐	☐
19.	Indonesia is the country that has the most number of eruptions. 印尼為全球火山爆發次數最多的國家。	☐	☐	☐	☐
20.	Over the past two hundred years, there were about one hundred and thirty-eight thousand deaths caused by eruptions in Indonesia. Therefore, we infer that there is a lack of early warning system on eruptions in this country. 在過往二百年間，印尼因山火爆發導致死亡的總人數高達十三萬八千，由此推論，印尼缺乏一套有效的火山爆發預警系統。	☐	☐	☐	☐

Task 5:	Please use all the information and knowledge that you have acquired from the above to answer the following questions. 請運用以上你所獲得的所有資料及知識，回答下列問題。
	Suggested Time: 5 minutes

What would you do if there is a sudden volcano eruption near where you live?
若在你的居所附近突然發生火山爆發，你會如何處理？

Please select **only two** choices that you consider the **most important** and give a **brief reason**, in Chinese or English, for each of your choices.
請選擇兩項你認為最重要的，並在旁邊填上簡單的原因。中英均可。

During the eruption, I will 火山爆發時，我會 (Please select two 請選兩項)：

☐ Seek shelter indoors 尋找室內地方作庇護

Reason (原因): _____

☐ Avoid river valleys or low-lying area 避免走進河谷或低窪地區

Reason (原因): _____

☐ Stay away from open space 遠離空曠地方

Reason (原因): _____

☐ Stay away from seashore 遠離海邊

Reason (原因): _____

☐ Stay away from hillside 遠離山坡

Reason (原因): _____

☐ Cover my mouth and nose 掩蔽口鼻

Reason (原因): _____

☐ Avoid areas downwind of the volcano 避免走進風向從火山吹來的地方

Reason (原因): _____

☐ Others 其他，please specify 請說明：_____

Reason (原因): _____

After the eruption, I will 火山爆發後，我會 (Please select two 請選兩項)：

☐ Stay indoors and close doors, windows, and all ventilation 留在室內及關上所有門窗及抽風系統

Reason (原因): _____

☐ Wear long-sleeved shirts and long pants 穿上長袖衫及長褲

Reason (原因): _____

☐ Use goggles or wear eyeglasses 戴上護目鏡

Reason (原因): _____

☐ Put on a dust mask or hold a damp cloth over the face 戴上防塵面具或用濕布罩面

Reason (原因): _____

☐ Stay away from volcanic ashfall 遠離降火山灰的地方

Reason (原因): _____

☐ Avoid driving or turning on truck engines 避免駕車或發動汽車引擎

Reason (原因): _____

☐ Clear heavy ash from flat or low-pitched roofs and rain gutters 清理積累的火山灰及雨水渠

Reason (原因): _____

☐ Others 其他，please specify 請說明：_____

Reason (原因): _____

Task 6:	Next time, you want to have research projects on other topics. Please read the following questions carefully and try your best to answer them, in Chinese or English. 隨後，你打算進行關於其他課題的研究。請細心閱讀以下題目，並盡力回答，中英均可。
	Suggested Time: 10 minutes

Q6.1 (a) Suppose you are going to do a research about **the healthiest fast food restaurant** in Hong Kong. What **questions** would you like to study first? Please write **two questions** on the following lines.
假若你將進行一項關於"**全港最健康快餐店**"的研究，你會先定立哪**兩條研究問題**作為開始？請在下列橫線，寫出這**兩條問題**。

Two Questions (兩條問題):

_____

_____

_____

_____

_____

Q6.1 (b) To do the above research, what kind of **information** do you need to collect? Please write **three items of information** on the following lines.
如若進行以上研究，你需要收集**什麼資料**？請在下列橫線，寫出**三項該等資料**。

Three Items of Information (三項資料):

_____

_____

_____

_____

_____

Q6.2 If you want to know whether **the living conditions and the development** of another country is better or worse than those of your home country, what kind of **information** would you like to collect for analysis? Please write **three items of information** on the following lines.
假若你想了解某國家的生活條件及發展是否比自己國家更好或更差，你會收集什麼資料作分析？請在下列橫線，寫出三項該等資料。

Three Items of Information (三項資料):

_____

_____

_____

Q6.3 If you are going to help the government establish a law about whether all supermarkets should provide **paper bags instead of plastic bags** to their customers, what **viewpoints from people** should you take into consideration? Please write **three** of them on the following lines.
假若你將協助政府制定一條法例，關於是否規定超級市場不得為顧客提供膠袋，而只能提供紙袋。你應該聽取持哪些觀點的人們的意見？請在下列橫線，寫出三類你會納入作考慮的觀點。

Three Viewpoints (三類觀點):

_____

_____

_____

Q6.4 If you are going to do a research about **global warming**, what **kinds of experts** would you like to consult? Please write **three kinds of experts** on the following lines.
假若你將進行一項關於全球暖化的研究，你會向哪三方面的專家請教？請在下列橫線，寫出這三方面的專家。

Three Viewpoints (三類觀點):

_____

_____

_____

～ End of Test ～

Appendix 18a – Appendix 1 of Pre-test

地球科學

自我重建的火山

聖海倫斯火山可能正在填補自己的火山口

撰文／威斯特（Krista West）
翻譯／邱淑慧

2004年10月2日，美國華盛頓州的聖海倫斯火山在正午時分打了個飽嗝，噴出一股熱氣；緊接著是長達一小時的低頻率顫動。看來，岩漿可能正在地面下蠢蠢欲動。華盛頓州西南部卡斯克德火山觀測站的科學家擔心，火山活動可能對民眾生命造成威脅，因此發佈了3級火山警報，將該區上空劃爲飛行紅色警戒區。第二天，聯邦航空總署限制了峰頂周圍8.85公里內的飛航，飛機必須改變航道，或是延遲航班。幾天之後，噴發出的輕盈火山灰飄送到火山東北方110多公里處，可見發佈警報是對的。

噴出煙來：聖海倫斯火山或許尚未爆發，但緩慢湧出的熔岩，最終可能會填滿火山口，這個火山口是在1980年那次爆發所形成。此爲2005年6月8日火山西側的空拍圖。

但是，這回聖海倫斯火山並沒有發生類似1980年那樣的災難性爆發。沒有任何人受傷或喪生，沒有一棵樹因此而倒下，空中交通也隨即恢復正常。火山學家在10月6日降低了警報等級。

雖然驚險刺激能吸引媒體注意，民眾無疑也期待著一個巨大、爆炸性的噴發，但聖海倫斯火山的噴發卻是緩慢而安靜的。不過，即使噴發的活動已經大爲平靜，但直到今天它仍在持續噴發，週期性地吐出火山氣體、火山灰，並且伴隨著顫動。今年3月時的一次噴發，掀起的火山灰甚至高出海平面11公里。

回顧起來，科學家認爲聖海倫斯的火山活動在9月底至10月初逐漸增強，並不是準備要由山頂爆發，而是液態的岩漿正以穩定的節奏挖掘著通往地表的通道。這座火山在自己的火山口內逐漸堆積出一個新的熔岩穹丘，甚至可能回復到1980年爆發前的形狀。

聖海倫斯火山「就像是一管巨大的牙膏，只不過擠出來的是岩漿。」阿拉斯加大學費班克分校的火山學家艾克爾柏格（John Eichelberger）說。目前這座火山的構造，並沒有太多空間可以讓岩漿聚集。所以岩漿通往地表的路徑一旦成形，火山活動減緩，就會開始擠出「牙膏」來。當熔岩持續噴

Appendix 18a – Appendix 1 of Pre-test

出來，便會在火山口內形成一個狹長如脊椎般的穹丘。

隆伯格錯了嗎？

這個新的穹丘外型明顯，因酷似鯨背而廣爲科學家所知，它高出火山口底部426公尺，體積約4500萬立方公尺（今年3月最新測量的結果），可以裝入200艘超大型油輪。熔岩持續噴出，以每秒兩立方公尺的速度壘加在穹丘之上。如此緩慢的速度，使氣體可以逃逸出，岩石也可穩穩定住而不致爆發。

卡斯克德火山觀測站的火山學家史考特（William E. Scott）表示，這樣的熔岩流可以持續個好幾年，可是「要發生如同1980年5月18日的情況，實際上是不可能的，因爲火山已經完全變了個樣子。」他並且補充說明，「現在我們關注的是爆發的型態，而不是爆發與否。」

1980年的災難性爆發，快速改變了山的形狀。規模5.1的地震造成此處有紀錄以來最劇烈的山崩，山的整個北半邊都崩塌了。這樣的崩塌使底部的壓力減輕，產生巨大的岩漿泡泡，向外爆破，也毀滅了途中所經的一切。現在，噴發的形式已由滲漏取代爆發，不過隨著熔岩緩慢擠出，形成新的穹丘，卻可以使山的等高線分佈隨著時間而改變。「這座山正在自我重建。」艾克爾柏格說。

艾克爾柏格曾經研究過俄國堪察加半島的貝濟米亞尼火山，他表示，聖海倫斯火山正進行著相同的過程。貝濟米亞尼火山在1956年爆發，並側邊爆破，留下一個與聖海倫斯火山類似的火山口。50年來熔岩穹丘的成長與間歇性的噴發，幾乎已經填滿了貝濟米亞尼的火山口，並且使山形重建得像是1956年之前尚未爆發的樣貌。

科學家還不確定，聖海倫斯火山是不是會像貝濟米亞尼火山一樣自我重建。史考特說：「穹丘的成長，有各種不同的大小與時序，我們不可能確定眼前的噴發是否還會持續。」現在的聖海倫斯火山已經沒有空間容納一個像1980年時那樣的岩漿泡泡，也就是說，除非火山進行某種重建過程，使火山內部產生空間，否則，就是我們要開始擔心的時候了。

【本文摘自科學人2005年9月號】

【新聞小辭典】火山會長大

BACK TOP

Appendix 18b – Appendix 2 of Pre-test

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WHAT'S NEW

We're Back!!

The VW staff would like to thank everyone for their continued support and apologize for the brief interruption in updates while we were transitioning both equipment and staff. We will continue to work with our volcano web partners from around the world to keep VW fresh and add web features as they become available. There are several new features coming to VW in the coming months including a volcano blog, GIS layers, local area volcano maps, and more!! The RSS site feed and weekly updates will all be back online starting December 15th!

HOT NEWS!!

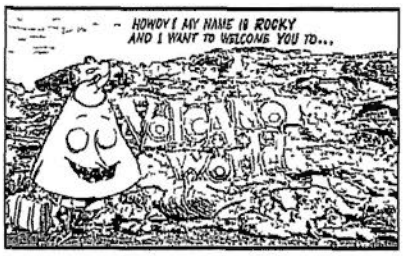
Gamkonora, Halmahera, Indonesia

(Image Credit: Dan Olberg, Senior Geologist, PT Nusa Halmahera Minerals)

Indonesians thank volcano for eliminating pest

JAKARTA (AFP) ◆ Farmers residing on the slopes of a smouldering Indonesian volcano are thanking the mountain for getting rid of a pest that had devastated the area's coconut palms, a report here said Tuesday. Gamkonora volcano

Appendix 18b – Appendix 2 of Pre-test



Volcano of the Month

Ganesa, Titan

This radar image of Titan shows Ganesa Macula, interpreted as a cryovolcano (ice volcano), and its surroundings. Cryovolcanism is thought to have been an important process on Titan and may still be happening today. This mosaic was made from images obtained by the Cassini radar mapper on two flybys. The lower part of the image was from the flyby on Oct. 26, 2004, while the upper part was from the Jan. 13, 2007, flyby.

Ganesa macula is the dark circular feature seen on the lower left of the mosaic. Bright rounded features, interpreted as cryovolcanic flows, are seen towards the top and the right of the mosaic. This image mosaic was taken in synthetic aperture mode. The resolution of the images is approximately 350 meters (1,150 feet). North is toward the top. The image mosaic is about

on Halmahera island in Indonesia's North Maluku province erupted in July, shooting rocks, ash and smoke into the air for days and prompting thousands to flee their homes. "Almost all our coconut trees were previously ruined by the sexava pest. Now we are completely free of this pest, following Gamkonora blanketing the area with ash in July," the state Antara news agency quoted a local farmer, Yakup, as saying.

Other areas on the same island that were not inundated by the ash continue to suffer from the pest, an insect which voraciously eats the leaves of the coconut tree, greatly reducing the coconut harvest. Coconuts processed into copra are a main source of livelihood for residents in the area. "When Gamkonora erupted... the ash it spewed made us all suffer, and many got coughs and the flu. But it turns out that this very same ash has helped us overcome this sexava pest," said another farmer, Julis.

Undersea Volcano East Pacific Rise

Larry O'Hanlon, Discovery News - For the first time ever, scientists have the goods on a large volcanic eruption at the bottom of the ocean. Putting together more than 50,000 sea floor images, along with 10 exploratory dives with the Alvin submarine, an unprecedented map has been pieced together showing 22 million cubic meters of new lava coming out of the East Pacific Rise - - a seafloor spreading center off the

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'RSS Site Feeds!'

VW is happy to provide a site feed of the SI/USGS current eruptions and our "RAQ's" (Recently Asked Questions)

(Note Direct site feeds need a 'reader' program such as Google Reader or a RSS capable browser (such as

Appendix 18b – Appendix 2 of Pre-test

570 kilometers (354 miles) wide and 390 kilometers (240 miles) high

For more information on this image:
Visit the JPL Planetary Photojournal
or
Visit the Cassini/Huygens Homepage

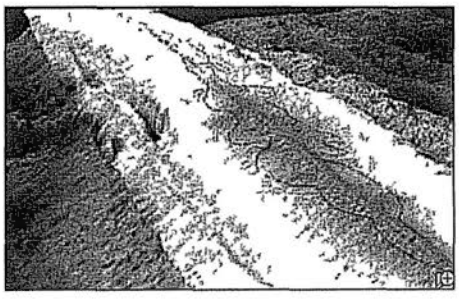
SPACE IMAGING

High Resolution Satellite Images

Space Imaging has kindly provided Volcano World with some excellent IKONOS satellite images of Earth's volcanoes. We are grateful for their contribution and support.

Pacific coast of Mexico. The area covered by the recent eruption is equivalent to metropolitan Oklahoma City, or nearly half of Manhattan.

Read more of this article at: Discovery News



Opera))

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Volcano World Website Policies

Appendix 18c: Items Removed from the Pre-test for Task 2 and Task 3

To avoid providing too much information and to reduce the amount of reading, the following 12 items (about the effects of volcanoes) were removed from the pre-test.

25. Eruption can provide habitat to pioneer species.
火山爆發能為某些先驅樹種提供棲息地。

26. Volcanoes generate tourism.
火山區會成為旅遊景點。

27. Pyroclastic flows travel very quickly down the slopes and can kill.
火山爆發引起的急速碎石流能致命。

28. Eruption destroys old habitat and crops.
火山爆發會摧毀原有的動物棲息地及農作物。

29. Eruption can destroy cities, towns, communities.
火山爆發能摧毀城鎮及社區。

30. Eruption displaces populations.
火山爆發會令人口遷移。

31. Eruption disrupts commerce.
火山爆發會破壞正常的商業活動。

32. Famine, forest fires, and earthquakes are caused by or related to eruptions.
火山爆發會引發饑荒、山火及地震。

33. Volcanoes underwater can affect aquatic life.
水底火山能影響水中生態。

34. Houses, buildings, roads, and fields can get covered with ash.
火山灰會覆蓋房屋、道路及田野。

35. Sunlight is blocked out by ash.
太陽光會被火山灰遮擋。

36. Air quality near an eruption is poor.
火山爆發使周圍的空氣質素變差。

Appendix 18d: Initial Design of Task 2 in the Pre-test

Task 2a:	How would you categorize the above 24 items? Please select **two ways** of categorizing the items that you think most appropriate by checking the boxes next to the choices. 請從下列選項，挑選兩款你認為最恰當的分類方法，用作整理以上廿四項資料。 請在選項旁邊的方格內加上✓號。
	Suggested Time: 5 minutes

☐ For 3 Categories:

a) Temporary/Immediate/Short-term Effects; b) Long-term Effects; c) Permanent Effects

分為三類： 甲）暫時/即時/短期性影響、乙）長期性影響、丙）永久性影響

☐ For 2 Categories:

a) Effects for Sure; b) Possible Effects

分為兩類： 甲）必然出現/發生的影響、乙）有可能出現/發生的影響

☐ For 2 Categories:

a) Direct Effects; b) Indirect Effects

分為兩類： 甲）直接影響、乙）間接影響

☐ For 5 Categories:

a) Effects on Atmosphere; b) Effects on Climate; c) Effects on Weather; d) Effects on Nature;
e) Effects on Environment

分為三類： 甲）對大氣層的影響、乙）對氣候的影響、丙）對天氣的影響、
丁）對大自然的影響、戊）對環境的影響

☐ For 3 Categories:

a) Effects on Air; b) Effects on Land; c) Effects on Sea

分為三類： 甲）對空氣的影響、乙）對陸地的影響、丙）對海洋的影響

☐ For 3 Categories:

a) Effects on the Surrounding of the Volcano; b) Effects on the Region/City/Town of the Volcano;
c) Global Effects

分為三類： 甲）對該火山周圍的影響、乙）對該火山所屬地區/城鎮的影響、
丙）全球性影響

☐ For 5 Categories:

a) Effects on Roads and Buildings; b) Effects on Field; c) Effects on Bird; d) Effects on Livestock;
e) Effects on People

分為三類： 甲）對道路及建築物的影響、乙）對田地的影響、丙）對雀鳥的影響、
丁）對家畜的影響、戊）對人們的影響

☐ For 4 Categories:

a) Effects on People; b) Effects on Plants; c) Effects on Animals; d) Effects on Environment

分為三類： 甲）對人的影響、乙）對植物的影響、丙）對動物的影響、丁）對環境的影響

☐ For 3 Categories:

a) Effects from General Volcanic Activities; b) Effects during Eruption; c) Effects after Eruption

分為三類： 甲）一般性火山活動帶來的影響、乙）火山爆發時的影響、
丙）火山爆發後的影響

☐ For 4 Categories:

a) Effects from Ash; b) Effects from Lava; c) Effects from Gases Emitted;
d) Effects from Deposits

分為三類： 甲）來自火山灰的影響、乙）來自火山熔岩的影響、
丙）來自火山釋放氣體的影響、丁）來自火山沉澱物的影響

☐ Others (Please specify, in Chinese or English) 其他分類（請填寫，中英均可）：

For _____ Categories 分為_____類：

a) _____;

b) _____;

c) _____;

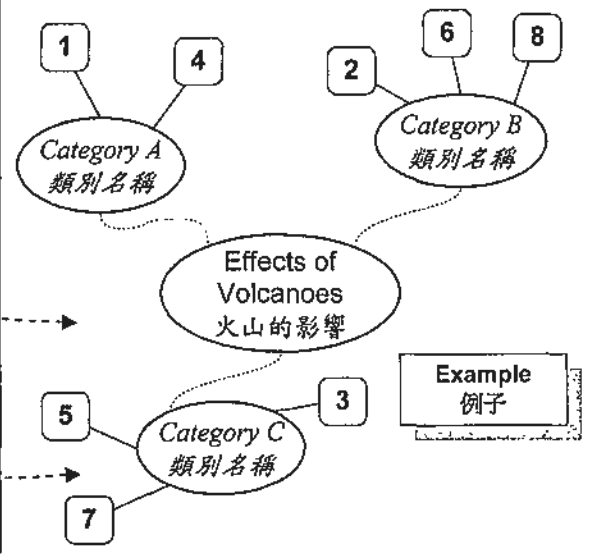
d) _____;

e) _____

Task 2b:

Please **select one** categorization method from **your choices** above. Use this method to complete the mind map in the following box for **connecting the 24 items** shown on P.3 and P.4. In the mind map, you are just required to indicate the numbers of the items. An example is given on the right.

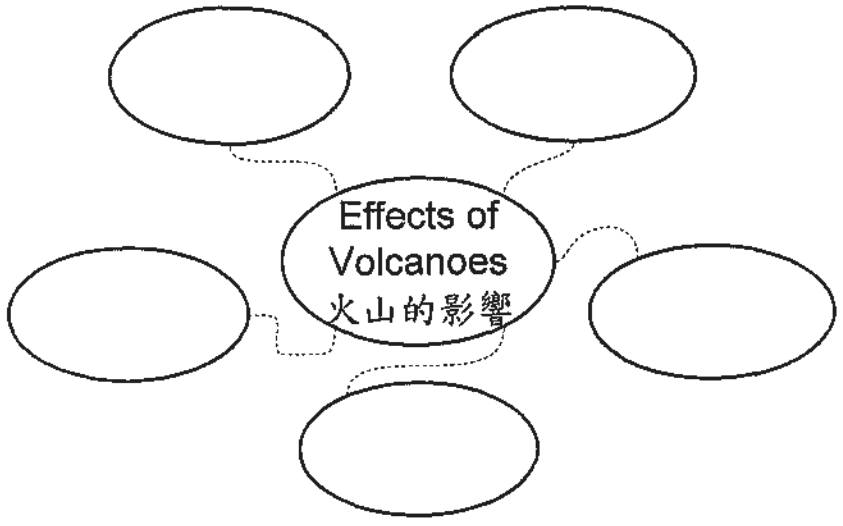
請根據以上你所選的兩種分類方法，從中再挑選一組類別，並用該組類別完成以下空格內的腦圖，把頁三及頁四內的廿四項資料連繫起來。你只須把該等資料的號碼寫在腦圖上便可，例子如右。



Suggested Time: 5 minutes

Please indicate the categories by **writing their names in the bubbles** and **connect** the 24 items given above to the categories. If necessary, you may add sub-categories under certain categories.

請將類別名稱寫在圈內，並把以上所列的廿四項資料連接到適當的類別。如有需要，你可以在某些類別下，新增子類別。



Name: _____ (____) Class: _____ Time Allowed: 50 minutes

*Please use a **black or dark blue ball pen** to complete this test. Try your best to complete all the tasks.*

You are going to have a research (研究) about reproductive cloning (生物複製技術). To start your research, you would like to get three kinds of information (資料) about the topic. They are:

1. Historical Information 歷史方面的資料,
2. Scientific Information 科學方面的資料, and
3. Ethical Information 道德方面的資料.

Appendix 19: Post-test Paper

You are given two websites (*Appendix 1* and *Appendix 2*), which will provide some historical and scientific information (歷史性及科學性資料) about reproductive cloning (生物複製技術).

Task 1:	For each given website, please use **at most five** sets of key words or phrases, in Chinese or English, to label/record the key information of that site. 請用不多於五組關鍵字或片語，標記或記錄各網站所包含的重要資訊。中英均可。
Hints 提示:	Do **NOT** read the websites line by line. Just skim (略讀) a page to get its key information (重要資訊). *Suggested Time: 8 minutes*

Website (網站名稱) – [科學人雜誌網站：複製豬「酷比」是小怪胎？]
URL (網址) – http://sa.ylib.com/news/newsshow.asp?FDocNo=102&CL=15 ← [*Appendix 1*]

No More than 5 Sets of Key Words/Phrases (不多於五組關鍵字或片語):

Website (網站名稱) – [Cloning -- A Webliography | 複製科技--網站目錄]
URL (網址) – http://www.lib.msu.edu/skendall/cloning/ ←———— [*Appendix 2*]

No More than 5 Sets of Key Words/Phrases (不多於五組關鍵字或片語):

You talk to your teacher about your research (研究). Your teacher gives you the following question for study.

Question:

What impacts can cloning technologies have on the modern world?
生物複製科技會對現今世界帶來什麼影響？

After looking at some useful websites, you have collected the following 21 items of information about the impacts of cloning technologies (廿一項資料關於生物複製科技的影響).

Please read the following 21 items carefully and then complete **Task 2** and **Task 3**.
請細心查看下列廿一項資料，然後完成工作二及工作三。

1. Cloning extinct species has been a dream of some scientists for decades.
   複製已絕種動物是某些科學家多年來的夢想。

2. One of the obstacles in the attempt to clone extinct species is the need for nearly perfect DNA.
   由於已絕種動物現今並不存在，尋找牠們的ＤＮＡ便成為複製牠們的最大障礙。

3. Presently, problems like retardation, cardiopulmonary defects, and immune impairment are commonly shared by the cloned animals.
   現有的複製動物普遍存在發育遲緩、心肺存在缺陷、免疫系統功能不健全等問題。

4. Researchers are considering cloning endangered species, like the giant panda.
   研究人員正考慮複製各種瀕臨絕種動物，如中國大熊貓。

5. Conservation biologists and environmentalists think cloning may deter donations to help preserve natural habitat and wild animal populations.
   主張保育的環境學家認為，複製科技會妨礙人們對保護自然生態及野生動物所作的努力。

6. Cloning technologies can be used to produce a healthy liver so as to replace the diseased one.
   利用複製技術可以制造一個健康的肝臟，從而取代病變的肝臟。

7. Cloning technologies can be used to cure heart disease by cloning the cells of a healthy heart and implanting the cloned cells into the lesions area.
   複製技術可用來醫治心臟病，通過複製健康心臟的細胞，再植入病變區域，達至治療的目的。

8. So far, scientists still do not understand the canceration of cells. Cloning technologies can help answer the relevant questions.
   至今，科學家仍未知道細胞如何發生癌變，複製技術有助解答這方面的問題。

9. Cloning technologies can be used to provide new bone marrow for patients with leukemia.
   利用複製技術可以為白血病人制造新的骨髓，使之快樂生活。

10. From recent experience, scientists are aware of the great risks involved in cloning technologies.
這幾年來，根據複製動物的經驗，科學家們認識到目前複製技術還存在相當大的風險。

11. Cloning technologies have been a good theme for a number of movies, such as Jurassic Park.
複製科技成為不少電影的拍攝題材，如侏儸紀公園。

12. Some scientists think cloning certain people with special contributions can help human beings control their own evolution, resulting in largely enhancing human achievement.
一些科學家認為，複製有特殊貢獻的人物，可使人類控制自己的演化，大幅提高人類的成就。

13. Cloning technologies can change people's aging process so as to realize the dream of immortality.
複製技術可改變人類的衰老過程，進而實現長生不老的夢想。

14. Each human body carries on average eight flaw genes, which might cause a number of diseases. Cloning technologies can be used to replace such genes so as to reduce the incidence rate.
據統計平均每人體內攜帶八個缺陷基因，這些基因會引發許多疾病。利用複製技術可以替代缺陷基因，減少發病機會率。

15. The process of cloning might lead to the absence or flaw of individual gene, resulting in some irreversible problems.
複製技術的過程會使個別基因出錯或缺失，從而造成一些無法逆轉的問題。

16. Cloning technologies can help sterile couples have their own children.
複製技術可以幫助不育的夫妻，使他們擁有自己的孩子。

17. A number of ova would be used and destroyed while researching human cloning technology. This will result in foetal death and killing potential human life.
在研究複製人技術的過程中，會犧牲許多卵子，且造成胎兒夭折，毀滅一個個生命的潛能。

18. A cloned human might have mental deficiency due to his/her special identity.
複製人可能因自己的特殊身份而產生心理缺陷。

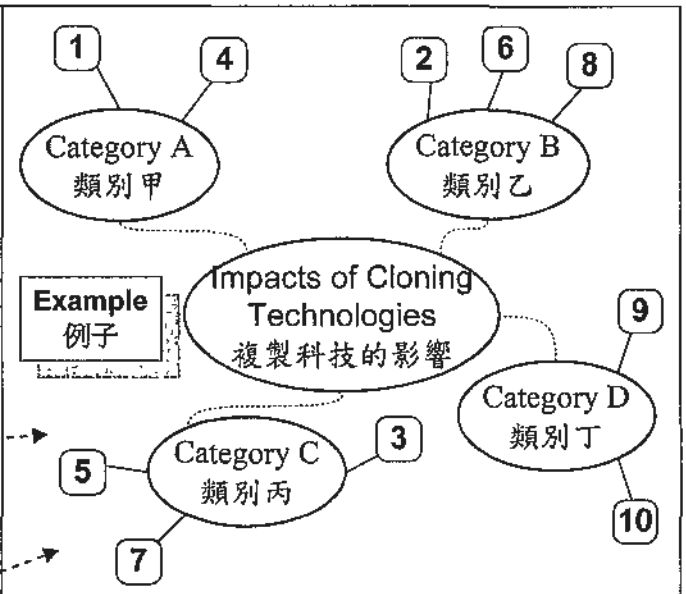
19. It is difficult to recognize the identity of a cloned human. The existing ethical relationship fails to describe the connection between a cloned human being and the DNA provider.
複製人的身份難以認定，他們與被複製者之間的關係無法納入現有的倫理關係。

20. A large amount of cloned human with identical gene structure might initiate widespread dissemination of new diseases.
大量基因結構完全相同的複製人，可能誘發新型疾病的廣泛傳播。

21. The abuses of cloning technologies by terrorists are possible.
複製技術可能被濫用，成為恐怖分子的工具。

Task 2:

Please **categorize** the above 21 items by **drawing a mind map** in the following box. There is **no limit** on the number of categories. In you mind map, there is **no need** to name each category. You can simply use a bubble to represent a category and **connect the appropriate items** to the category by indicating the numbers of the items. An example is given on the right. If necessary, you may add sub-categories under certain categories.



請在以下空格內畫一幅腦圖，用來將以上廿一項資料作分類。腦圖內的類別數目不限，你亦不用為每個類別寫上名稱，只須以橢圓形來表示一種類別，並把適當資料項目的號碼連至該類別便可。例子如上。如有需要，你可以在某些類別下，新增子類別。

Suggested Time: 10 minutes

Impacts of Cloning Technologies
複製科技的影響

Task 3:	Please give simple **illustration and conclusion** on the impacts brought by cloning technologies by **integrating** the 21 items shown on P.2 and P.3. Please write, in Chinese or English, on the lines provided in the following box. 試綜合頁二及頁三內的廿一項資料，並在下列方格內簡單說明及總結生物複製科技帶來的影響。中英均可。
	Suggested Time: 8 minutes

Impacts Brought by Cloning Technologies (生物複製科技帶來的影響):

Task 4:	From a variety of websites, you get some major events about the recent development of cloning technologies. Using the information given in the **following table** and the **21 items** shown on P.2 and P.3, answer the true/false questions on next page. 你從多個有關網站，獲得以下表格內的資料。該等資料顯示近年與複製科技發展有關的重要事件。請根據下列資料，加上頁二及頁三所提供的廿一項影響，回答下頁的是非題。 *Suggested Time: 8 minutes*

Year	Event 事件
1996	English embryologist cloned the world's first organism, Dolly the sheep, from adult cells. 英國科學家利用動物細胞複製出全球首隻哺乳類動物，名為複製羊多莉。
1998	19 European nations signed a ban on human cloning. 十九個歐洲國家簽署禁止複製人類的條約。
1999	Chinese American biologist cloned calves from frozen cells taken from a Japanese bull. 美籍華裔科學家利用日本公牛的冷凍細胞複製出多隻小牛。
2000	Teams of Japanese and Scottish researchers announced that they had cloned pigs. 日本與蘇格蘭的共同研究小組宣稱已複製出豬隻。
2000	Japanese scientists cloned a baby bull from a bull that was a clone itself. 日本科學家從一隻複製牛再複製出一隻小牛。
2000	Britain was the first country legalizing the cloning of human embryos, which must be destroyed after 14 days. 英國成為首個讓複製人類胚胎合法化的國家，複製出來的胚胎必須於十四日後銷毀。
2001	U.S. scientists cloned human embryos for the first time. 美國科學家首次複製出人類胚胎。
2004	The U.S. asked the United Nations for banning all forms of human cloning. 美國促請聯合國禁止全球各國進行各種形式的人類複製活動。
2004	Britain wanted to ban reproductive cloning but allow therapeutic cloning. 英國支持禁止再生(生殖)複製，但主張保留醫療複製。
2004	A U.S. woman paid US$50,000 to a company to clone her cat, the first cat cloned for commercial reasons. 一名美國人向一間公司支付五萬美元，用來為她複製已死去的貓兒，成為全球首隻作商業用途的複製貓。
2005	South Korean scientist cloned the world's first dog. 南韓科學家製造出全球第一隻複製狗。
2005	The U.N. voted 84 to 34 in favor of a nonbinding statement for a total ban on human cloning. 聯合國以 84 對 34 票通過一條沒有約束力的聲明，禁止一切複製人類的活動。
2008	U.S. scientists created the first 5 mature human embryos using skin cells. The clones were destroyed as being unethical and illegal. 美國科學家利用人類皮膚細胞複製出五個成熟的人類胚胎。由於這些胚胎為不道德及違法，他們隨即被銷毀。

Please put a tick in the appropriate boxes. 請在適當空格內加上✓號。		True 正確	Mostly True 大致正確	Cannot Decide 未能斷定	False 不正確
1.	Britain was the first country researching cloning technologies. 英國是全球最早研究複製技術的國家。	☐	☐	☐	☐
2.	Britain was the first country that succeeded in cloning organism from adult cells. 英國是全球首個利用動物細胞複製出哺乳類動物的國家。	☐	☐	☐	☐
3.	A number of European nations planned to ban human cloning before 2000. 不少歐洲國家在二零零零年前已打算禁止複製人類的活動。	☐	☐	☐	☐
4.	Scientists have grasped the technology for cloning animals from frozen cells. 科學家已經掌握利用冷凍細胞來複製動物的技術。	☐	☐	☐	☐
5.	Cloned animals can be cloned again. 複製動物可以再被複製。	☐	☐	☐	☐
6.	Britain was not involved in the 19 European nations that signed a ban on human cloning in 1998. 一九九八年簽署有關複製人類禁令的十九個歐洲國家並不包括英國。	☐	☐	☐	☐
7.	There was cooperation between Asian and European countries for the research of cloning technologies. 曾有亞洲國家和歐洲國家共同研究複製技術。	☐	☐	☐	☐
8.	Scientists succeeded in cloning several domestic animals, like pig, bull, and sheep. 科學家已成功複製出多種家畜動物，如豬、牛、羊。	☐	☐	☐	☐
9.	According to the event in 2000, we infer that Britain has a well-developed legal system. 從二零零零年的事件能看出，英國是一個具備完善法律制度的國家。	☐	☐	☐	☐
10.	Human embryo was cloned in the U.S. at a later time than that was done in Britain. 美國比英國較遲複製出人類胚胎。	☐	☐	☐	☐
11.	Subsequent to 2000, it is legal for scientists in Britain to keep the cloned human embryos for long period. 二零零零年後，科學家在英國可以把複製出來的人類胚胎長期保存。	☐	☐	☐	☐
12.	From 1996 to 2000, scientists mainly worked on the research of animal cloning. 一九九六至二零零零年間，科學家們主要集中研究動物複製技術。	☐	☐	☐	☐
13.	In 2004, the U.S and Britain were divided in opinion on banning cloning. 二零零四年，英、美兩國對禁止複製活動的問題，意見有所分歧。	☐	☐	☐	☐
14.	In the U.S., there is commercial business related to cloning technologies. 以複製科技賺錢的行業已於美國出現。	☐	☐	☐	☐
15.	South Korea also meets the requirements for developing pet cloning business. 南韓也具備發展複製寵物行業的條件。	☐	☐	☐	☐
16.	In 2005, most countries in the world supported a total ban on human cloning. 二零零五年，全球大部份國家支持禁止所有複製人類的活動。	☐	☐	☐	☐
17.	Nowadays in the U.S., cloning human embryos is illegal. 現今在美國，複製人類胚胎屬於違法行為。	☐	☐	☐	☐

18.	The U S , Britain, Japan and Korea are the leading countries in cloning technologies. 美、英、日、韓四國在複製科技方面具有領導地位。	☐	☐	☐	☐
19.	The U S and Britain mainly work on the research of human cloning, while Japan and Korea work on that of animal cloning. 美、英兩國主要研究人類複製技術，日、韓則以研究動物複製為主。	☐	☐	☐	☐
20	It is more difficult to clone dogs than to clone bull or sheep. 複製狗隻所需的技術比起複製牛、羊的技術較為困難。	☐	☐	☐	☐

Task 5:	Please use all the information and knowledge that you have acquired from the above to answer the following question. 請運用以上你所獲得的所有資料及知識，回答下列問題。
	Suggested Time: 5 minutes

Suppose you are the general manager of an advanced technology company. The company is going to establish a new department, which will be dedicated for the research of cloning technologies. Soon, the company receives a number of objections from different community organizations and religious people. However, the SAR government and a number of medical practitioners strongly support the establishment of such department. As the general manager of the company, what would be your decisions?

假如你是一間先進科技公司的總經理，公司打算成立一個新部門，專門研究生物複製技術。不久，公司收到不少社會團體和宗教人士的反對，另一方面，特區政府及部份醫療界人士卻大力支持。身為公司的總經理，你會如何作決定？

Please select **two choices** that you consider the **most appropriate** and give a **brief reason**, in Chinese or English, for each of your choices.

請選擇兩項你認為最恰當的決定，並在旁邊填上簡單的原因。中英均可。

☐ Establish the new department researching all kinds of cloning technologies.
成立新部門，全面研究各種生物複製技術。
Reason (原因): _____

☐ Establish the new department researching all kinds of technologies for animal cloning.
成立新部門，全面研究各種動物複製技術。
Reason (原因): _____

☐ Establish the new department researching the technology for mammal cloning only.
成立新部門，只研究哺乳類動物的複製技術。
Reason (原因): _____

☐ Establish the new department researching the technology for livestock cloning only.
成立新部門，只研究家畜動物的複製技術。

Reason (原因): _____

☐ Establish the new department researching the technology for pet cloning only.
成立新部門，只研究寵物的複製技術。

Reason (原因): _____

☐ Establish the new department researching the technology only for cloning endangered species.
成立新部門，只研究瀕臨絕種動物的複製技術。

Reason (原因): _____

☐ Establish the new department researching the technology only for cloning extinct species.
成立新部門，只研究已絕種動物的複製技術。

Reason (原因): _____

☐ Establish the new department researching all kinds of technologies for human cloning.
成立新部門，全面研究各種人類複製技術。

Reason (原因): _____

☐ Establish the new department researching the technology for human embryo cloning only.
成立新部門，只研究人類胚胎的複製技術。

Reason (原因): _____

☐ Establish the new department researching the technology for therapeutic cloning only.
成立新部門，只研究醫療性（或治療性）複製技術。

Reason (原因): _____

☐ Establish the new department researching the technology for human organ cloning only.
成立新部門，只研究人類器官的複製技術。

Reason (原因): _____

☐ Establish the new department researching the technology for bone marrow cloning only.
成立新部門，只研究骨髓的複製技術。

Reason (原因): _____

☐ Give up the establishment of the new department researching cloning technologies.
放棄成立研究複製技術的新部門。

Reason (原因): _____

☐ Others 其他，please specify 請說明：

Reason (原因): _____

Task 6:	Next time, you want to have research projects on other topics. Please read the following questions carefully and try your best to answer them, in Chinese or English. 隨後，你打算進行關於其他課題的研究。請細心閱讀以下題目，並盡力回答，中英均可。
	Suggested Time: 10 minutes

Q6.1 (a) Suppose you are going to do a research about **the most environmentally friendly secondary school** in Hong Kong. What **questions** would you like to study first? Please write **two questions** on the following lines.
假若你將進行一項關於"全港最環保中學"的研究，你會先定立哪兩條研究問題作為開始？請在下列橫線，寫出這兩條問題。

Two Questions (兩條問題):

_____

_____

_____

_____

_____

Q6.1 (b) To do the above research, what kind of **information** do you need to collect? Please write **three items of information** on the following lines.
如若進行以上研究，你需要收集什麼資料？請在下列橫線，寫出三項該等資料。

Three Items of Information (三項資料):

_____

_____

_____

_____

_____

Q6.2 If you want to know whether **the public transportation** of another city is better or worse than that of Hong Kong, what kind of **information** would you like to collect for analysis? Please write **three items of information** on the following lines.
假若你想了解某城市的公共交通工具是否比香港更好或更差，你會收集什麼資料作分析？請在下列橫線，寫出三項該等資料。

Three Items of Information (三項資料):

_____

_____

_____

Q6.3 If you are going to help the government establish a reclamation plan deciding whether to **increase** the **area of harbor reclamation** near Central and Wan Chai, what **viewpoints from people** should you take into consideration? Please write **three** of them on the following lines.
假若你將協助政府制定填海計劃，並須決定是否加大中環及灣仔的填海範圍。你應該聽取持哪些觀點的人們的意見？請在下列橫線，寫出三類你會納入作考慮的觀點。

Three Viewpoints (三類觀點):

_____

_____

_____

Q6.4 If you are going to do a research about **environmental pollution**, what **kinds of experts** would you like to consult? Please write **three kinds of experts** on the following lines.
假若你將進行一項關於環境污染的研究，你會向哪三方面的專家請教？請在下列橫線，寫出這三方面的專家。

Three Experts (三類專家):

_____

_____

_____

～ End of Test ～

Just for opinion (意見收集)：

Would you like to have WebQuest activities in the future? ☐ Yes, I would. ☐ No, I won't.
你會否希望將來再進行 WebQuest 形式的學習活動？ ☐ 願意 ☐ 不願意

Appendix 19a – Appendix 1 of Post-test

【發燒新鮮事】

生命科學

複製豬「酷比」是小怪胎？

所謂「複製」的真正意涵，不可望文生義！

文／[illegible]

複製豬酷比三號日前在生技大展中亮相，成為媒體鎂光燈競逐的焦點。話說從1997年桃莉羊問世以來，「複製動物」的話題不斷在各國燃燒，台灣亦不落人後，除了豬之外，牛與老鼠也成為有關單位計畫進行複製的對象。只不過，科學家所稱的「複製（ clone）」，與一般人所聯想到的複製內涵，其實並不太相同。

國內慣稱的「複製」，英文叫 clone，中國大陸則直接音譯成「克隆」。以翻譯科學著作聞名的中研院史語所人類組助理研究員王道還表示，「克隆」一詞聽起來較中性，雖然無法立即望文生義，但相較於「複製」的譯法，卻也避免望文生義、卻生錯義的好處。

之所以生錯義，主因一般人看到「複製動物」時，多以「複寫本」的觀念進行理解。以為是有一個本尊，然後透過複製技術，可以像影印機複印紙張一樣，複製出一模一樣的「分身」。然而，所謂的「cloning 」，指得是基因組或主宰遺傳特徵的細胞核的複製，而非完整的動物個體的複製。

以不久前在媒體上造成轟動的動科所的酷比複製豬為例，吳信志表示，稱其為複製，不是說這三隻小豬長得一模一樣，真諦在於三隻小豬的細胞核內的遺傳物質百分之百相同。

王道還也說，其實，目前所謂的「複製動物」，正確的說法是「以人工合成卵子培養胚胎的技術」 至於桃莉羊，正確的叫法是「怪胎羊」，因為自然界不可能出現這種胚胎。他強調，關於「 cloning」的誤解，英國第一流期刊Nature去年即已刊出呼籲正名的文章 然而國內卻完全予以忽略。

究竟，「複製技術」是如何運作的？吳信志以動科所的複製豬為例，一開始，

科學小字典

科學人2008年4月號
(抓拔黑鮪魚)

查詢其他名詞: GO

生物學新鮮事

RNA vs 蛋白質

綠島珊瑚礁新天地

刷條碼，認生物

河馬打哪兒來？

失衡的亞馬遜雨林

看進幹細胞

皇后的秘密服務

達爾文也微笑

日本山蛹有兩個媽媽

17年之癢

小春蟲，是人類的祖先嗎？

利用人為的基因轉殖技術，將第九凝血因子基因、乳鐵蛋白基因轉殖到藍瑞斯種的公豬身上（稱為第o代），然後利用有性生殖的方式，將公豬與一般母豬交配，繁衍出第一代身上同時帶有第九凝血因子與乳鐵蛋白這兩個基因的豬種。

動科所用第一代的雙基因藍瑞斯種母豬，作為複製的本尊，然後透過「核移置技術」，把母豬身上的細胞核，放到卵母細胞核已被挖空、只剩細胞質的受核卵母細胞（可取自任一頭豬）上、並使該細胞退回到細胞分化前的「早期胚」細胞，之後再將這個早期胚細胞，放進任一頭只要生殖周期與胚胎發展吻合的母豬的的輸卵管裡頭。

動科所現存的三隻複製豬，就像同卵雙生的雙胞胎，身上具有相同的細胞核。不過，誠如吳信志所言，即便是同卵雙生的雙胞胎，受到子宮因素及後天環境因素的影響，也不可能百分之百長得一模一樣。由此推敲，酷比一號到三號，也不會百分之百長得一樣才是。

除了最後會長成什麼樣的成體難以預測之外，複製動物也存在當前科學界難以透徹理解的遺傳缺陷，也就是複製出的動物通常會早衰或早死。例如，動科所發展複製豬的過程，被植入早期胚細胞的母豬，也出現過多次流產的紀錄。

即使如此，複製動物未來在醫學或經濟上的貢獻，仍被吳信志等科學家寄予厚望。複製豬身上帶有的基因，可分泌出治療疾病的蛋白質藥物的原料，而且，隨著異體器官移植技術的成熟，有朝一日說不定人的身上也可帶有豬的器官，再者，對瀕臨絕種的動物而言，也可透過「複製技術」助其衍生後代。這些利基，相較於複製的噱頭，或許才是更值得大眾所關注。【本文：原標題為：複製豬[illegible]，由中國時報授權轉載，原載於2002年8月18日中國時報生活科技版 】

炭疽，真能活！

壓力真要命

記憶的形成與磨滅

多謝天花，給我對抗愛滋的突變！

呼叫倚道夫

帶有傷痕的基因

放棄了一馬

小老鼠大如牛

複製動物有沒有明天？

女王蜂的抉擇

海中森林的基因秘密

人類跟老鼠是近視！

神經再生新曙光

鯨魚數量已經安全無虞？

免疫系統的傳令兵

Y染色體完成基因定序

現代第一人

肉食恐龍也會吃素？

高科技醫藥研究時代

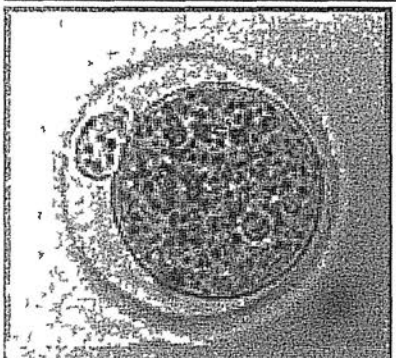
為什麼日本人r、l音不分？

追隨古爾德

抽脂脂肪可分離出幹細胞？

BACK ▲TOP

Cloning--A Webliography

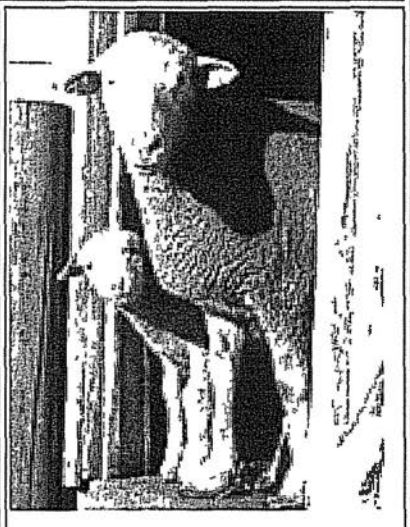


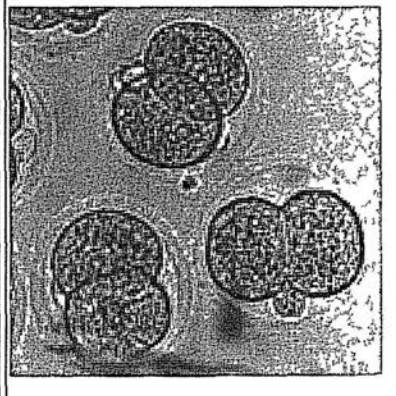
This site was last updated on June 7, 2007

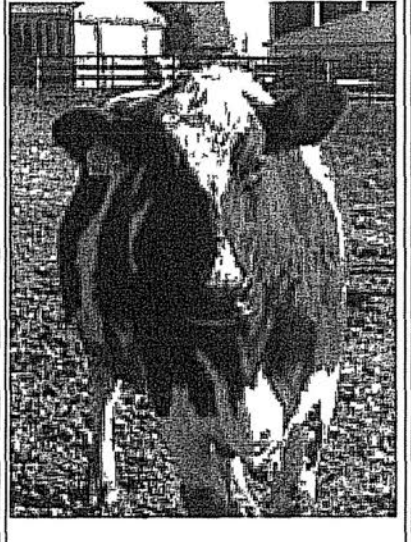
This Webliography is intended to help you find the best, most reliable information about animal and human cloning available on the Web. There are links of interest to everyone from students and the public to scientists. If you are new to the topic or want to understand how cloning works, start with the Introduction to Cloning page.

Cloning has been one of the hottest topics in biotechnology and biomedical research for the last several years. Not to be confused with gene cloning, molecular cloning, or cell cloning, **whole organism cloning** results in a clone as defined by the *Encyclopaedia Britannica* as "an individual organism that was grown from a single body cell of its parent and that is genetically identical to it."(1) The idea that a higher organism could be a clone of another is certainly not new. Among animals, twinning occurs naturally, producing two separate organisms with the same genetic makeup. Scientists in the 1950's, 1960's and 1970's demonstrated that they were able to clone frog tadpoles from frog embryonic cells using nuclear transfer. Later, in the 1980's, scientists created clones of mammals by splitting embryos in a process called "artificial twinning" or by nuclear transfer using embryonic cells (2).

A major breakthrough in animal cloning



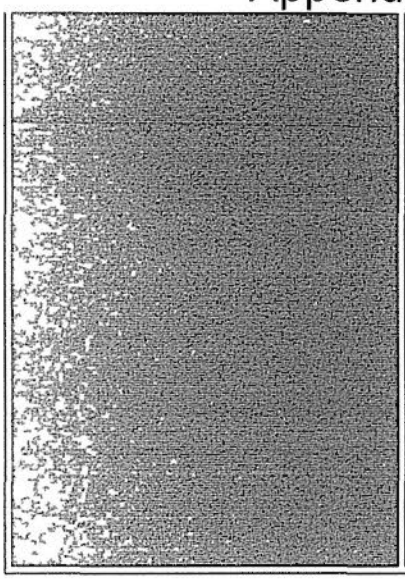




occurred in 1997 when Ian Wilmut and his group at the Roslin Institute in Scotland cloned a sheep (Dolly) using genetic material from a non-embryonic cell, an adult mammary gland cell (3). The nuclear transfer process whereby they accomplished this is described at several Background Web sites. Once it was proven possible to clone a new animal from the cell of an adult animal, other groups began to experiment with cloning different species. Cloning from adult cells means that it is possible to be more certain ahead of time what the cloned animal will be like. To date, cloned animals include sheep, cattle (4,5), mice (6,7), pigs (8,9), goats (10), cats (11), rabbits (12), rats (14), mules (15), horses (13), and deer (16).

Of course, the issue of cloning has brought up many legal and ethical issues, both for animal cloning and for human cloning. The Public Policy and Laws page links to information about legislation being passed in the U.S. and around the world as well as the statements of various advocacy groups for public policy. Two types of cloning are being discussed nowadays in relation to humans: therapeutic cloning and reproductive cloning. It is important to understand the difference in order to follow ethical and legal discussions. Another page points to more philosophical and Ethics discussions around the issue of cloning.

Cloning of organisms, like many new technologies, is controversial because it is difficult to predict what good or bad could come from it. Unfortunately many

	people are misinformed about the different types of cloning, and misinformation is spread by rumor and on the Web. Even people making policy decisions are sometimes swayed by scientifically unproven reports. It is important that everyone educate themselves about the topic using reliable sources of information so that sound decisions can be made about the future.	

Appendix 19c: Items Removed from the Post-test for Task 2 and Task 3

To avoid providing too much information and to reduce the amount of reading, the following 2 items (about the effects of cloning technologies) were removed from the post-test.

22. Human cloning might destroy the dignity and distinctive quality of human beings by treating the cloned children as goods only for medicine.
複製人類會破壞人的尊嚴及獨特性，使小孩淪為藥療物品，剝奪了人本身的價值。

23. Even if both male and female extinct species can be cloned, no one can tell whether they would be viable at all in the absence of parents teaching or showing them their natural behavior.
就算某已絕種動物的雌、雄品種皆能被複製，但這些動物由於缺乏父母的教導及給牠們示範動物的天性及行為，這些動物最終能否生存下去，始終是一個很大的疑問。

Appendix 20a: Rubric for Analyzing Students' Work Completed in *WQ1*

	Beginning (Rating = 1)	Developing (Rating = 2)	Accomplished (Rating = 3)	Exemplary (Rating = 4)	Score
Conclusion on Global Warming [C7.1a] draw conclusion from the information collected	The conclusion is too simple or not clear. There is no connection with the findings by the four consultants.	The conclusion is recognizable by extracting relevant information from the findings by the four consultants. Causes and effects of global warming are not clearly distinguished in the conclusion.	The conclusion is recognizable by tying up most of the main points from the findings by the four consultants. Causes and effects of global warming are clearly distinguished in the conclusion.	The conclusion is concise by pulling important pieces of information from the findings by the four consultants. Causes and effects of global warming are clearly distinguished in the conclusion, which also includes prediction of future effects.	
Suggestions for Improvement [C6.1] make judgments and draw conclusions from research to solve problems	General suggestions, which are not specific to solving global warming, for environmental protection are given. The suggestions have no connection with the issues or causes discussed and concluded previously.	General suggestions for solving global warming are given. The suggestions have little connection with the issues and causes discussed and concluded previously. Some suggestions are impractical and unattainable.	Specific suggestions for solving most of the issues and causes discussed and concluded previously are given. Most of the suggestions are practical and attainable. Attempts for classifying the suggestions are demonstrated.	Specific suggestions for slowing down or stopping the issues and causes discussed and concluded previously are given. The suggestions are practical and attainable, and classified according to some extends or levels.	

Appendix 20b: Rubric for Analyzing Students' Work Completed in *WQ2*

		Beginning (Rating = 1)	Developing (Rating = 2)	Accomplished (Rating = 3)	Exemplary (Rating = 4)	Score
[C6.1] make judgments and draw conclusions from research to solve problems	Appropriateness of Choice	The choice neither embraces the advantages of using paper and plastic bags nor avoids the disadvantages of that.	The choice embraces some advantages of using paper and plastic bags and avoids some disadvantages of that. It is considered possibly practical or probably appropriate in the context of the task.	The choice embraces most advantages of using paper and plastic bags and avoids most disadvantages of that. It is considered practical or appropriate in the context of the task.	The choice embraces the advantages and avoids the disadvantages of using paper and plastic bags. It is considered not only practical but also effective in the context of the task.	
	Explanation of Choice	There is no reason to support the choice; or fallacious, irrelevant or unwarranted reasons are used. There is no reference to the findings of using paper and plastic bags.	General or simple reasons, which are not adequate for supporting the choice, are given. Part of the explanation is related to the findings of using paper and plastic bags.	Relevant reasons, which take most of the findings of using paper and plastic bags into account, are given to support the choice.	The choice is not only supported by relevant reasons, which take most of the findings of using paper and plastic bags into account, but also justified by sufficient evidence.	

Appendix 20c: Rubric for Analyzing Students' Work Completed in *WQ3*

		Beginning (Rating = 1)	Developing (Rating = 2)	Accomplished (Rating = 3)	Exemplary (Rating = 4)	Score
[C11.1] make inferences and simple generalizations from the evidence collected	Questions for Discussion (Q1 and Q2) – Inference	There is no inference; or fallacious or illogical inference being inconsistent with the data presented is suggested.	Plausible inference is suggested. It is somewhat inconsistent with the data presented.	Logical inference is suggested. It is somewhat inconsistent with the data presented.	Logical inference is suggested based on the data gathered. The inference reflects and matches the data presented.	
	Questions for Discussion (Q1 and Q2) – Reason	No reason or irrelevant reason is given to support the inference.	Simple and general reasons that are related to the two aspects are given as explanation. The explanation is insufficient to reasonably establish a connection between two aspects.	Reasonable explanation is given to support the inference. The explanation is not clear or specific enough to illustrate the relationship between two aspects.	Clear reasons that flow logically and reasonably from one aspect to another for explaining the relationship between them are given to support the inference.	
	Questions for Discussion (Q3 and Q4) – Inference	There is no inference; or fallacious or illogical inference being inconsistent with the data presented is suggested.	Plausible inference is suggested. It is somewhat inconsistent with the data presented.	Logical inference is suggested. It is somewhat inconsistent with the data presented.	Logical inference is suggested based on the data gathered. The inference reflects and matches the data presented.	
	Questions for Discussion (Q3 and Q4) – Reason	No reason or irrelevant reason is given to support the inference.	An appropriate and relevant aspect for making reference to the target one is identified in the explanation, which is insufficient to reasonably establish a connection between two aspects.	An appropriate and relevant aspect for making reference to the target one is identified in the explanation, which is reasonable but not clear or specific enough to illustrate the relationship between two aspects.	Clear reasons that flow logically and reasonably from an appropriate and relevant aspect to the target one for explaining the relationship between them are given to support the inference.	

Explanation or Description of Graphs [C7.1a] draw conclusion from the information collected	Explanation of graphs is omitted; or explanation totally misinterprets the data graphed.	Explanation is somewhat inconsistent with the data graphed. It misinterprets the data somewhat.	Explanation is consistent with the data graphed. It accurately describes the data.	Explanation not only accurately describes the data graphed but also identifies some details or key relationships from the data.	

Appendix 20d: Rubric for Analyzing Students' Work Completed in *WQ4*

		Beginning (Rating = 1)	Developing (Rating = 2)	Accomplished (Rating = 3)	Exemplary (Rating = 4)	Score
[C11.1] make inferences and simple generalizations from the evidence collected	Question for Discussion (Q1) – Generalization	There is no generalization; or fallacious or irrelevant characteristics are generalized that are supported by neither the data gathered nor the information collected for healthy fast food.	Simple and general characteristics of American fast food are stated. The characteristics are not related to the data set.	Simple characteristics of American fast food are derived from the data set. The characteristics are related to the data gathered, and the information collected for healthy fast food.	Specific characteristics of American fast food are derived logically from the data set. The generalization is grounded on the data gathered, and the information collected for healthy fast food.	
	Question for Discussion (Q1) – Reason	No reason/evidence; or irrelevant reason/evidence is given for the generalization.	Simple evidence or general reason is given for the generalization. The evidence/reason is basically not related to deriving the characteristics from the data set.	Related evidence is provided to support the generalization. The evidence is somewhat insufficient or not specific enough to derive the characteristics from the data set.	Appropriate evidence is provided to support the generalization. The evidence is sufficient to logically establish a connection from the data set to the characteristics derived.	
Selection of Restaurant [C6.1] make judgments and draw conclusions from research to solve problems		Restaurant is selected without making reference to the data gathered. The selection is supported by no evidence or reason concerning healthy fast food.	Restaurant is selected with little reference to the data gathered. The selection is supported by insufficient evidence and improper explanation concerning healthy fast food.	Restaurant is selected based upon the data gathered. The selection is supported by evidence but somewhat improper explanation concerning healthy fast food.	Restaurant is selected in best accordance with the data gathered. The selection is supported by evidence and reasonable argument concerning healthy fast food.	

Correlation between Number of Calories and Grams of Fat [C7.1a] draw conclusion from the information collected	There is no reason to support the conclusion; or fallacious, irrelevant or unwarranted reasons are used for the conclusion. There is no reference to the data gathered.	The conclusion is supported by misinterpretation of the data gathered; or simple reasons with little reference to the data gathered are used to draw the conclusion.	The conclusion is supported by accurate interpretation of the data gathered. The amount of data taken into account is somewhat insufficient for drawing the conclusion.	The conclusion is supported by accurate interpretation of the data gathered. Sufficient data is taken into account for drawing the conclusion.	

Appendix 21: Details of Video Clips (Physical Activities) Recorded during the Implementation of the WebQuests

This appendix presents the details of the videos clips (physical activities) recorded in the lessons for the implementation of the WebQuests.

A) Physical Activities during *WQ1*

The table below summarizes the video clips recorded in the lessons for the implementation of *WQ1*. Altogether, there were 15 video clips recorded during the implementation of *WQ1*. As reported in Section 4.2.3 of Chapter 4, three 70-minute lessons were allotted to *WQ1* for its implementation. The video clips **WQ1GaV1**, **WQ1GaV2**, and **WQ1GaV3** recorded the physical activities of the target group in G_a during the three lessons respectively, while the video clips **WQ1GbV1**, **WQ1GbV2**, and **WQ1GbV3** recorded the physical activities of the target group in G_b during the three lessons respectively, and so on. Owing to a technical problem, the camcorder stopped recording at 21:53 in the first lesson for G_b (i.e. the video clip **WQ1GbV1**), while the researcher and his assistant were not aware of the problem till the end of the lesson. Thus, **WQ1GbV1** was an incomplete video clip for that lesson.

	Group of Participants (G_a)	Group of Participants (G_b)	Group of Participants (G_c)	Group of Participants (G_d)	Group of Participants (G_e)
Lesson 1 for *WQ1* (for individual inquiry)	• Video clip: **WQ1GaV1** • Duration: 1:06:20 • Content: physical activities of a target group in G_a	• Video clip: **WQ1GbV1** • Duration: 21:53 • Content: physical activities of a target group in G_b	• Video clip: **WQ1GcV1** • Duration: 1:05:54 • Content: physical activities of a target group in G_c	• Video clip: **WQ1GdV1** • Duration: 1:13:35 • Content: physical activities of a target group in G_d	• Video clip: **WQ1GeV1** • Duration: 1:12:23 • Content: physical activities of a target group in G_e
Lesson 2 for *WQ1* (for group work)	• Video clip: **WQ1GaV2** • Duration: 1:08:52	• Video clip: **WQ1GbV2** • Duration: 1:06:14	• Video clip: **WQ1GcV2** • Duration: 1:09:35	• Video clip: **WQ1GdV2** • Duration: 1:10:29	• Video clip: **WQ1GeV2** • Duration: 1:15:14

	• Content: physical activities of a target group in G_a	• Content: physical activities of a target group in G_b	• Content: physical activities of a target group in G_c	• Content: physical activities of a target group in G_d	• Content: physical activities of a target group in G_e
Lesson 3 for *WQ1* (for presentation)	• Video clip: **WQ1GaV3** • Duration: 1:09:04 • Content: physical activities of a target group in G_a	• Video clip: **WQ1GbV3** • Duration: 55:42 • Content: physical activities of a target group in G_b	• Video clip: **WQ1GcV3** • Duration: 1:04:27 • Content: physical activities of a target group in G_c	• Video clip: **WQ1GdV3** • Duration: 1:08:31 • Content: physical activities of a target group in G_d	• Video clip: **WQ1GeV3** • Duration: 1:10:50 • Content: physical activities of a target group in G_e

Table 21.1: Lesson Video Clips (Physical Activities) for Implementation of WQ1

B) Physical Activities during *WQ2*

The table below summarizes the video clips recorded in the lessons for the implementation of *WQ2*. Likewise, there were 15 video clips recorded during the implementation of *WQ2*. As reported, like *WQ1*, three 70-minute lessons were allotted to *WQ2* for its implementation. The video clips **WQ2GaV1**, **WQ2GaV2**, and **WQ2GaV3** recorded the physical activities of the target group in G_a during the three lessons respectively, while the video clips **WQ2GbV1**, **WQ2GbV2**, and **WQ2GbV3** recorded the physical activities of the target group in G_b during the three lessons respectively, and so on. There were no technical problems on video recording during the implementation of *WQ2*.

	Group of Participants (G_a)	Group of Participants (G_b)	Group of Participants (G_c)	Group of Participants (G_d)	Group of Participants (G_e)
Lesson 1 for *WQ2* (for individual inquiry)	• Video clip: **WQ2GaV1** • Duration: 1:08:23 • Content: physical activities of a target	• Video clip: **WQ2GbV1** • Duration: 1:06:17 • Content: physical activities of a target	• Video clip: **WQ2GcV1** • Duration: 1:07:39 • Content: physical activities of a target	• Video clip: **WQ2GdV1** • Duration: 1:13:15 • Content: physical activities of a target	• Video clip: **WQ2GeV1** • Duration: 1:14:02 • Content: physical activities of a target

	group in G_a	group in G_b	group in G_c	group in G_d	group in G_e
Lesson 2 for *WQ2* (for group work)	• Video clip: **WQ2GaV2** • Duration: 1:08:32 • Content: physical activities of a target group in G_a	• Video clip: **WQ2GbV2** • Duration: 1:08:07 • Content: physical activities of a target group in G_b	• Video clip: **WQ2GcV2** • Duration: 1:21:29 • Content: physical activities of a target group in G_c	• Video clip: **WQ2GdV2** • Duration: 1:10:48 • Content: physical activities of a target group in G_d	• Video clip: **WQ2GeV2** • Duration: 1:39:18 • Content: physical activities of a target group in G_e
Lesson 3 for *WQ2* (for presentation)	• Video clip: **WQ2GaV3** • Duration: 1:09:08 • Content: physical activities of a target group in G_a	• Video clip: **WQ2GbV3** • Duration: 1:03:12 • Content: physical activities of a target group in G_b	• Video clip: **WQ2GcV3** • Duration: 1:14:13 • Content: physical activities of a target group in G_c	• Video clip: **WQ2GdV3** • Duration: 1:07:24 • Content: physical activities of a target group in G_d	• Video clip: **WQ2GeV3** • Duration: 1:09:43 • Content: physical activities of a target group in G_e

Table 21.2: Lesson Video Clips (Physical Activities) for Implementation of WQ2

C) Physical Activities during *WQ3* and *WQ4*

The table below summarizes the video clips recorded in the lessons for the implementation of *WQ3* and *WQ4*. Altogether, there were 10 video clips recorded during the implementation of *WQ3* and *WQ4*.

As reported in Section 4.2.3 of Chapter 4, each of *WQ3* and *WQ4* was assigned with one 70-minute lesson for its implementation. The video clips **WQ3GaV**, **WQ3GbV**, **WQ3GcV**, **WQ3GdV**, and **WQ3GeV** recorded the physical activities of the five target groups in G_a, G_b, G_c, G_d, and G_e respectively during the lessons for *WQ3*. The video clips **WQ4GaV**, **WQ4GbV**, **WQ4GcV**, **WQ4GdV**, and **WQ4GeV** recorded the physical activities of the five target groups in G_a, G_b, G_c, G_d, and G_e respectively during the lessons for *WQ4*. There were no technical problems on video recording during the implementation of *WQ3* and *WQ4*.

	Group of Participants (G_a)	Group of Participants (G_b)	Group of Participants (G_c)	Group of Participants (G_d)	Group of Participants (G_e)

Lesson for *WQ3*	• Video clip: **WQ3GaV** • Duration: 1:18:36 • Content: physical activities of a target group in G_a	• Video clip: **WQ3GbV** • Duration: 1:21:33 • Content: physical activities of a target group in G_b	• Video clip: **WQ3GcV** • Duration: 1:19:37 • Content: physical activities of a target group in G_c	• Video clip: **WQ3GdV** • Duration: 1:18:18 • Content: physical activities of a target group in G_d	• Video clip: **WQ3GeV** • Duration: 1:39:10 • Content: physical activities of a target group in G_e
Lesson for *WQ4*	• Video clip: **WQ4GaV** • Duration: 1:18:59 • Content: physical activities of a target group in G_a	• Video clip: **WQ4GbV** • Duration: 1:08:49 • Content: physical activities of a target group in G_b	• Video clip: **WQ4GcV** • Duration: 1:17:30 • Content: physical activities of a target group in G_c	• Video clip: **WQ4GdV** • Duration: 1:14:14 • Content: physical activities of a target group in G_d	• Video clip: **WQ4GeV** • Duration: 1:52:38 • Content: physical activities of a target group in G_e

Table 21.3: Lesson Video Clips (Physical Activities) for Implementation of WQ3 and WQ4

Appendix 22: Details of Video Clips (Screen Activities) Recorded during the Implementation of the WebQuests

This appendix presents the details of the videos clips (screen activities) recorded in the lessons for the implementation of the WebQuests.

A) Screen Activities during *WQ1*

The table below summarizes the video clips, for screen activities, recorded in the lessons for the implementation of *WQ1*. Altogether, there were 15 video clips recorded during the implementation of *WQ1*. As mentioned in Section 4.2.3 of Chapter 4, the implementation of *WQ1* lasted three 70-minute lessons. The video clips **WQ1GaS1**, **WQ1GaS2**, and **WQ1GaS3** recorded the screen activities of the target group in G_a during the three lessons respectively, while the video clips **WQ1GbS1**, **WQ1GbS2**, and **WQ1GbS3** recorded the screen activities of the target group in G_b during the three lessons respectively, and so on. There were no technical problems on screen recording during the implementation of *WQ1*.

	Group of Participants (G_a)	Group of Participants (G_b)	Group of Participants (G_c)	Group of Participants (G_d)	Group of Participants (G_e)
Lesson 1 for *WQ1* (for individual inquiry)	• Video clip: **WQ1GaS1** • Duration: 52:37 • Content: screen activities of a target group in G_a	• Video clip: **WQ1GbS1** • Duration: 59:26 • Content: screen activities of a target group in G_b	• Video clip: **WQ1GcS1** • Duration: 1:19:59 • Content: screen activities of a target group in G_c	• Video clip: **WQ1GdS1** • Duration: 1:03:45 • Content: screen activities of a target group in G_d	• Video clip: **WQ1GeS1** • Duration: 1:03:57 • Content: screen activities of a target group in G_e
Lesson 2 for *WQ1* (for group work)	• Video clip: **WQ1GaS2** • Duration: 1:03:19 • Content: screen activities of	• Video clip: **WQ1GbS2** • Duration: 1:01:31 • Content: screen activities of	• Video clip: **WQ1GcS2** • Duration: 1:19:59 • Content: screen activities of	• Video clip: **WQ1GdS2** • Duration: 1:03:42 • Content: screen activities of	• Video clip: **WQ1GeS2** • Duration: 1:19:58 • Content: screen activities of

	a target group in G_a	a target group in G_b	a target group in G_c	a target group in G_d	a target group in G_e
Lesson 3 for *WQ1* (for presentation)	• Video clip: **WQ1GaS3** • Duration: 30:25 • Content: screen activities of a target group in G_a	• Video clip: **WQ1GbS3** • Duration: 15:42 • Content: screen activities of a target group in G_b	• Video clip: **WQ1GcS3** • Duration: 20:17 • Content: screen activities of a target group in G_c	• Video clip: **WQ1GdS3** • Duration: 19:44 • Content: screen activities of a target group in G_d	• Video clip: **WQ1GeS3** • Duration: 20:03 • Content: screen activities of a target group in G_e

Table 21.4: Lesson Video Clips (Screen Activities) for Implementation of WQ1

B) Screen Activities during *WQ2*

The table below summarizes the video clips, for screen activities, recorded in the lessons for the implementation of *WQ2*. Likewise, there were 15 video clips recorded during the implementation of *WQ2*. As mentioned, like *WQ1*, the implementation of *WQ2* lasted three 70-minute lessons. The video clips **WQ2GaS1**, **WQ2GaS2**, and **WQ2GaS3** recorded the screen activities of the target group in G_a during the three lessons respectively, while the video clips **WQ2GbS1**, **WQ2GbS2**, and **WQ2GbS3** recorded the screen activities of the target group in G_b during the three lessons respectively, and so on. There were no technical problems on screen recording during the implementation of *WQ2*.

	Group of Participants (G_a)	Group of Participants (G_b)	Group of Participants (G_c)	Group of Participants (G_d)	Group of Participants (G_e)
Lesson 1 for *WQ2* (for individual inquiry)	• Video clip: **WQ2GaS1** • Duration: 58:22 • Content: screen activities of a target group in G_a	• Video clip: **WQ2GbS1** • Duration: 54:27 • Content: screen activities of a target group in G_b	• Video clip: **WQ2GcS1** • Duration: 1:06:55 • Content: screen activities of a target group in G_c	• Video clip: **WQ2GdS1** • Duration: 59:09 • Content: screen activities of a target group in G_d	• Video clip: **WQ2GeS1** • Duration: 1:11:22 • Content: screen activities of a target group in G_e
Lesson 2 for *WQ2* (for	• Video clip: **WQ2GaS2**	• Video clip: **WQ2GbS2**	• Video clip: **WQ2GcS2**	• Video clip: **WQ2GdS2**	• Video clip: **WQ2GeS2**

group work)	• Duration: 1:04:02 • Content: screen activities of a target group in G_a	• Duration: 1:06:33 • Content: screen activities of a target group in G_b	• Duration: 1:13:15 • Content: screen activities of a target group in G_c	• Duration: 1:00:45 • Content: screen activities of a target group in G_d	• Duration: 1:30:56 • Content: screen activities of a target group in G_e
Lesson 3 for *WQ2* (for presentation)	• Video clip: **WQ2GaS3** • Duration: 13:05 • Content: screen activities of a target group in G_a	• Video clip: **WQ2GbS3** • Duration: 16:39 • Content: screen activities of a target group in G_b	• Video clip: **WQ2GcS3** • Duration: 11:28 • Content: screen activities of a target group in G_c	• Video clip: **WQ2GdS3** • Duration: 11:01 • Content: screen activities of a target group in G_d	• Video clip: **WQ2GeS3** • Duration: 15:23 • Content: screen activities of a target group in G_e

Table 21.5: Lesson Video Clips (Screen Activities) for Implementation of WQ2

C) Screen Activities during *WQ3* and *WQ4*

The table below summarizes the video clips, for screen activities, recorded in the lessons for the implementation of *WQ3* and *WQ4*. Altogether, there were 10 video clips recorded during the implementation of *WQ3* and *WQ4*.

As mentioned in Section 4.2.3 of Chapter 4, each of *WQ3* and *WQ4* lasted one 70-minute lesson for its implementation. The video clips **WQ3GaS, WQ3GbS, WQ3GcS, WQ3GdS,** and **WQ3GeS** recorded the screen activities of the five target groups in G_a, G_b, G_c, G_d, and G_e respectively during the lessons for *WQ3*. The video clips **WQ4GaS, WQ4GbS, WQ4GcS, WQ4GdS,** and **WQ4GeS** recorded the screen activities of the five target groups in G_a, G_b, G_c, G_d, and G_e respectively during the lessons for *WQ4*. There were no technical problems on screen recording during the implementation of *WQ3* and *WQ4*.

	Group of Participants (G_a)	Group of Participants (G_b)	Group of Participants (G_c)	Group of Participants (G_d)	Group of Participants (G_e)
Lesson for *WQ3*	• Video clip: **WQ3GaS** • Duration:	• Video clip: **WQ3GbS** • Duration:	• Video clip: **WQ3GcS** • Duration:	• Video clip: **WQ3GdS** • Duration:	• Video clip: **WQ3GeS** • Duration:

	1:08:41 • Content: screen activities of a target group in G_a	1:08:54 • Content: screen activities of a target group in G_b	1:08:33 • Content: screen activities of a target group in G_c	1:03:44 • Content: screen activities of a target group in G_d	1:19:59 • Content: screen activities of a target group in G_e
Lesson for *WQ4*	• Video clip: **WQ4GaS** • Duration: 1:07:02 • Content: screen activities of a target group in G_a	• Video clip: **WQ4GbS** • Duration: 1:14:03 • Content: screen activities of a target group in G_b	• Video clip: **WQ4GcS** • Duration: 1:04:09 • Content: screen activities of a target group in G_c	• Video clip: **WQ4GdS** • Duration: 1:00:38 • Content: screen activities of a target group in G_d	• Video clip: **WQ4GeS** • Duration: 1:38:26 • Content: screen activities of a target group in G_e

Table 21.6: Lesson Video Clips (Screen Activities) for Implementation of WQ3 and WQ4

Appendix 23a: Scores Assigned by Three Experts on the Four WebQuests

This appendix presents the results of the design-based evaluation of the WebQuests. The following four tables present the numerical results of the expert review based upon March's (2003) evaluation rubric.

The table below presents the scores given by the three experts on the design of *WQ1*. The total scores given by *Expert A*, *Expert W*, and *Expert Y* were 24, 16, and 20 respectively, while the average of the total scores given to *WQ1* was 20.

	WQ1			
	Expert A	Expert W	Expert Y	**Average**
Engaging Opening	3	2	2	**2.33**
The Question / Task	3	3	3	**3.00**
Background for Everyone	3	2	2	**2.33**
Roles / Expertise	3	1	3	**2.33**
Use of the Web	3	2	3	**2.67**
Transformative Thinking	3	2	2	**2.33**
Real World Feedback	3	2	3	**2.67**
Conclusion	3	2	2	**2.33**
Total Score:	**24**	**16**	**20**	**20.00**

Table 23.1: Scores Given by Three Experts on the Design of WQ1

The table below presents the scores given by the three experts on the design of *WQ2*. The total scores given by *Expert A*, *Expert W*, and *Expert Y* were 24, 22, and 21 respectively, while the average of the total scores given to *WQ2* was 22.3.

	WQ2			
	Expert A	Expert W	Expert Y	**Average**
Engaging Opening	3	3	3	**3.00**
The Question / Task	3	3	3	**3.00**
Background for Everyone	3	3	2	**2.67**
Roles / Expertise	3	3	3	**3.00**
Use of the Web	3	3	3	**3.00**
Transformative Thinking	3	3	2	**2.67**
Real World Feedback	3	2	3	**2.67**
Conclusion	3	2	2	**2.33**
Total Score:	**24**	**22**	**21**	**22.33**

Table 23.2: Scores Given by Three Experts on the Design of WQ2

The table below presents the scores given by the three experts on the design of *WQ3*. The total scores given by *Expert A*, *Expert W*, and *Expert Y* were 24, 17, and 18 respectively, while the average of the total scores given to *WQ3* was 19.7.

	WQ3			
	Expert A	Expert W	Expert Y	**Average**
Engaging Opening	3	2	3	**2.67**
The Question / Task	3	2	3	**2.67**
Background for Everyone	3	3	2	**2.67**
Roles / Expertise	3	1	2	**2.00**
Use of the Web	3	3	3	**3.00**
Transformative Thinking	3	2	2	**2.33**
Real World Feedback	3	2	2	**2.33**
Conclusion	3	2	2	**2.33**
Total Score:	**24**	**17**	**19**	**20.00**

Table 23.3: Scores Given by Three Experts on the Design of WQ3

The table below presents the scores given by the three experts on the design of *WQ4*. The total scores given by *Expert A*, *Expert W*, and *Expert Y* were 24, 16, and 23 respectively, while the average of the total scores given to *WQ4* was 21.

	WQ4			
	Expert A	Expert W	Expert Y	**Average**
Engaging Opening	3	2	3	**2.67**
The Question / Task	3	2	3	**2.67**
Background for Everyone	3	2	3	**2.67**
Roles / Expertise	3	1	3	**2.33**
Use of the Web	3	3	3	**3.00**
Transformative Thinking	3	2	2	**2.33**
Real World Feedback	3	2	3	**2.67**
Conclusion	3	2	3	**2.67**
Total Score:	**24**	**16**	**23**	**21.00**

Table 23.4: Scores Given by Three Experts on the Design of WQ4

Appendix 23b: Tables Returned by Three Experts Indicating Their Determination of the Relation

The following tables indicate the determination of the relation between the set of target learning outcomes and the set of WebQuests by the three experts. The table below presents the relation between the target learning outcomes and the WebQuests. In the table, a tick refers to a relation between a learning outcome and a WebQuest.

Target Learning Outcomes	*WQ1*	*WQ2*	*WQ3*	*WQ4*
Make judgments and draw conclusions from research to solve problems [C6.1]	1. ☑	2. ☑	3. ☑	4. ☑
Draw conclusion from the information collected and apply the knowledge to solve problems of similar nature [C7.1]	5. ☑	6. ☑	7. ☑	8. ☑
Use multiple keywords or phrases to label information; categorize and connect the concepts derived from information [C8.1]	9. ☑	10. ☑	11. ☑	12. ☑
Integrate the agreement and disagreement among sources [C8.2]	13. ☑	14. ☑	15.	16.
Make inferences and simple generalizations from the evidence collected [C11.1]	17.	18.	19. ☑	20. ☑

Table 23.5: Relation between the Target Learning Outcomes and the WebQuests

The table below presents the determination of each relation by *Expert A*. In the table, there is no box marked by *Expert A* as "Disagree".

1. Agree/~~Disagree~~	2. Agree/~~Disagree~~	3. Agree/~~Disagree~~	4. Agree/~~Disagree~~
5. Agree/~~Disagree~~	6. Agree/~~Disagree~~	7. Agree/~~Disagree~~	8. Agree/~~Disagree~~
9. Agree/~~Disagree~~	10. Agree/~~Disagree~~	11. Agree/~~Disagree~~	12. Agree/~~Disagree~~
13. Agree/~~Disagree~~	14. Agree/~~Disagree~~	15. Agree/Disagree	16. Agree/Disagree
17. Agree/Disagree	18. Agree/Disagree	19. Agree/~~Disagree~~	20. Agree/~~Disagree~~

Table 23.6: Determination of the Relation by Expert A

The table below presents the determination of each relation by *Expert W*. In the table, there is one box (13) marked by *Expert W* as "Disagree" that refers to the relation between *WQ1* and the learning outcome [C8.2].

1. Agree/~~Disagree~~	2. Agree/~~Disagree~~	3. Agree/~~Disagree~~	4. Agree/~~Disagree~~
5. Agree/~~Disagree~~	6. Agree/~~Disagree~~	7. Agree/~~Disagree~~	8. Agree/~~Disagree~~
9. Agree/~~Disagree~~	10. Agree/~~Disagree~~	11. Agree/~~Disagree~~	12. Agree/~~Disagree~~
13. ~~Agree~~/Disagree	14. Agree/~~Disagree~~	15. Agree/~~Disagree~~	16. Agree/~~Disagree~~
17. Agree/~~Disagree~~	18. Agree/~~Disagree~~	19. Agree/~~Disagree~~	20. Agree/~~Disagree~~

Table 23.7: Determination of the Relation by Expert W

The table below presents the determination of each relation by *Expert Y*. In the table, there are three boxes (13, 15, and 17) marked by *Expert Y* as "Disagree". However, according to *Table 23.5*, there is no tick in the boxes 15 and 17. In other words, there is no relation between *WQ1* and the learning outcome [C11.1] (box 17) and also there is no relation between *WQ3* and the learning outcome [C8.2] (box 15). As a result, there is one box (13), representing a relation, marked by *Expert Y* as "Disagree" that refers to the one between *WQ1* and the learning outcome [C8.2].

1. Agree/Disagree	2. Agree/Disagree	3. Agree/Disagree	4. Agree/Disagree
5. Agree/Disagree	6. Agree/Disagree	7. Agree/Disagree	8. Agree/Disagree
9. Agree/Disagree	10. Agree/Disagree	11. Agree/Disagree	12. Agree/Disagree
13. Agree/Disagree	14. Agree/Disagree	15. Agree/Disagree	16. Agree/Disagree
17. Agree/Disagree	18. Agree/Disagree	19. Agree/Disagree	20. Agree/Disagree

Table 23.8: Determination of the Relation by Expert Y

Appendix 23c: Comments Given by Three Experts on the Explanation of the Relation

The following three tables present all comments given by the three experts on the explanation of the relation between the set of target learning outcomes and the set of WebQuests. The comments given by *Expert A*, *Expert W*, and *Expert Y* are organized and presented in *Table 23.9*, *Table 23.10*, and *Table 23.11* respectively.

As shown in *Table 23.9*, *Expert A* provided comment on every point of explanation in the given table (*Table 3.7*). In consistent with his determination of the relation, as shown in *Table 23.6*, there were no negative comments given by *Expert A* on the explanation. His comments supported every single point of explanation stated in each box of the table.

As shown in *Table 23.10*, *Expert W* provided comment on the explanation in each box of the given table *(Table 3.7)*. In consistent with her determination of the relation, as shown in *Table 23.7*, there was one negative comment given by *Expert W* on the explanation. According to her comments, *Expert W* supported and agreed with almost all points of explanation in the table, except the one explaining the relation between *WQ1* and the learning outcome "[C8.2]: integrate the agreement and disagreement among sources" that referred to the box marked by her as "Disagree" in *Table 23.7*. In her discussion, she argued that "there was a lack of evidence showing that strong chasm among the sources of information would be induced during the group process though there were different roles in the WebQuest".

As shown in *Table 23.11*, among the 20 boxes with explanation in the given table (*Table 3.7*), *Expert Y* provided comments on the explanation in 7 boxes only. In consistent with her determination of the relation, as shown in *Table 23.8*, there was one negative comment given by *Expert Y* on the explanation in the 7 boxes. According to her comments, *Expert Y* supported and agreed with the explanation in 6 boxes and argued against the one explaining the relation between *WQ1* and the learning outcome "[C8.2]: integrate the agreement and disagreement among sources" that referred to the box marked by her as "Disagree" in *Table*

23.8. In her discussion, she did not agree that there were disagreements in the sources, regarding global warming, provided in the WebQuest. Thus, she did not agree that students might vary in the arguments on a point regarding global warming owing to different sources of information.

Target Learning Outcomes	*WQ1*	*WQ2*	*WQ3*	*WQ4*
[C6.1] make judgments and draw conclusions from research to solve problems	• Comment on the first point: the explanation is appropriate and well-grounded, matching with my examination. • Comment on the second point: the explanation is suitable and evidence-based.	• Comment on the first point: I agree with the explanation. • Comment on the second point: the explanation matches my examination.	• Comment on the first point: the explanation is suitable and evidence-based. • Comment on the second point: I believe that the explanation fairly indicates the correlation between correlation between the target learning outcomes and the WebQuest.	• Comment on the first point: the explanation is appropriate and well-grounded, matching with my examination. • Comment on the second point: the explanation is proper and well-grounded.
[C7.1] draw conclusion from the information collected and apply the knowledge to solve problems of similar nature	• Comment on the first point: the explanation is apt with qualified and grounded arguments. • Comment on the second point: I believe that the explanation fairly indicates the correlation between correlation between the target learning outcomes and the WebQuest.	• Comment on the first point: the explanation is suitable and evidence-based. • Comment on the second point: the explanation is appropriate and well-grounded, matching with my examination.	• Comment on the first point: I agree with the explanation. • Comment on the second point: the explanation is proper and well-grounded. • Comment on the third point: I believe that the explanation fairly indicates the correlation between correlation between the target learning outcomes and the WebQuest.	• Comment on the first point: the explanation matches my examination. • Comment on the second point: the explanation is suitable and evidence-based.
[C8.1] use multiple keywords or phrases to label	• Comment on the first point: the explanation is proper and	• Comment on the first point: the explanation matches my	• Comment on the first point: the explanation is suitable and	• Comment on the first point: the explanation is appropriate and

information; categorize and connect the concepts derived from information	well-grounded. • Comment on the second point: the explanation is suitable and matches the correlation between correlation between the target learning outcomes and the WebQuest. • Comment on the third point: the explanation matches my examination.	examination. • Comment on the second point: the explanation is suitable and evidence-based.	evidence-based. • Comment on the second point: the explanation is appropriate and well-grounded, matching with my examination. • Comment on the third point: the explanation matches my examination.	well-grounded, matching with my examination. • Comment on the second point: I agree with the explanation. • Comment on the third point: I believe that the explanation fairly indicates the correlation between correlation between the target learning outcomes and the WebQuest. • Comment on the fourth point: the explanation is proper and well-grounded. • Comment on the fifth point: I agree with the explanation.
[C8.2] integrate the agreement and disagreement among sources	• Comment: the explanation is appropriate and well-grounded, matching with my examination.	• Comment: the explanation is appropriate and well-grounded, matching with my examination.		
[C11.1] make inferences and simple generalizations from the evidence collected			• Comment on the first point: I agree with the explanation. • Comment on the second point: the explanation is suitable and evidence-based.	• Comment on the first point: the explanation is appropriate and well-grounded, matching with my examination. • Comment on the second point:

			• Comment on the third point: the explanation is proper and well-grounded.	the explanation matches my examination. • Comment on the third point: the explanation is appropriate and well-grounded, matching with my examination.

Table 23.9: Comments Given by Expert A on the Explanation of the Relation

Target Learning Outcomes	*WQ1*	*WQ2*	*WQ3*	*WQ4*
[C6.1] make judgments and draw conclusions from research to solve problems	• Comment: achievement of this learning outcome is totally reflected in the stages of Task and Process inside WQ1.	• Comment: judgment and decision-makings are important processes during both individual and group work whilst abundant resources are available in the WQ2 for helping students to solve the problem.	• Comment: the WQ3 aimed at not only training of data comparison and analysis, but also drawing inferences from those data. But the design of WQ concentrated in a few aspects only which may lead to a limited scope in solving the problem "Living in other country is better". Students might draw conclusion based on some confined tracks.	• Comment: the WQ4 aimed at not only training of data comparison and analysis, but also drawing inferences from those data. But the design of WQ somehow can work better for guiding students to select foods at a certain basis for comparison, e.g. a meal which includes antipasto, main course, dessert and drink. Variation of judgment among groups could be lessened.
[C7.1] draw conclusion from the information collected and apply the knowledge to solve problems of similar nature	• Comment: students could easily learn any subject issues through the questioning design of "What", "How" and "Why" inside WQ1.	• Comment: students could easily learn any subject issues through the questioning design of "What", "Which" and "How" inside WQ2. This could help them to transfer their learning to other domains.	• Comment: students could easily learn any subject issues through the techniques of find real world data to support their explanation and conclusion. This could help them to transfer their learning to other domains.	• Comment: students could easily learn any subject issues through the techniques of find real world data to support their explanation and conclusion. This could help them to transfer their learning to other domains.
[C8.1] use multiple keywords or phrases to label information; categorize and connect the	• Comment: students could easily identify distinct keywords from the questions set inside	• Comment: students could easily identify distinct keywords from the questions set inside	• Comment: students could easily identify distinct keywords from the questions set inside	• Comment: students could easily identify distinct keywords from the questions set inside

concepts derived from information	WQ1 to retrieve corresponding web resources and links the concepts together during group process.	WQ2 to retrieve corresponding web resources and links the concepts together during group process.	WQ3 to retrieve corresponding data in the web resources and connect the concepts through both obvious and inconspicuous channels.	WQ4 to retrieve corresponding data in the web resources and connect the concepts and draw correlation.
[C8.2] integrate the agreement and disagreement among sources	• Comment: although the roles are different, but there is lack of evidence showing that strong chasm among the sources of information would be induced during group process.	• Comment: based on the radical question: "Paper or Plastic?" and different role-play, students would face agreements / disagreements, integrate and conclude opinions with the supportive information from Web sources before making a consensus.		
[C11.1] make inferences and simple generalizations from the evidence collected			• Comment: through data analysis, students could make correlation between two concepts. Also with more data collected and analyzed, students might have a better view of the problem and thus have more evidence to drawing further inference.	• Comment: through real data collection from Web sources, students could establish a general view about the topic. Students could also make correlation between two concepts during data analysis.

Table 23.10: Comments Given by Expert W on the Explanation of the Relation

Target Learning Outcomes	*WQ1*	*WQ2*	*WQ3*	*WQ4*
[C6.1] make judgments and draw conclusions from research to solve problems	• Comment: using sub-problems as scaffolding to help students make decision and activate them to think thoroughly.	• Comment 1: in the phase 4, students are required to present pros and cons of using both plastic and paper bags, and this motivate students to make judgments and draw conclusions. • Comment 2: to protect environment, people have to limit their behavior; to make living convenient, people choose to ignore environment. This is an everlasting paradox. From this task, students have to face the paradox and make a wise or more suitable choice. This is alike in all choices in a person's life.	• Comment: happiness of living in a country concerns about many things that should be considered totally. The task of this WebQuest requires students not only to imagine the life, but also to compare and analyze information, resulting in some informative and convincing conclusion and decision.	• No comment.
[C7.1] draw conclusion from the information collected and apply the knowledge to solve problems of similar nature	• Comment 1: the four different roles build up a real problem-solving procedure including the phenomena, deeply reasons, results caused,	• Comment: although environmental problems are similar, from different perspectives, students have to find reason to use plastic or	• No comment.	• No comment.

	and measures to take. • Comment 2: the general procedure could be generalized to other similar problems.	paper. Any problem has positive and negative side, and it depends on what position you are. This could be generalized to other social problems.		
[C8.1] use multiple keywords or phrases to label information; categorize and connect the concepts derived from *information*	• No comment.	• No comment.	• No comment.	• No comment.
[C8.2] integrate the agreement and disagreement among sources	• Comment: I don't think there are disagreements in sources in this WebQuest, although different points may exist. The global warming has been criticized too much currently, so I do not think students will get different sources as for this issue.	• Comment: the teacher encourages students to use versified tools to express themselves so as to convince others.	• **Extra comment**: what should be criteria of living better in a country or a district, may be different for different students who hold different expectation to life. So there may be diversified points of view among four students of one group, or different groups. In order to make balance among these views, they need to integrate the agreement and disagreement and make a optimal decision.	

[C11.1] make inferences and simple generalizations from the evidence collected	• Extra comment: To finish the final products, students need to combine different roles' views that make the general issue more specific, such as 10 things we should do to help curb global warming. Except global warming, other environmental problems also have common characteristics, so student will have chance to generalize their findings to similar context.		• No comment.	• No comment.

Table 23.11: Comments Given by Expert Y on the Explanation of the Relation

Appendix 24a: Lesson Transcripts (Students' Physical Activities) of Five Case Groups in *WQ1*

As reported in Section 3.3.4.3, three 70-minute lessons were allotted to *WQ1*. Among the three lessons, the first one was used to 1) allow the teacher to illustrate the WebQuest activity to students, for the first few minutes, and 2) let each group member carry out individual research according to his/her assigned role. The second lesson was for each group to combine the findings brought by the members in the first lesson, so as to allow the group to create the learning product. The third lesson was for each group to 1) have final preparation of the presentation and 2) conduct oral presentation of their learning product to the class.

First Lesson for *WQ1*

From **WQ1GaV1**, **WQ1GbV1**, **WQ1GcV1**, **WQ1GdV1**, and **WQ1GeV1** (i.e. video clips of the first lesson for *WQ1*), it was found that the teacher employed the same strategy for delivering the WebQuest to the five groups of participants (i.e. G_a, G_b, G_c, G_d, and G_e) in the first lesson.

0:00	10:14	The teacher mentioned to the students the location of the files required for the WebQuest, including the link to the WebQuest page and other support files, and demonstrated how the students could get access to those files using his computer, the projector and the screen. While the teacher illustrated the WebQuest activity to the students, all students sat in the middle of the computer room with no access to computers, and listened to the teacher. The teacher introduced the WebQuest activity to the students by first mentioning the topic – Global Warming. Then, he showed the students the *Introduction* section and told the students the background of the activity. After that, he mentioned to the students the three key attributes of a WebQuest, which are *Introduction*, *Task*, and *Process*.

		After that, he showed the students the *Task* section and stated the context of the task and the mission to be completed by the students. He also explained the meaning of "expert" to the students. After that, he showed the students the *Process* section and mentioned the four consultants to be played by students. Then, he explained each of the four consultants, in detail, by mentioning the specific knowledge and information that the consultant should have. After that, the teacher recapitulated the main characteristics of the four consultants. After that, the teacher mentioned how the class time of the coming three double lessons would be used. He explained to the students how to perform individual inquiry in the first lesson, how to group the findings by the four members in the second lesson, and what the students should do in the third lesson. After that, for each consultant, the teacher explained to the students how to make use of the guiding questions and pre-selected Web resources to develop individual expertise. He also demonstrated how to use the support files (templates for individual inquiry). After that, the teacher set goal for the lesson by repeating what the students needed to complete in that lesson. Then, he made the seating arrangement for each group of students. After that, all students moved to the computer workstations by following the seating arrangement given by the teacher.

Target Group in G_a (*WQ1* Lesson 1)

10:15	1:06:20	At the beginning, the four students discussed the allocation of the four consultants. Then, each of them worked on his own computer without leaving the seat. Throughout the rest of the lesson, students A (the closest to the camcorder) and B rarely talked to each other but looking at and operating the computers quietly. Students C and D (the farthest from the camcorder) often chatted with each

		other. Student B talked to student C for a few times. Student B talked to student D for a few times. Students A and B almost had no discussion with students C and D. Students B and C had a few short dialogues with the teacher.

Target Group in G_b (*WQ1* Lesson 1)

11:36	21:53	At the beginning, the four students discussed the allocation of the four consultants. Then, each of them worked on her own computer without leaving the seat. Throughout the rest of the lesson (the rest of the video clip), student A (the closest to the camcorder) talked to student B for only one time. Student C talked to student D (the farthest from the camcorder) for only one time. Students B and C had a few short discussions. Each of students A and D had a short dialogue with the teacher. The four students mainly looked at and operated their computers quietly. *Owing to a technical problem, the camcorder stopped recording at 21:53. The teacher and his assistant were not aware of the problem till the end of the lesson.*

Target Group in G_c (*WQ1* Lesson 1)

10:49	1:05:54	At the beginning, the four students discussed the allocation of the four consultants. Then, each of them worked on his/her own computer without leaving the seat. Throughout the rest of the lesson, student A (the closest to the camcorder) rarely chatted with other members. Students B and C had constant discussions with each other. Students B, C and D (the farthest from the camcorder) often chatted together. They seemed happy while chatting. Student D chatted with a classmate, who was the member of another group, on her right hand side for a few times. Students C and D had a few short dialogues with the teacher.

Target Group in G_d (*WQ1* Lesson 1)

11:56	1:13:35	At the beginning, the four students discussed the allocation of the four consultants. Then, each of them worked on his/her own computer without

		leaving the seat. Throughout the rest of the lesson, the four students mainly looked at the screens and operated their computers without talking. Students A (the closest to the camcorder) and B chatted with each other for a few times. Students B and C chatted with each other for a few times. Student D (the farthest from the camcorder) rarely talked to the others. Students A, B and C had a few short dialogues with the teacher. Near the end of lesson (7 minutes before the end of the video clip till the end of the video clip), students A, C and D sat around student B to help student B find the required information at the given Websites. The teacher also came to them and explained some information at the Website to the students.

Target Group in G_e (*WQ1* Lesson 1)

13:10	1:12:23	At the beginning, the four students discussed the allocation of the four consultants. Then, each of them worked on his/her own computer, almost, without leaving the seat. Throughout the rest of the lesson, students A (the closest to the camcorder) and B chatted with each other constantly. Students C and D (the farthest from the camcorder) chatted with each other constantly. Students A, B and C sometimes chatted together. They seemed happy while chatting. Student D chatted with a classmate, who was the member of another group, on his right hand side for a few times. Students B and C had a few short dialogues with the teacher.

Second Lesson for *WQ1*

From **WQ1GaV2**, **WQ1GbV2**, **WQ1GcV2**, **WQ1GdV2**, and **WQ1GeV2** (i.e. video clips of the second lesson for *WQ1*), it was found that the teacher employed the same strategy for implementing the WebQuest in the second lesson for the five groups of participants (i.e. G_a, G_b, G_c, G_d, and G_e).

0:00	6:24	The teacher recapitulated what the students did in the previous lesson (i.e. Lesson 1) and reminded the students that each of them was a consultant of the U.S. president. He mentioned again the location of the files required for the WebQuest, including the link to the WebQuest page. Then, he showed the WebQuest page to the students, and reminded the students that 1) they were the experts of four particular areas and 2) they had completed their individual research. After that, the teacher talked about what the students had to do in this lesson by mentioning the combination of the findings by the four consultants. The teacher also told the students what they would do in the next lesson (i.e. Lesson 3). The teacher mentioned the connection of the three lessons by stating that what the students would do in this lesson was related to what they did in the previous lesson, and what they would do in the next lesson was related to what they would do in this lesson. After that, the teacher told the students what should be included in their PowerPoint presentation by explaining the required elements stated in the *Process* section one by one. Then, he demonstrated how the students could get access to and make use of the PowerPoint template that he had prepared for the students. He also explained to the students what key information should be presented on each slide of the PowerPoint template. After that, the teacher mentioned to the students that all the individual research reports submitted by the students in the previous lesson were classified according to the students' grouping and stored in specific folders on the network drive for the ease of retrieval. He also explained to the students how to make use of the specific folders on the network drive in order to facilitate their group work. He told the students that there was no need to submit the PowerPoint document and keeping their group work in the specific folders was okay. While the teacher illustrated the WebQuest activity to the students, all students sat in the middle of the computer room with no access to

		computers, and listened to the teacher. After that, the teacher made the seating arrangement for each group of students. Then, all students moved to the computer workstations by following the seating arrangement given by the teacher.

Target Group in G_a (*WQ1* Lesson 2)

6:25	1:08:52	For the first 40 minutes, the four students mainly looked at the computer screens and operated their own computers quietly. Student B talked to students A (the closest to the camcorder) and C for a few times. Student C talked to student D (the farthest from the camcorder) for a few times. Students B and C had a few short dialogues with the teacher. For the rest of the lesson, students A, C and D left their seats. They sat together with student B. Students B, C and D had frequent discussions with each other, while student A often showed his silence, and sometimes returned to his seat for operating his computer. When the four students sat together for discussion, students B and D were in-charge-of operating the computer (B's computer), while students A and C did not touch that computer.

Target Group in G_b (*WQ1* Lesson 2)

7:30	1:06:14	For the first 30 minutes, the four students mainly looked at the computer screens and operated their own computers quietly. They rarely chatted with others. Student D (the farthest from the camcorder) used to leave her seat and came to student B for a short discussion with students A (the closest to the camcorder) and B. For the next 5 minutes, student A left her seat. She sat behind students B and C, and watched the computer screens of students B and C without talking, while students B, C and D still worked quietly on their computers. For the next 8 minutes, student B stopped working on her computer and sat quietly next to student C. For the next 2 minutes, student D left her seat and sat together with students A and B. For the rest of the lesson, students A, B and D sat together with student C. They chatted together from time to time. When the four students sat together for discussion, students C and D were in-charge-of operating the computer (C's computer), while student A did not touch that computer. Student B sometimes returned to her seat for operating her computer for

		short periods.

Target Group in G_c (*WQ1* Lesson 2)

8:24	1:09:35	Throughout the rest of the lesson, the four students mainly stayed in their seats by looking at the computer screens and operating their own computers. They hardly left their seats. Students B and C frequently chatted with each other. They also had frequent chatting with student D (the farthest from the camcorder). Students B and C had a few short dialogues with the teacher. Student A (the closest to the camcorder) rarely talked to the others. Student C used to leave his seat and worked together with student B on B's computer for a short while. After the end of the lesson, students A and D left the computer room, while students B and C kept staying and working on their computers for about five more minutes.

Target Group in G_d (*WQ1* Lesson 2)

8:57	1:10:29	For the first few minutes, the four students looked at the computer screens and operated their own computers. For the next 40 minutes, student A (the closest to the camcorder) stayed in her own seat and operated her computer. She sometimes talked to student B. Students B, C and D often chatted with each other. Student B sometimes left her seat and worked on student C's computer. Student D (the farthest from the camcorder) often left his seat. He moved to student B for chatting for a number of times. He also worked on student C's computer for a number of times. Student C mainly stayed in his own seat and operated his computer. Students B and C had a few short dialogues with the teacher. For the next five minutes, student C kept staying in his seat and operating his computer. Student B worked on student A's computer, while student A worked on student B's computer. Student D moved around students A, B and C without touching his computer. For the rest of the lesson, the four students sat together at C's computer and they had frequent discussions together. Students B, C and D operated the computer (C's computer) in turn, while student A did not touch that computer.

Target Group in G_e (*WQ1* Lesson 2)

9:17	1:15:14	For the first 50 minutes, the four students mainly looked at the computer

		screens and operated their own computers quietly. Student C talked to student D (the farthest from the camcorder) for a few times. Students B and C often chatted with each other. Student B worked on student C's computer for a few times. Student B talked to student A (the closest to the camcorder) for a few times. Student A seldom talked to the others. For the next few minutes, only student C worked on his own computer. Students A, C and D sat aside for chatting without touching the computers. For the rest of the lesson, student D sat next to student C and they worked together on C's computer. Student B sat next to student A and they worked together on A's computer.

Third Lesson for *WQ1*

From **WQ1GaV3**, **WQ1GbV3**, **WQ1GcV3**, **WQ1GdV3**, and **WQ1GeV3** (i.e. video clips of the third lesson for *WQ1*), it was found that the teacher employed the same strategy for implementing the WebQuest in the third lesson for the five groups of participants (i.e. G_a, G_b, G_c, G_d, and G_e).

0:00	2:58	The teacher talked about what the students would do in this lesson (Lesson 3). He mentioned to the students that they would be given about fifteen minutes for checking again their presentation content and preparing for their group presentation by having rehearsals. He also reminded the students 1) the location (the specific folder on the network drive) for saving their final group products, 2) the requirements for the filenames of their group products, and the time limit for the presentation of each group. Finally, he told the students the presentation order of the groups. While the teacher talked to the students, all students sat in the middle of the computer room with no access to computers, and listened to the teacher. After that, the teacher asked the students to follow the seating arrangement they had in the previous lessons. Then, all students moved to the computer workstations by following the seating arrangement for the previous lessons.

Target Group in G_a (*WQ1* Lesson 3)

2:59	33:13	The four students mainly sat in front of the screens and operated their own computers. Students B, C and D (the farthest from the camcorder) had frequent discussions together. Student B often left his seat for chatting with students C and D by standing in the middle of C and D. Student B sometimes worked together with student C on C's computer. He also had frequent dialogues with the teacher. Student D often left his seat for chatting with students B and C. Students A (the closest to the camcorder) and C never left their seats.
33:14	1:09:04	All students in the class logged off the computers and sat in the middle of the computer room with no access to computers, and listened to the teacher.

		Then, each group came out to conduct their presentation, one by one, using the teacher's computer, the multimedia projector and the screen. All members of a group took part in presenting their work to the class. All groups could make use of the slideshow function provided by the presentation software package to facilitate their oral presentation. Upon completion of each group presentation, the teacher provided oral feedback (both positive and negative comments on the group's performance) to the group and reminded the rest of the class to pay attention to those comments for subsequent presentation.

Target Group in G_b (*WQ1* Lesson 3)

2:41	18:15	The four students mainly sat in front of the screens and operated their own computers. After about 3 minutes, students A (the closest to the camcorder) and C exchanged their seats (i.e. student A left her seat and worked on C's computer, while student C left her seat and worked on A's computer) until they logged off the computers. Student A often held a piece of paper on hand and sometimes showed the paper to students B and C. Students A, B and C had frequent discussions together. Student B sometimes kept her ear close to the computer speaker and looked like listening to the sound produced by the computer. Student D (the farthest from the camcorder) just talked to the others for a few times. She watched her screen all the time and looked like having rehearsal by reading the text (or pronouncing the words) shown on the screen.
18:16	55:42	All students in the class logged off the computers and sat in the middle of the computer room with no access to computers, and listened to the teacher. Then, each group came out to conduct their presentation, one by one, using the teacher's computer, the multimedia projector and the screen. All members of a group took part in presenting their work to the class. All groups could make use of the slideshow function provided by the presentation software package to facilitate their oral presentation. Upon completion of each group presentation, the teacher provided oral feedback (both positive and negative comments on the group's performance) to the group and reminded the rest of the class to pay attention to those comments for subsequent presentation.

Target Group in G_c (*WQ1* Lesson 3)

3:24	22:59	The four students mainly sat in front of the screens and operated their own computers. Students B and C always talked to each other. They often worked together on C's computer. Student B often sat next to student C and chatted with C without touching his (B's) own computer. They sometimes watched C's screen together and looked like having rehearsal by reading the text (or pronouncing the words) shown on C's screen. They also had a few short dialogues with the teacher. Student A (the closest to the camcorder) rarely talked to the others but just looked at her screen and operated her computer quietly. Student D (the farthest from the camcorder) sometimes talked to students B and C. She sometimes kept her ear close to the computer speaker and looked like listening to the sound produced by the computer.
23:00	1:04:27	All students in the class logged off the computers and sat in the middle of the computer room with no access to computers, and listened to the teacher. At the beginning, the teacher gave the students an introduction about how to conduct presentation, including where they should stand and whom they should look at. Then, each group came out to conduct their presentation, one by one, using the teacher's computer, the multimedia projector and the screen. All members of a group took part in presenting their work to the class. All groups could make use of the slideshow function provided by the presentation software package to facilitate their oral presentation. Upon completion of each group presentation, the teacher provided oral feedback (both positive and negative comments on the group's performance) to the group and reminded the rest of the class to pay attention to those comments for subsequent presentation.

Target Group in G_d (*WQ1* Lesson 3)

5:30	26:02	The four students reverse their seating arrangement. Student A took student D's original seat. Student B took student C's original seat, student C took student B's original seat, while student D took student A's original seat. Each of them had two pieces of paper on his/her hand. Student A (the farthest from the camcorder) mainly sat together with

		student B without touching her (A's) own computer. They often watched B's screen together and also referred to the pieces of paper on their hands. They looked like having rehearsal by reading the text (or pronouncing the words) shown on B's screen and those on the paper. Student B sometimes kept her ear close to the computer speaker and looked like listening to the sound produced by the computer. Students C and D (the closest to the camcorder) mainly sat in front of the screens and operated their own computers. They often talked to each other. Student C sometimes looked like having rehearsal by reading the text (or pronouncing the words) shown on his screen. Students A, B and C sometimes had discussion together. Students B and C had a few short dialogues with the teacher.
26:03	1:08:31	All students in the class logged off the computers and sat in the middle of the computer room with no access to computers, and listened to the teacher. Then, each group came out to conduct their presentation, one by one, using the teacher's computer, the multimedia projector and the screen. All members of a group took part in presenting their work to the class. All groups could make use of the slideshow function provided by the presentation software package to facilitate their oral presentation. Upon completion of each group presentation, the teacher provided oral feedback (both positive and negative comments on the group's performance) to the group and reminded the rest of the class to pay attention to those comments for subsequent presentation.

Target Group in G_e (*WQ1* Lesson 3)

5:15	23:34	Students A (the closest to the camcorder), B and D (the farthest from the camcorder) never touched their own computers. They sat together with student C in front of C's computer. They had frequent discussions together. For most of the time, they looked like having rehearsal, in turn, by reading the text (or pronouncing the words) shown on the screen. The four students looked very happy while sitting together for discussion or rehearsal. Student B sometimes kept her ear close to the computer speaker and looked like listening to the sound produced by the computer. She also had a few short dialogues with the teacher.
23:35	1:10:50	All students in the class logged off the computers and sat in the middle of the computer room with no access to computers, and listened to the teacher.

		At the beginning, the teacher gave the students an introduction about how to conduct presentation, including where they should stand and whom they should look at. Then, each group came out to conduct their presentation, one by one, using the teacher's computer, the multimedia projector and the screen. All members of a group took part in presenting their work to the class. All groups could make use of the slideshow function provided by the presentation software package to facilitate their oral presentation. Upon completion of each group presentation, the teacher provided oral feedback (both positive and negative comments on the group's performance) to the group and reminded the rest of the class to pay attention to those comments for subsequent presentation.

Appendix 24b: Lesson Transcripts (Students' Physical Activities) of Five Case Groups in *WQ2*

As reported in Section 3.3.4.3, like *WQ1*, three 70-minute lessons were allotted to *WQ2*. Among the three lessons, the first one was used to 1) allow the teacher to illustrate the WebQuest activity to students, for the first few minutes, and 2) let each group member carry out individual research according to his/her assigned viewpoint. The second lesson was for each group to 1) discuss and debate based upon the four perspectives, and 2) reach a consensus subsequently, so as to allow the group to create the learning product. The third lesson was for each group to 1) have final preparation of the presentation and 2) conduct oral presentation of their learning product to the class.

First Lesson for *WQ2*

From **WQ2GaV1**, **WQ2GbV1**, **WQ2GcV1**, **WQ2GdV1**, and **WQ2GeV1** (i.e. video clips of the first lesson for *WQ2*), it was found that the teacher employed the same strategy for delivering the WebQuest to the five groups of participants (i.e. G_a, G_b, G_c, G_d, and G_e) in the first lesson.

0:00	10:33	The teacher mentioned to the students their overall performance of the previous WebQuest activity (i.e. *WQ1*) and encouraged them to do better for the coming WebQuest activity. After that, the teacher began to talk about *WQ2*. He mentioned to the students the location of the files required for the WebQuest, including the link to the WebQuest page and other support files, and showed the WebQuest page to the students using his computer, the projector and the screen. While the teacher illustrated the WebQuest activity to the students, all students sat in the middle of the computer room with no access to computers, and listened to the teacher. Before talking about *WQ2*, the teacher recapitulated the theme of *WQ1* with the students. Then, he mentioned the theme of *WQ2*. He showed the students the *Introduction* section and told the students the background of the activity by explaining the meaning of grocery store and the situation in

		a grocery store for giving paper or plastic papers. After that, he showed the students the *Task* section and stated the context of the task and the mission to be completed by the students. He also explained "shopping day" to the students. After that, he showed the students the *Process* section and mentioned the four viewpoints to be taken by students. He also reminded the students to stick to the chosen viewpoints throughout the whole activity. Then, he explained each of the four viewpoints, in detail, by mentioning the particular stand that should be held. After that, the teacher mentioned how the class time of the coming two double lessons would be used. Then, he showed the students the common set of Web materials to be read by all group members. He also read some of the materials together with the students through the project and the screen. He explained to the students how to perform individual inquiry in the first lesson and how the group members would discuss and debate in the next lesson. After that, for two of the four viewpoints, the teacher demonstrated how to make use of the guiding questions and pre-selected Web resources to complete individual research reports. He also reminded the students not to copy a lot of information from Websites for a guiding question. After that, the teacher set goal for the lesson by repeating what the students needed to complete in that lesson. Then, he told the students to follow the seating arrangement they had in the previous lessons. After that, all students moved to the computer workstations by following the seating arrangement given by the teacher.

Target Group in G_a (*WQ2* Lesson 1)

10:34	1:08:23	At the beginning, the four students discussed the allocation of the four viewpoints. Then, each of them worked on his own computer without leaving the seat. Throughout the rest of the lesson, students A (the closest to the camcorder) rarely talked to the others but looking at and operating his computer quietly.

		Student B chatted with students C and D (the farthest from the camcorder) for a few times. Students C and D sometimes chatted with each other. Student D used to leave his seat and talked to student B or looked at B's screen for a few times. The teacher used to give short demonstration to students B and C on their own computers for a few times.

Target Group in G_b (*WQ2* Lesson 1)

13:18	1:06:17	At the beginning, the four students discussed the allocation of the four viewpoints. Then, each of them worked on her own computer without leaving the seat. Throughout the rest of the lesson, the four students almost had no discussion with others. Student B chatted with student A (the closest to the camcorder) for only a few times. Student D (the farthest from the camcorder) chatted with students C and B for only a few times. The four students mainly looked at and operated their computers quietly. The teacher used to give short demonstration to students B, C and D on their own computers for a few times. The teacher used to give short demonstration to student A on A's computer for several times.

Target Group in G_c (*WQ2* Lesson 1)

11:38	1:07:39	At the beginning, the four students discussed the allocation of the four viewpoints. Then, each of them worked on his/her own computer without leaving the seat, except student C. Throughout the rest of the lesson, student A (the closest to the camcorder) never talked to the others but looking at and operating her computer quietly. Students B and C chatted with each other for a few times. Students C and D (the farthest from the camcorder) chatted with each other for a few times. Student C used to leave his seat for about 8 minutes. Student C had a few short dialogues with the teacher. The teacher used to give short demonstration to students A, B and C on their own computers for a few times.

Target Group in G_d (*WQ2* Lesson 1)

14:34	1:13:15	At the beginning, the four students discussed the allocation of the four viewpoints. Then, each of them worked on his/her own computer. Throughout the rest of the lesson, the four students mainly looked at the screens and operated their computers with not much talking. Students A (the closest to the camcorder) and B chatted with each other for a few times. Students C and D (the farthest from the camcorder) chatted with each other for a few times. Each of them used to leave his/her seat for a few short periods. A few students from other groups used to come to this group for talking separately to students A, B, C and D for short periods. The teacher used to give short illustration to students B and C on their screens for a few times. The teacher used to give short illustration to student A on her screen for several times.

Target Group in G_e (*WQ2* Lesson 1)

12:03	1:14:02	At the beginning, the four students discussed the allocation of the four viewpoints. Then, each of them worked on his/her own computer without leaving the seat. Throughout the rest of the lesson, students A (the closest to the camcorder) and B sometimes chatted with each other. Students C and D (the farthest from the camcorder) sometimes chatted with each other. Students B and C often chatted with each other. Students A, B and C chatted together for a few times. Students A and B had a few short dialogues with the teacher. The teacher used to give short demonstration to student A on A's computer for a few times. The teacher used to give short illustration to student B on her screen for a few times.

Second Lesson for *WQ2*

From **WQ2GaV2**, **WQ2GbV2**, **WQ2GcV2**, **WQ2GdV2**, and **WQ2GeV2** (i.e. video clips of the second lesson for *WQ2*), it was found that the teacher employed the same strategy for implementing the WebQuest in the second lesson for the five groups of participants (i.e. G_a, G_b, G_c, G_d, and G_e).

0:00	5:36	The teacher mentioned again the location of the files and folders required for the WebQuest, including the link to the WebQuest page and the folders created for the groups. Then, he showed the WebQuest page to the students, and recapitulated the mission of the WebQuest activity and what the students had completed in the previous lesson (i.e. Lesson 1). He reminded the students the four different viewpoints that had been played (in Lesson 1) and to be played (in Lesson 2) by the four group members. He reminded the students to stick to the chosen viewpoints and make use of the information found for the chosen viewpoints to convince the others. After that, the teacher talked about what the students had to do in that lesson. He told the students to discuss based upon the chosen viewpoints. He also told the students to debate by using the information found for a particular viewpoint to convince other group members to accept the viewpoint. He then required each group to reach a consensus which was agreed by all members. He also mentioned that there could be an alternative if neither paper nor plastic bag was chosen. After that, the teacher told the students what should be included in their PowerPoint presentation by explaining the five required elements stated in the *Process* section one by one. Then, he mentioned to the students that there was no limitation on the design and organization of the PowerPoint presentation and there was no PowerPoint template provided to them. After that, the teacher reminded the students to try to complete the PowerPoint document within the lesson and prepare for their group presentation before the next lesson. After that, the teacher mentioned to the students that all the individual research reports submitted by the students in the previous lesson were classified according to the students' grouping and stored in specific folders on the network drive for the ease of retrieval. He also explained to the students how to make use of the specific folders on the network drive in order to facilitate their group work. He told the students that there was no

		need to submit the PowerPoint document and keeping their group work in the specific folders was okay. While the teacher illustrated the WebQuest activity to the students, all students sat in the middle of the computer room with no access to computers, and listened to the teacher. After that, the teacher told the students to start working on the computers without mentioning the seating arrangement. Then, all students moved to the computer workstations by following the seating arrangement they had in the previous lessons.

Target Group in G_a (*WQ2* Lesson 2)

5:37	1:08:32	For the first 5 minutes, the four students sat in front of their computers and talked to each other frequently. Student D (the farthest from the camcorder) often left his seat and came to student B for talking to him (B). Student B actively talked to students C and A (the closest to the camcorder) for several times. At the end of that period, he left his seat and talked to the teacher for a short while. Then, the teacher came to his group and stood between students B and C. The teacher initiated discussion among the four students, and then he left the group. For the next 10 minutes, the four students left their computers and mainly sat together for discussion. One minute after the students started their discussion, the teacher came to the group again and guided the students how to conduct the discussion. He also sat together with the students, and listened to their discussion and sometimes joined their discussion. During the discussion, students B and D had intensive debate. They tried very hard to present arguments for their own viewpoints and to convince each other and the other two members (A & C). Students A and C sometimes presented their arguments to support or oppose students B or C. Individual students sometimes returned to theirs computers for a short while to look for information. For the next 3 minutes, students C and D returned to their computers, while students A and B stood behind students C and D. They continued their discussion and students B and D still had intensive debate. The teacher was also with them. For the next 3 minutes, the four students mainly looked at the computer screens and operated their own computers quietly. Student D used to leave

		his seat and talked to student B. Student B used to leave his seat and talked to student D. For the next 12 minutes, the four students left their computers and sat together for discussion again. The teacher also sat together with them and listened to them. He sometimes asked the students a few questions and gave them some comments. He also helped the students conclude their discussion. For the next 8 minutes, the four students returned to their computers. They mainly worked on their own computers. Student B used to leave his seat and talked to student D for a few times. Student D used to leave his seat and talked to student A for a few times. Students B, C and D often chatted together. For the rest of the lesson, students A and B left their seats and mainly sat together with students C and D. They worked together on C's and D's computers, while students C and D were in-charge-of operating the computers. The teacher used to sit behind the group for helping them for a short while. Students A and B sometimes returned to their seats for operating their computers for a few short periods.

Target Group in G_b (*WQ2* Lesson 2)

7:40	1:08:07	For the first 3 minutes, the four students mainly looked at the computer screens and operated their own computers quietly. They rarely chatted with others. For the next 5 minutes, the teacher came to the group and asked them to sit together for discussion. The four students followed the teacher's instruction by leaving their computers and sitting together. The teacher stayed with the group and guided the students to start the discussion. Then, he sat together with the group and guided each group member to express her arguments. Student C stated her arguments first. Then, the teacher helped students A and B to support or oppose C's arguments. After that, student C further stated other arguments to convince students A and B, and student D also joined the discussion. There was no intensive debate in the group. For the next 27 minutes, the teacher left the group and the four students continued their discussion. After a few minutes, the teacher came back to join the group and listen to their discussion. He helped the students to express their arguments by asking them questions and giving them

		comments. He also helped individual students to summarize the main points of their arguments, and connected and classified the arguments stated by different group members. At the end, the teacher helped the students conclude the discussion. For the next 1 minute, the four students worked together on student C's computer. For the rest of the lesson, the four students returned to their own computers. They mainly looked at the computer screens and operated their own computers quietly. Student C and D (the farthest from the camcorder) sometimes chatted with each other. Student B and C sometimes chatted with each other. Student A (the closest to the camcorder) and B chatted with each other for a few times. Student D used to leave her seat and talked to student B. Student B used to leave her seat and talked to student D. Student C had a few short dialogues with the teacher.

Target Group in G_c (*WQ2* Lesson 2)

7:40	1:21:29	For the first 3 minutes, the four students mainly looked at the computer screens and operated their own computers. Students B and C sometimes chatted with each other. For the next 13 minutes, the teacher came to the group and sat behind students B and C. He initiated discussion among the four students by first asking student D (the farthest from the camcorder) to state the arguments for her viewpoint. Then, students B and C responded to D by opposing D's arguments. The teacher kept helping the group to discuss by asking students B and C questions and telling them what should be considered. Then, the teacher asked student A (the closest to the camcorder) to tell the others something about the two international companies in her report. After student A introduced the two companies to the others, the teacher walked around students B, C and D and kept helping them to discuss by asking them questions and telling them what should be considered. At the end of that period, the teacher left the group. There was no intensive debate in the group. During the discussion, the four students sat in front of their computers and did not leave their seats. For the next 23 minutes, the four students mainly looked at the computer screens and operated their own computers. Students B, C and D often had discussion together. Student A rarely talked to the others. Students A and C used to leave their seat for talking to students of other groups for a short

		while. The teacher used to came to the group for listening to the discussion among students B, C and D and giving comments to them for a few short periods. For the next 15 minutes, students B, C and D mainly sat together and worked together on C's computer, while student A did not join them and worked on her own computer. The teacher used to come to the group and helped students B, C and D conclude their discussion. For the next 4 minutes, student A left her seat. She sat together with the others for about 2 minutes and, then, returned to her seat. After that, the lesson ended. For the next 15 minutes (i.e. the time after the end of the lesson), student A logged off her computer and left the computer room. Students B, C and D kept working on their own computers and sometimes chatted with each other.

Target Group in G_d (*WQ2* Lesson 2)

9:06	1:10:48	For the first 3 minutes, the four students mainly looked at the computer screens and operated their own computers. Students C and D (the farthest from the camcorder) sometimes chatted with each other. For the next 4 minutes, the teacher came to the group and asked the students to sit together for discussion. After sitting together, student D stated the arguments of her viewpoint first. Then, the teacher helped students A and C to respond to D's arguments. At the end of the period, the teacher left the group and went to another group. For the next 2 minutes, the four students continued their discussion. For the next 4 minutes, the four students returned to their seat and worked on their own computers. Student A (the closest to the camcorder) used to leave his seat for talking to student D for a few times. Student D used to leave her seat for talking to student A. For the next 3 minutes, student A left his seat and sat together with students C and D for discussion, while student B kept working on his computer. For the next 11 minutes, the four students worked on their own computers. Student A used to leave his seat for talking to students C and D for a few

		times. Students B and C sometimes chatted with each other. Student C used to leave her seat for having discussion with students A and B. For the next 10 minutes, students A sat together with students C and D for discussion. Student B sometimes joined their discussion. For most of the time (in that period), he worked on his own computer. At the end of the period, the teacher joined their discussion and helped the students (B, C & D) conclude their discussion. For the next 12 minutes, the four students worked on their own computers and they often chatted with each other. Student A often left his seat and sat together with students C and D for discussion and working together on their (C and D's) computers. For the rest of the lesson (about 11 minutes), student A mainly sat together with students C and D and worked together with them (C and D) on their (C and D's) computers, while student B worked on his own computer. Student B sometimes chatted with students A, C and D and looked at their computer screens.

Target Group in G_e (*WQ2* Lesson 2)

12:50	1:39:18	For the first 2 minutes, the four students mainly looked at the computer screens and operated their own computers. Students B and C sometimes chatted with each other. For the next 9 minutes, the teacher came to the group and told each of the four students what arguments he/she should present according to his/her viewpoints. Then, student D (the farthest from the camcorder) left his seat and came to student B for sitting together with the others. The teacher also sat together with the students and guided their discussion by giving comments on the arguments given by individual students and posing contradiction to some of their arguments. He also pointed out the misconception in the students' argument. Students B, C and D looked engaged in the discussion. Student A sometimes raised a few questions for the others. After that, the teacher helped the students to make their conclusion by reminding them what should be considered and included in their conclusion. For the next 7 minutes, the teacher left the group. Students A (the closest to the camcorder) and C worked on their own computers, while student D sat together with student B and they (B & D) worked together on B's computer.

		Students B, C and D often had discussion together. For the next 3 minutes, the teacher came to the group again. He sat together with the students and listened to their discussion. He helped the students make their conclusion by asking them a few questions concerning the practical context of the WebQuest activity. For the next 2 minutes, the teacher left the group. Students A and C kept working on their own computers. Students B and D kept working together on B's computer. For the next 4 minutes, the four students continued their discussion. The teacher came to the group again and listened to their discussion. He helped the students frame their solution by reminding them some practical issues that should be considered. Then, he left the group. For the next 9 minutes, student A worked on her own computer. Students B, C and D often had discussion together and work together on B's computer. For the next 3 minutes, the four students worked on their own computers. Students C and D often chatted with each other. For the next 8 minutes, the four students sat together again. Students A and B worked together on A's computer. Students C and D worked on B's computer. The four students sometimes had discussion together. After that, the lesson ended. For the next 33 minutes (i.e. the time after the end of the lesson, and also after school), students A and B kept working together on A's computer. Student D worked on B's computer. Student C worked on his own computer. Student D often chatted with students A and B. For the last 12 minutes of that period, student C logged off his computer and left the computer room. Students A, B and D worked together on A's computer.

Third Lesson for *WQ2*

From **WQ2GaV3**, **WQ2GbV3**, **WQ2GcV3**, **WQ2GdV3**, and **WQ2GeV3** (i.e. video clips of the third lesson for *WQ2*), it was found that the teacher employed the same strategy for implementing the WebQuest in the third lesson for the five groups of participants (i.e. G_a, G_b, G_c, G_d, and G_e).

0:00	2:06	The teacher mentioned to the students that they would be given about ten minutes for checking again their presentation content and preparing for their group presentation by having rehearsals. He also requested the students to use the cordless microphone during the presentation. Then, he told the students the presentation order of the groups. While the teacher talked to the students, all students sat in the middle of the computer room with no access to computers, and listened to the teacher. The teacher did not use any computer equipment while talking to the students. After that, all students moved to the computer workstations by following the seating arrangement they had in the previous lessons.

Target Group in G_a (*WQ2* Lesson 3)

2:07	15:09	The four students mainly sat in front of the screens and operated their own computers. Students B, C and D (the farthest from the camcorder) often had discussions together. Student D often left his seat for sitting together with students B and C and chatting with them. Student A (the closest to the camcorder) talked to student B for a few times. He used to leave his seat and talked to students C and D for a short while. Students B and C never left their seats.
15:09	1:09:08	All students in the class logged off the computers and sat in the middle of the computer room with no access to computers, and listened to the teacher. Then, each group came out to conduct their presentation, one by one, using the teacher's computer, the multimedia projector, the screen, and the

		cordless microphone. All members of a group took part in presenting their work to the class. All groups could make use of the slideshow function provided by the presentation software package to facilitate their oral presentation. Upon completion of each group presentation, the teacher provided oral feedback (both positive and negative comments on the group's performance) to the group and reminded the rest of the class to pay attention to those comments for subsequent presentation.

Target Group in G_b (*WQ2* Lesson 3)

0:00	16:14	*Owing to a technical problem, the camcorder failed to record for the first few minutes of the lesson. It started recording after the teacher had finished briefing the students on what they would do in that lesson.* The four students mainly sat in front of the screens and operated their own computers. They often talked to each other. Student B used to work together with student A (the closest to the camcorder) on A's computer for a short while. The teacher used to help students B and D (the farthest from the camcorder) operate their computers for a short while. For the last 7 minutes, the four students mainly watched their own screens and looked like having rehearsal by reading the text (or pronouncing the words) shown on the screens. They often discussed with each other. For the last 2 minutes, student D left her seat and sat together with students B and C.
16:15	1:03:12	All students in the class logged off the computers and sat in the middle of the computer room with no access to computers, and listened to the teacher. Then, each group came out to conduct their presentation, one by one, using the teacher's computer, the multimedia projector, the screen, and the cordless microphone. All members of a group took part in presenting their work to the class. All groups could make use of the slideshow function provided by the presentation software package to facilitate their oral presentation. Upon completion of each group presentation, the teacher provided oral feedback (both positive and negative comments on the group's performance) to the group and reminded the rest of the class to pay attention to those comments for subsequent presentation.

Target Group in G_c (*WQ2* Lesson 3)

2:04	13:23	The four students mainly sat in front of the screens and operated their own computers. Students B, C and D (the farthest from the camcorder) sometimes had discussions together. Student C sometimes sat next to student B and watched B's screen without touching his (C's) own computer. Student D used to sit next to student C for chatting with C for a short while. Student A (the closest to the camcorder) rarely talked to the others but just looked at her screen and operated her computer quietly.
13:24	1:14:13	All students in the class logged off the computers and sat in the middle of the computer room with no access to computers, and listened to the teacher. At the beginning, the teacher gave the students an introduction about how to conduct presentation, including where they should stand and whom they should look at. Then, each group came out to conduct their presentation, one by one, using the teacher's computer, the multimedia projector, the screen, and the cordless microphone. All members of a group took part in presenting their work to the class. All groups could make use of the slideshow function provided by the presentation software package to facilitate their oral presentation. Upon completion of each group presentation, the teacher provided oral feedback (both positive and negative comments on the group's performance) to the group and reminded the rest of the class to pay attention to those comments for subsequent presentation.

Target Group in G_d (*WQ2* Lesson 3)

3:32	14:37	Throughout the period, each of the four students had a piece of paper on his/her hand. Student A (the farthest from the camcorder) did not use her own computer. She sat together with student B and worked together with B on B's computer. For the first few minutes, they watched B's screen together and also referred to the pieces of paper on their hands. They looked like having rehearsal by reading the text (or pronouncing the words) shown on B's screen and those on the paper. Students C and D (the closest to the camcorder) mainly sat in front of the screens and operated their own computers. Student C sometimes looked

		like having rehearsal by reading the text (or pronouncing the words) shown on his screen. He sometimes talked to students B and D.
14:38	1:07:24	All students in the class logged off the computers and sat in the middle of the computer room with no access to computers, and listened to the teacher. Then, each group came out to conduct their presentation, one by one, using the teacher's computer, the multimedia projector, the screen, and the cordless microphone. All members of a group took part in presenting their work to the class. All groups could make use of the slideshow function provided by the presentation software package to facilitate their oral presentation. Upon completion of each group presentation, the teacher provided oral feedback (both positive and negative comments on the group's performance) to the group and reminded the rest of the class to pay attention to those comments for subsequent presentation.

Target Group in G_e (*WQ2* Lesson 3)

3:22	18:04	For the first 2 minutes, student A (the closest to the camcorder) sat together with student B. They mainly looked at student B's screen and manipulated the mouse with nearly no keyboard operation. Students C and D (the closest to the camcorder) mainly sat in front of their computers but rarely touched the computers. They often chatted with each other and they often watched student B's screen. After that, student D sat together with student C. They often chatted with each other and rarely touched the computer. Students A and B kept sitting together and working together on B's computer. They looked like having rehearsal by reading the text (or pronouncing the words) shown on B's screen. They sometimes discussed with students C and D.
18:05	1:09:43	All students in the class logged off the computers and sat in the middle of the computer room with no access to computers, and listened to the teacher. At the beginning, the teacher gave the students an introduction about how to conduct presentation, including where they should stand and whom they should look at. Then, each group came out to conduct their presentation, one by one, using the teacher's computer, the multimedia projector, the screen, and the cordless microphone. All members of a group took part in presenting their work to the class. All groups could make use of the slideshow function provided by the presentation software package to facilitate their oral presentation. Upon completion of each group presentation, the teacher

		provided oral feedback (both positive and negative comments on the group's performance) to the group and reminded the rest of the class to pay attention to those comments for subsequent presentation.

Appendix 24c: Lesson Transcripts (Students' Physical Activities) of Five Case Groups in *WQ3*

As reported in Section 3.3.4.3, *WQ3* was assigned with one 70-minute lesson for its implementation. From **WQ3GaV**, **WQ3GbV**, **WQ3GcV**, **WQ3GdV3**, and **WQ3GeV3** (i.e. video clips of the five lessons for *WQ3*), it was found that the teacher employed the same strategy for delivering the WebQuest to the five groups of participants (i.e. G_a, G_b, G_c, G_d, and G_e) in the lessons.

0:00	12:12	At the beginning, the teacher mentioned to the students about the short-term WebQuest that would be completed within the lesson. Then, he mentioned the location of the files required for the WebQuest, including the link to the WebQuest page and other support files, followed by opening and showing the WebQuest page to the students using his computer, the projector and the screen. While the teacher illustrated the WebQuest activity to the students, all students sat in the middle of the computer room with no access to computers, and listened to the teacher. The teacher showed the students the *Introduction* section and the *Task* section, and told them the background of the activity, so as to raise the central question of the WebQuest and told the students their mission. After that, he showed the students the *Process* section and mentioned the importance of acquiring real data for comparison and for answering the central question. Then, he mentioned the four data items that the students would need to collect in the WebQuest activity and explained each of the four items one by one. At the end, the teacher made use of the area and the population of a country to help students master the concept of "crowdedness". After that, the teacher mentioned the data source of the activity by introducing the Central Intelligence Agency to the students and briefly talking about the background of the CIA. Then, he showed the students the Website of the CIA database. After that, the teacher told the students that they would work in groups of two for that WebQuest activity and required each group to form two small

		groups of two. Then, he explained the major steps stated in the *Process* section. During his explanation, the teacher also demonstrated how to acquire the data items required for a specific country at the Website of the CIA database, and showed and illustrated the sample graphs available in the *Process* section. After that, the teacher explained to the students what they needed to do for the four questions at the bottom of the *Process* section one by one. After that, the teacher mentioned the two support files that he had prepared for the students and, then, demonstrated how to use the support files (templates for spreadsheet and report) one by one. He also pointed out what the students had to pay attention to while using the two support files. After that, the teacher mentioned and showed the students the specific folders created for each group on the network drive. He told the students that there was no need to submit the Word document and saving their group work in the corresponding folders was okay. After that, the teacher set goal for the lesson by reminding the students that they had to complete the WebQuest within the lesson. After that, the teacher asked the students to follow the seating arrangement they had in the previous lessons. Then, all students moved to the computer workstations by following the seating arrangement for the previous lessons.

Target Group in G_a (*WQ3*)

12:13	1:18:36	At the beginning, the four students discussed their grouping and then took the seats according to their grouping. The two sitting closer to the camcorder belonged to one working group, while another two (far from the camcorder) belonged to another working group. For the first 18 minutes, students A (the closest to the camcorder) and B worked on their own computers. They sometimes talked to each other. They had a few short dialogues with the teacher. After that (since 30:22), student A sat together with student B and worked together with student B on B's computer till the end of the lesson. They often chatted with each other and took turns to operate the computer (B's). They sometimes talked to students C and D. After the end of the lesson

		(since 1:06:44), they kept working together on B's computer for 12 more minutes. For the first 21 minutes, students C and D (the farthest from the camcorder) worked on their own computers. They often discussed with each other. After that (since 33:28), student C sat together with student D without touching his (C's) own computer for about 27 minutes. They had frequent discussions and student D was in-charge-of operating the computer (D's). They sometimes talked to students A and B. After that (since 1:00:10), student D sat together with student C and worked together with student C on C's computer till the end of the lesson. They had frequent discussions and student D was mainly in-charge-of operating the computer (C's). After the end of the lesson (since 1:06:44), they kept working together on C's computer for 6 more minutes.

Target Group in G_b (*WQ3*)

12:50	1:21:33	At the beginning, the four students discussed their grouping and then took the seats according to their grouping. The two sitting closer to the camcorder belonged to one working group, while another two (far from the camcorder) belonged to another working group. Throughout the rest of the lesson, students A (the closest to the camcorder) and B worked on their own computers without leaving the seats. They sometimes talked to each other. They had a few short dialogues with the teacher. After the end of the lesson (since 1:05:32), they kept working on their own computers for 16 more minutes. For the last few minutes, student A sat together with student B without touching her (A's) computer. For the first 16 minutes, students C and D (the farthest from the camcorder) worked on their own computers. They sometimes talked to each other. Student C used to help student D operate her (D's) computer for a short while. After that (since 28:50), student C sat together with student D and worked together with student D on D's computer till the end of the lesson. They often chatted with each other and took turns to operate the computer (D's).

		They had a few short dialogues with the teacher. After the end of the lesson (since 1:05:32), they kept working together on D's computer for 11 more minutes.

Target Group in G_c (*WQ3*)

12:40	1:19:37	At the beginning, the four students discussed their grouping and then took the seats according to their grouping. The two sitting closer to the camcorder belonged to one working group, while another two (far from the camcorder) belonged to another working group. For the first 18 minutes, students A (the closest to the camcorder) and B worked on their own computers. Student B not often touched his own computer but mainly watched student A's screen. He used to operate student A's computer for a short while. They sometimes talked to each other. Student A had a few short dialogues with the teacher. After that (since 29:11), student B sat together with student A and worked together with student A on A's computer for about 28 minutes. They often chatted with each other and took turns to operate the computer (A's). They had a few short dialogues with the teacher. After that (since 57:43), students A and B exchanged their computers (i.e. student A worked on B's computer, while student B worked on A's computer) till the end of the lesson. They seldom talked to each other and mainly worked on the computers. Student A had a few short dialogues with the teacher. After the end of the lesson (since 1:06:19), student A kept working on the computer for 13 more minutes, while student B watched student A's screen without touching the computer. For the first 22 minutes, students C and D (the farthest from the camcorder) worked on their own computers. They sometimes talked to each other. Student D had a few short dialogues with the teacher. After that (since 34:29), student D sat together with student C and worked together with student C on C's computer till the end of the lesson. They often chatted with each other and took turns to operate the computer (C's). They had a few short dialogues with the teacher. After the end of the lesson (since 1:06:19), they kept working together on C's computer for 11 more minutes.

Target Group in G_d (*WQ3*)

15:45	1:18:18	At the beginning, the four students discussed their grouping and then took the seats according to their grouping. The two sitting closer to the camcorder belonged to one working group, while another two (far from the camcorder) belonged to another working group. Throughout the rest of the lesson, students A (the closest to the camcorder) and B mainly worked on their own computers. They often talked to each other. A few students from other groups used to come to them and talked to them for a few times. Student A used to work together with student B on B's computer for a few short periods. She used to leave her seat and went to other groups for a few short periods. Student B used to work on student A's computer for a few times. She used to leave her seat and went to other groups for a few short periods. She had a few short dialogues with the teacher. After the end of the lesson (since 1:06:03), they kept working on their own computers for 10 more minutes. For the last few minutes, student A sat together with student B without touching her (A's) computer. Throughout the rest of the lesson, students C and D (the farthest from the camcorder) mainly worked on their own computers. They sometimes talked to each other. They had a few short dialogues with the teacher. Student C used to work together with student D on D's computer for a few short periods. Student D used to work together with student C on C's computer for a few short periods. Student D used to leave his seat and talked to students A and B for a few times. After the end of the lesson (since 1:06:03), they kept working on their own computers for 12 more minutes. For the last few minutes, student D sat together with student C without touching his (C's) computer.

Target Group in G_e (*WQ3*)

13:48	1:39:10	At the beginning, the four students discussed their grouping and then took

		the seats according to their grouping. The two sitting closer to the camcorder belonged to one working group, while another two (far from the camcorder) belonged to another working group. For the first 51 minutes, students A (the closest to the camcorder) and B mainly worked on their own computers. They often talked to each other. Student A used to sit together with student B without touching her (A's) computer for a short while. Student B used to help student C operate his (C's) computer for a few short periods. She used to work together with student A on A's computer for a few short periods. She had a few short dialogues with the teacher. After that (1:05:14), students A and B exchanged their computers (i.e. student A worked on B's computer, while student B worked on A's computer). They worked on the computers and seldom talked to each other till the end of the lesson. After the end of the lesson (since 1:10:21, also after school), they kept working on the computers for 29 more minutes. For the last few minutes, student B watched student A's screen without touching the computer. For the first 28 minutes, students C and D (the farthest from the camcorder) mainly worked on their own computers. They sometimes talked to each other. Student C sometimes talked to student B. He had a few short dialogues with the teacher. Student D used to sit together with student C without touching his (D's) computer for a few short periods. He sometimes chatted with a classmate, who was the member of another group, on his right hand side. After that (42:30), student D sat together with student C without touch his (D's) own computer till the end of the lesson. They sometimes talked to each other and student C was in-charge-of operating the computer (C's). After the end of the lesson (since 1:10:21, also after school), they kept working together on C's computer for 13 more minutes.

Appendix 24d: Lesson Transcripts (Students' Physical Activities) of Five Case Groups in *WQ4*

As reported in Section 3.3.4.3, like *WQ3*, *WQ4* was assigned with one 70-minute lesson for its implementation. From **WQ4GaV**, **WQ4GbV**, **WQ4GcV**, **WQ4GdV3**, and **WQ4GeV3** (i.e. video clips of the five lessons for *WQ4*), it was found that the teacher employed the same strategy for delivering the WebQuest to the five groups of participants (i.e. G_a, G_b, G_c, G_d, and G_e) in the lessons.

0:00	12:12	At the beginning, the teacher mentioned about the last WebQuest to be done by the students for the subject. He also mentioned about the short-term WebQuest and reminded the students to make good use of the lesson time so as to complete the activity in time (within the lesson). Then, he stated again the grouping requirement and the way of submitting their learning products. After that, the teacher opened and showed the WebQuest page to the students using his computer, the projector and the screen. While the teacher illustrated the WebQuest activity to the students, all students sat in the middle of the computer room with no access to computers, and listened to the teacher. First, the teacher mentioned to the students the title of the WebQuest. Then, he discussed the contradiction implied in the title with the students. After that, he showed the students the *Introduction* section and talked about the background of the activity. In order to raise their interest, he also discussed three popular American fast food restaurants with the students followed by raising a question about the healthiness of American fast food. After that, the teacher showed the students the *Task* section and elaborated on the context of the task and the mission to be completed by the students. After that, he showed the students the *Process* section and discussed with them the two questions to be answered prior to collecting data and working on the report. Then, he mentioned the Web materials provided in the *Process* section for acquiring information about the two questions. After that, the teacher briefly talked about the major steps to be done by the students for completing their reports.

		After that, the teacher talked about how to gather the required data by demonstrating the usage of the Washington Post Fast Food Calorie Counter. He also reminded the students the importance of choosing comparable portion of food at different fast food restaurants for proper comparison. Then, he mentioned the need of graphs for data analysis. After that, the teacher explained to the students what they needed to do for the two questions at the bottom of the *Process* section one by one and reminded the students to make use of the data gathered for answering the questions. After that, the teacher mentioned the two support files that he had prepared for the students and, then, demonstrated how to use the support files (templates for spreadsheet and report) one by one. He also pointed out what the students had to pay attention to while using the two support files. After that, the teacher mentioned to the students the specific folders created for each group on the network drive and reminded the students to save their group work in the corresponding folders. After that, the teacher set goal for the lesson by reminding the students that they had to complete the WebQuest within the lesson. Then, all students moved to the computer workstations by following the seating arrangement for the previous lessons.

Target Group in G_a (*WQ4*)

12:13	1:16:59	The four students took the seats according to their previous grouping (i.e. grouping for the previous WebQuest). The two sitting closer to the camcorder belonged to one working group, while another two (far from the camcorder) belonged to another working group. Throughout the rest of the lesson, students A (the closest to the camcorder) and B mainly worked on their own computers. They sometimes talked to each other. Student B used to leave his seat and sat together with student A for a few short periods. Student B had a few short dialogues with the teacher. After the end of the lesson (since 1:07:08), they kept working on their own computers for 11 more minutes. For the first 11 minutes, students C and D (the farthest from the camcorder)

		worked on their own computers. They sometimes talked to each other. Student C used to leave his seat and helped a classmate, who was the member of another group, for a short while. Student C sometimes chatted with student B. After that (since 23:40), students C and D exchanged their computers (i.e. student C worked on D's computer, while student D worked on C's computer) for about 35 minutes. They often chatted with each other. They had a few short dialogues with the teacher. After that (since 58:47), student C sat together with student D without touching the computer till the end of the lesson. They often chatted with each other and student D was in-charge-of operating the computer (C's). After the end of the lesson (since 1:07:08), they kept working together on C's computer for 2 more minutes.

Target Group in G_b (*WQ4*)

12:18	1:08:49	The four students took the seats according to their previous grouping (i.e. grouping for the previous WebQuest). The two sitting closer to the camcorder belonged to one working group, while another two (far from the camcorder) belonged to another working group. Throughout the rest of the lesson, students A (the closest to the camcorder) and B worked on their own computers without leaving the seats. They sometimes talked to each other. Student B used to sit together with student A without touching her (A's) computer for a short while. They had a few short dialogues with the teacher. *Owing to a special school activity (fire drill), the lesson ended 10 minutes before the scheduled time.* For the first 37 minutes, students C and D (the farthest from the camcorder) worked on their own computers without leaving the seats. They sometimes talked to each other. They had a few short dialogues with the teacher. After that (since 49:16), student D sat together with student C and worked together on C's computer for about 9 minutes. They often chatted with each other and took turns to operate the computer (C's).

		After that (since 58:19), students C and D exchanged their computers (i.e. student C worked on D's computer, while student D worked on C's computer) till the end of the lesson. Student D used to leave her seat and talked to student A for a short while. *Owing to a special school activity (fire drill), the lesson ended 10 minutes before the scheduled time.*

Target Group in G_c (*WQ4*)

13:44	1:17:30	The four students took the seats according to their previous grouping (i.e. grouping for the previous WebQuest). The two sitting closer to the camcorder belonged to one working group, while another two (far from the camcorder) belonged to another working group. For the first 35 minutes, students A (the closest to the camcorder) and B worked on their own computers without leaving the seats. They sometimes talked to each other. They had a few short dialogues with the teacher. Student B sometimes talked to students C and D. After that (since 48:13), students A and B exchanged their computers (i.e. student A worked on B's computer, while student B worked on A's computer) for about 24 minutes. They often talked to each other. Student A used to sit together with student B without touching the computer for a few short periods. Student B used to sit together with student A without touching the computer for a few short periods. Student B used to leave his seat and talked to students C and D for a short while. They had a few short dialogues with the teacher. After the end of the lesson (since 1:06:57), student B kept working on the computer for 5 more minutes, while student A kept working on the computer for 10 more minutes. After that (since 1:12:14), student B left the computer room, while student A returned to and worked on his own (A's) computer till he left the computer room. For the first 40 minutes, students C and D (the farthest from the camcorder) worked on their own computers. They seldom talked to each other. Student D used to sit together with student C without touching her (D's) computer for a few short periods.

		After that (since 53:49), student D sat together with student C and worked together with student C on C's computer till the end of the lesson. They sometimes chatted with each other and took turns to operate the computer (C's). They had a few short dialogues with the teacher. After the end of the lesson (since 1:06:19), they kept working together on C's computer for 11 more minutes.

Target Group in G_d (*WQ4*)

13:25	1:14:14	The four students took the seats according to their previous grouping (i.e. grouping for the previous WebQuest). The two sitting closer to the camcorder belonged to one working group, while another two (far from the camcorder) belonged to another working group. For the first 43 minutes, students A (the closest to the camcorder) and B mainly worked on their own computers. They often talked to each other. They had a few short dialogues with the teacher. A student from another group used to come to student A and talked to student A for a few times. Student A used to leave her seat and helped a classmate, who was the member of another group, for a few times. After that (since 56:48), student A sat together with student B and worked together on B's computer for about 11 minutes. They often talked to each other and took turns to operate the computer (B's). They sometimes talked to students C and D. Student B used to leave her seat and helped a classmate, who was the member of another group, for a short period. Two students from another group used to come to them and talked to them for a few times. After the end of the lesson (since 1:06:49), they kept working on the computers for 5 more minutes. After that (since 1:07:50), student A worked on B's computer, while student B worked on A's computer till they left the computer room. Student A often looked around without touching the computer. For the first 44 minutes, students C and D (the farthest from the camcorder) mainly worked on their own computers. They sometimes talked to each other. Student D used to work together with student C on C's computer for a few short periods. They had a few short dialogues with the teacher. After that (since 57:17), student C sat together with student D and worked

		together on D's computer till the end of the lesson. They often talked to each other and took turns to operate the computer (D's). They sometimes talked to students A and B. Student C used to return to and work on his own computer for a short while. Student C used to come to student B and watch student B's screen for a short while. After the end of the lesson (since 1:06:49), they kept working together on D's computer for 7 more minutes.

Target Group in G_e (*WQ4*)

17:47	1:52:38	The four students took the seats according to their previous grouping (i.e. grouping for the previous WebQuest). The two sitting closer to the camcorder belonged to one working group, while another two (far from the camcorder) belonged to another working group. For the first 30 minutes, students A (the closest to the camcorder) and B mainly worked on their own computers. They often talked to each other. They had a few short dialogues with the teacher. Student A used to sit together with student B without touching her (A's) computer for a few short periods. Student B used to sit together with student A without touching her (B's) computer for a few short periods. Student B sometimes talked to student C. After that (since 48:18), students A and B exchanged their computers (i.e. student A worked on B's computer, while student B worked on A's computer) for about 18 minutes. They often talked to each other. After that (since 1:06:58), student B sat together with student A and worked together on B's computer for about 3 minutes. They often chatted with each other and took turns to operate the computer (B's). After that (since 1:09:34), students A and B returned to and worked on their own computers for about 9 minutes. Student B often sat together with student A without touching her own (B's) computer. After the end of the lesson (since 1:11:19, also after school), they kept working on the computers for 41 more minutes. After that (since 1:18:26), student B mainly sat together with student A and worked together on A's computer till they left the computer room. They sometimes chatted with each other and took turns to operate the computer (A's). They had a few short dialogues with the teacher. Student B often left her seat and stayed around student A.

		Throughout the rest of the lesson, students C and D (the farthest from the camcorder) mainly worked on their own computers. They sometimes talked to each other. They used to exchange their computers for a short while. Student C sometimes talked to student B. He had a few short dialogues with the teacher. Student D used to sit together with student C without touching his (D's) computer for a few short periods. He sometimes chatted with a classmate, who was the member of another group, on his right hand side. After the end of the lesson (since 1:11:19, also after school), they kept working on their computers for 14 more minutes. For the last few minutes, student D mainly sat together with student C without touch his (D's) own computer.

Appendix 25a: Lesson Transcripts (Students' Screen Activities) of Five Case Groups in *WQ1*

Video Clip: **WQ1GaS1** – Target Group in G_a (*WQ1* Lesson 1)

The students first opened the WebQuest page followed by clicking into the *Task* section and the *Process* section. Student B also clicked into the *Evaluation* section and the *Conclusion* section. The students copied the corresponding support files (templates) from the S: drive to their H: drives. Before individual inquiry, student C visited a Web discussion forum and looked around in the forum for a few minutes. During the inquiry process, students A, C and D visited the Web discussion forum from time to time.

Student B used to search for information about the effects of global warming at Wikipedia and copied the information found from Wikipedia for two guiding questions in his research report. Student B also searched for useful pictures at Yahoo and Google and copied the pictures into his report. Student B often checked for the meaning of some English words found at different Websites using the Yahoo Dictionary.

Student A used to search for information about greenhouse effect at Wikipedia and copied the information found from Wikipedia for two guiding questions in his research report.

Students C and D browsed the pre-selected Web materials only to look for information for the guiding questions.

Once any useful or related information were found at Websites, the students copied the information (relevant text or paragraphs, pictures, or tables) from the Websites and pasted them directly to their reports in the boxes under the corresponding guiding questions.

The students could all locate relevant and appropriate information from different Websites for the corresponding guiding questions in their research reports. They could complete their research reports about ten minutes before the end of the lesson. All of them visited the discussion forum after submitting their reports to eClass.

Video Clip: **WQ1GbS1** – Target Group in G_b (*WQ1* Lesson 1)

The students first opened the WebQuest page followed by clicking directly into the *Process* section without checking other sections. The students copied the corresponding support files (templates) from the S: drive to their H: drives. The students could all focus on the task without visiting any Websites, which were not related to the task.

Student A used to search for information about greenhouse effect at Yahoo but didn't put the information in her report.

Student B used to search for information about the effects of global warming at Wikipedia and copied the information found from Wikipedia for two guiding questions in her research report. Student B often checked for the meaning of some English words found at different Websites using the Yahoo Dictionary.

Student A used to search for information about greenhouse effect at Wikipedia and copied the information found from Wikipedia for two guiding questions in her research report.

Students C and D browsed the pre-selected Web materials only to look for information for the guiding questions.

Once any useful or related information were found at Websites, the students copied the information (relevant text or paragraphs, pictures, or tables) from the Websites and pasted them directly to their reports in the boxes under the corresponding guiding questions. Student C used to search for information at the Chinese version of Wikipedia. She then translated the information (in Chinese) found into English using the Yahoo dictionary and typed the translated information (in English) into her report.

The students could all locate relevant and appropriate information from different Websites for the corresponding guiding questions in their research reports. They could complete their research reports a few minutes before the end of the lesson.

Video Clip: **WQ1GcS1** – Target Group in G_c (*WQ1* Lesson 1)

The students first opened the WebQuest page followed by clicking directly into the *Process* section without checking other sections. The students copied the corresponding support files (templates) from the S: drive to their H: drives. Student B visited some Websites about the latest computer hardware products from time to time. The other three students could focus on the task without visiting any Websites which were not related to the task.

Student D searched for information about the effects of global warming at Yahoo. She then translated the information (in Chinese) found by herself into English using the Yahoo dictionary and typed the translated information (in English) into her report for two guiding questions. She used the pre-selected Web materials to look for information for other guiding questions.

Students A, B and C browsed the pre-selected Web materials only to look for information for the guiding questions.

Once any useful or related information were found at Websites, the students copied the information (relevant text or paragraphs, pictures, or tables) from the Websites and pasted them directly to their reports in the boxes under the corresponding guiding questions.

Students A and B sometimes checked for the meaning of some English words found at different Websites using the Yahoo Dictionary. Student C sometimes used the Yahoo Dictionary to check for the English words of some Chinese terms.

The students could all locate relevant and appropriate information from different Websites for the corresponding guiding questions in their research reports. They could complete their research reports a few minutes before the end of the lesson.

Video Clip: **WQ1GdS1** – Target Group in G_d (*WQ1* Lesson 1)

The students first opened the WebQuest page followed by clicking directly into the *Process* section without checking other sections. The students copied the corresponding support files (templates) from the S: drive to their H: drives. The students could all focus on the task without visiting any Websites which were not related to the task.

Students A and D sometimes checked for the meaning of some English words found at different Websites using the Yahoo Dictionary. Student B used to copy text (some paragraphs in English) from some Websites and translated them into Chinese using the Yahoo Translator for reading.

The students browsed the pre-selected Web materials only to look for information for the guiding questions.

Once any useful or related information were found at Websites, the students copied the information (relevant text or paragraphs, pictures, or tables) from the Websites and pasted them directly to their reports in the boxes under the corresponding guiding questions.

The students could all locate relevant and appropriate information from different Websites for the corresponding guiding questions in their research reports. Students A, C and D could complete their research reports a few minutes before the end of the lesson. Student B completed his report a few minutes after the end of the lesson.

Video Clip: **WQ1GeS1** – Target Group in G_e (*WQ1* Lesson 1)

The students first opened the WebQuest page followed by clicking directly into the *Process* section without checking other sections. The students copied the corresponding support files (templates) from the S: drive to their H: drives. The students could all focus on the task without visiting any Websites which were not related to the task.

Student B frequently checked for the meaning of some English words found at different Websites using the Yahoo Dictionary. Students A and D sometimes checked for the meaning of some English words found at different Websites using the Yahoo Dictionary.

Students B and D used to copy text (some paragraphs in English) from some Websites and translated them into Chinese using the Babel Fish Translator for reading.

Student A used to search for information about the climate of Hong Kong at Wikipedia and copied the information found from Wikipedia for a guiding question in her research report. Students B, C and D browsed the pre-selected Web materials only to look for information for the guiding questions.

Once any useful or related information were found at Websites, the students copied the information (relevant text or paragraphs, pictures, or tables) from the Websites and pasted them directly to their reports in the boxes under the corresponding guiding questions.

The students could all locate relevant and appropriate information from different Websites for the corresponding guiding questions in their research reports. They could complete their research reports a few minutes before the end of the lesson.

Video Clip: **WQ1GaS2** – Target Group in G_a (*WQ1* Lesson 2)

For the first 40 minutes, each student opened his research report using Word and the presentation template given by the teacher using PowerPoint. Each of them selected and copied some text from his research report and pasted the text on the corresponding slide of the presentation template according to his role. Upon completion of the corresponding slide, each of students A, C and D saved the PowerPoint document as a new file in their group folder, followed by closing the PowerPoint document. Student B kept working on the PowerPoint document after saving the file.

During the above period, students A and D visited a Web discussion forum (the one they visited in Lesson 1) from time to time. Student C used to install and play a computer game (Little Fighter) for about five minutes but failed to run the game. Student B used to visit the Web discussion forum for a few seconds. Besides working on the corresponding slide according to his role, student B made use of image processing software (PhotoImpact) to design a background image for the cover slide, and also completed the cover slide.

For the last 15 minutes, there was nearly no operations on the computer screens of students A, C and D. Student A sometimes visited a few Websites, which were not related to the WebQuest activities. Computer operations were mainly and only found on the screen of student B's computer. Those operations were mainly about:

1. copying the slides (for the findings by the other three consultants) from the PowerPoint documents saved by students A, C and D, and pasting the slides to the PowerPoint document being edited, and
2. typing and inserting graphics on three slides entitled "What is Global Warming", "Conclusion on Global Warming" and "Suggestions for Improvement".

Video Clip: **WQ1GbS2** – Target Group in G_b (*WQ1* Lesson 2)

For the first 45 minutes, each student opened her research report using Word and the presentation template given by the teacher using PowerPoint. Each of them selected and copied some text, pictures or figures from her research report and pasted the information on the corresponding slide of the presentation template according to her role, followed by organizing the text (in point form), pictures or figures on the slide. Upon completion of the corresponding slide, each of students A, B and D saved the PowerPoint document as a new file in their group folder, followed by closing the PowerPoint document. Student C kept working on the PowerPoint document after saving the file.

During the above period, student B completed the corresponding slide of her role in about 15 minutes. She surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity, for the remaining time. Student D kept working on the slide for the first 20 minutes. Then, she surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity, for 15 minutes. After that, she worked on the PowerPoint document again for the last 10 minutes. Student A completed the corresponding slide of her role in about 20 minutes. Then, she surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity, for about 5 minutes. After that, there was no operation on her screen. Student C completed the corresponding slide of her role in about 25 minutes. Then, she opened the PowerPoint documents saved by students A, B and D one by one. She copied the text and figures on the slides done by students A, B and D, and pasted them on the corresponding slides of the PowerPoint document that she had been editing, followed by formatting the text and figures on those slides.

For the last 15 minutes, there was nearly no operations on the computer screens of students A, B and D. Computer operations were mainly and only found on the screen of student C's computer. Those operations were mainly about copying some text from Wikipedia (with the theme Global Warming) and pasting the text to the PowerPoint slide entitled "Conclusion on Global Warming". By the end of the lesson (i.e. just before the students logged off the computers), the slides entitled "What is Global Warming" and "Suggestions for Improvement" were still empty.

Video Clip: **WQ1GcS2** – Target Group in G_c (*WQ1* Lesson 2)

For the first 25 minutes, student A opened her research report, and copied some key points and key sentences from her report and pasted the text in a new Word document. Student B revised his research report by formatting the text and figures in the report and looking for more information for the guiding questions from the Web materials given in the WebQuest page. Student C looked around on the network drives by clicking into different folders for checking. Student D created a new PowerPoint document by selecting from the built-in samples provided by PowerPoint. Then, she completed the cover slide and the content slide of the newly created document, and added subsequent slides based on the presentation template given by the teacher. After that, she copied some text from her research report and pasted the information on the corresponding slide according to her role, followed by saving the PowerPoint document as a new file in their group folder.

For the next 15 minutes, student A kept extracting some key points and key sentences from her report and putting the text in another Word document. Student B selected and copied some text and pictures from his research report and pasted the information on the corresponding slide of the PowerPoint document saved by student D according to his role, followed by organizing the text (in point form) and pictures on the slide. There was nearly no operation on the computer screen of student C for that period. Student D kept working on the PowerPoint document by searching some pictures related to Global Warming at Yahoo and inserting the pictures found into the PowerPoint document.

For the next 10 minutes, student A opened the PowerPoint document created by student D. She put the text that she had extracted into another Word document on the corresponding slide of the PowerPoint document according to her role, followed by organizing the text (in point form) on the slide. Students C and D searched some pictures related to Global Warming at Yahoo and saved the pictures found in their group folder. Student B surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity.

For the last 20 minutes, students A and D surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity, for a few minutes. Then, they logged off the computers. Student C kept searching for relevant pictures at Yahoo for 10 minutes. Then, he logged off the computer. The operations shown on the computer screen of student B were mainly about copying sentences, which was well organized in point form and stored in Notepad, from a plain text file and pasting the text on two slides entitled "Conclusion on Global Warming" and "Suggestions for Improvement" of the PowerPoint document, followed by organizing the text on the slides in bulletin form. By the end of the lesson (i.e. just before the student B logged off the computer), the slide entitled "What is Global Warming" was still empty.

Video Clip: **WQ1GdS2** – Target Group in G_d (*WQ1* Lesson 2)

For the first 15 minutes, students A and B opened their research reports using Word and the presentation template given by the teacher using PowerPoint. They selected and copied some text and pictures from their research reports and pasted the information on the corresponding slides of the presentation template according to their roles, followed by formatting the text on the slides. Student D searched for relevant pictures at Yahoo and saved the pictures found in their group folder. Student C opened the presentation template given by the teacher and completed the cover slide, followed by inserting the graphics found by student D into the slide as background. Students B, C and D visited an instant messaging website from time to time.

For the next 20 minutes, students A and B kept doing what they did in the previous 15 minutes. Students C and D opened their research reports using Word and the presentation template given by the teacher using PowerPoint. They selected and copied some text and pictures from their research reports and pasted the information on the corresponding slides of the presentation template according to their roles, followed by formatting the text on the slides. Student C used to use image processing software (PhotoImpact) to enhance some graphics saved in the group folder. Students B, C and D still visited the instant messaging website from time to time.

For the next 5 minutes, student B copied some text from Wikipedia (with the theme Global Warming) and pasted the text to the PowerPoint slide entitled "What is Global Warming", while students A, C and D kept working on the corresponding slides of their roles.

For the next 10 minutes, the operations shown on the screen of student A were about typing slowly on the slide entitled "Suggestions for Improvement", while the operations shown on the screen of student B were about typing slowly on the slide entitled "Conclusion on Global Warming". Student C revised the PowerPoint document by formatting the text and resizing the graphics, in a consistent style, on the slides about findings by the four consultants. Student D visited the instant messaging website for a few minutes. Then, there was no operation on his screen.

For the last 10 minutes, computer operations were mainly and only found on the screen of student C's computer. Those operations were mainly about:

1. going through the PowerPoint document slide by slide,
2. formatting the text and graphics on the slides for findings by the four consultants, and
3. revising the contents of three slides entitled "Conclusion on Global Warming", "Suggestions for Improvement" and "What is Global Warming".

Video Clip: **WQ1GeS2** – Target Group in G_e (*WQ1* Lesson 2)

For the first 25 minutes, each student opened his/her research report using Word and the presentation template given by the teacher using PowerPoint. Students C and D selected and copied some text from their research reports and pasted the text on the corresponding slides of the presentation template according to their roles. Students A and B switched between Word and PowerPoint from time to time and typed text slowly, in points, on the corresponding slides of the presentation template according to their roles.

For the next 10 minutes, student A kept doing what she did in the previous minutes by reading her research report and typing slowing on the corresponding slide of her role. Student B searched for some relevant pictures at Yahoo and inserted the pictures found onto the corresponding slide of her role. Students C and D kept doing what they did in the previous minutes. They also searched for extra information about Global Warming at Yahoo Knowledge. Student C did not use any information found at Yahoo Knowledge, while student D copied a few points found at Yahoo Knowledge and pasted the text to the corresponding slide of his role.

For the next 8 minutes, students A and D kept doing what they did in the past 10 minutes. Upon completion of the corresponding slide, student B saved the PowerPoint document as a new file in their group folder, followed by closing PowerPoint. She kept searching for pictures at Yahoo but did not use any pictures found. Student B worked on the slide entitled "What is Global Warming" by typing slowly, in points, on it.

For the next 10 minutes, student A kept reading her research report and typing slowly on the corresponding slide of her role. She also searched for relevant pictures at Yahoo and inserted the pictures found onto the PowerPoint slide. Student B kept searching for pictures at Yahoo for 5 minutes. Then, there was no operation on her screen. Student C worked on the slide entitled "Suggestions for Improvement" by typing slowly, in points, on it. There was nearly no operation on student D's screen.

For the next 5 minutes, computer operations were only found on the screen of student C's computer. Those operations were mainly about checking the PowerPoint document slide by slide.

For the last 20 minutes, computer operations were mainly and only found on the screen of student A's computer. Those operations were mainly about typing slowly, in points, on the slide entitled "Conclusion on Global Warming". Checking the English words of some Chinese terms using the Yahoo Dictionary was found on the screen for a few times. At the beginning of that period, student C used to visit a Web discussion forum for a few minutes.

Video Clip: **WQ1GaS3** – Target Group in G_a (*WQ1* Lesson 3)

For the first 3 minutes, the four students all visited a Web discussion forum (the one they visited in Lessons 1 & 2).

For the next 6 minutes, student B opened the PowerPoint document and formatted text and pictures on the slides. There was no operation on his screen from time to time. Students B, C and D kept visiting the Web discussion forum.

For the next 9 minutes, student B used image processing software (PhotoImpact) to create a title, with special text effect, for the cover slide of the PowerPoint document. Students C and D opened the PowerPoint documents and went through the slides one by one. In the meantime, they kept visiting the Web discussion forum. Student D used to insert a few pictures found at the Web discussion forum into some PowerPoint slides as background image. There was no operation on his screen from time to time. Student A looked like finding photos at a Website called "photobucket".

For the last 12 minutes, student B kept working on the PowerPoint document by editing the text and pictures on the slides and then testing the slideshow in full screen. Student A edited and modified his homepage. Students C and D kept visiting the Web discussion forum or surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity.

Video Clip: **WQ1GbS3** – Target Group in G_b (*WQ1* Lesson 3)

For the first 4 minutes, students A, B and C opened the PowerPoint documents. The operations shown on the screen of student A's computer were mainly about typing slowly on the slide entitled "What is Global Warming". Student B searched for information about solutions for global warming at Yahoo. Student C went through the PowerPoint slides one by one. Student D browsed the Web materials given in the WebQuest page for her role.

For the next 3 minutes, student B kept searching for information at Yahoo. Student A also searched for information about how to solve global warming at Yahoo. Student C went through the PowerPoint slides one by one. Student D kept reading the Web materials given in the WebQuest page for her role.

For the last 8 minutes, student C kept going through the PowerPoint slides one by one. Student D kept reading the Web materials given in the WebQuest page for her role. She often checked for the meaning of some English words using the Yahoo Dictionary followed by clicking the audio pronunciation for the words. There was no operation on student B's screen from time to time. She sometimes checked for the meaning of some English words using the Yahoo Dictionary followed by clicking the audio pronunciation for the words. The operations shown on the screen of student A's computer were mainly about typing slowly on the slide entitled "Suggestion for Improvement". For the last few minutes, student A went through the PowerPoint slides one by one.

Video Clip: **WQ1GcS3** – Target Group in G_c (*WQ1* Lesson 3)

For the first 5 minutes, students A, B and D opened the PowerPoint documents and went through the slides one by one. Student C read the pages about guillotine and the French revolution at Wikipedia.

Afterwards, students A and D kept going through the PowerPoint slides one by one. Student A checked for the meaning of quite a number of English words using the Yahoo Dictionary followed by clicking the audio pronunciation for the words. Student D sometimes checked for the meaning of some English words using the Yahoo Dictionary followed by clicking the audio pronunciation for the words. There was nearly no operation on student B's screen, except running the slideshow of the PowerPoint document slowly in full screen. Student C went through the PowerPoint slides one by one and sometimes made a few minor changes on the slides. He also visited a few Websites about guillotine.

Video Clip: **WQ1GdS3** – Target Group in G_d (*WQ1* Lesson 3)

For the first 4 minutes, there was nearly no operation on student A's screen. Student B opened the PowerPoint document and went through the slide one by one. Student C opened the PowerPoint document and went through the slide one by one. She sometimes made some minor changes on the slides, while there was no operation on student D's screen.

For the next 5 minutes, students A and B visited two different Web discussion forums. Student C kept going through the PowerPoint slides one by one. She sometimes checked for the meaning of some English words using the Yahoo Dictionary followed by clicking the audio pronunciation for the words. There was still no operations on student D's screen.

For the remaining time, the four students either visited Web discussion forums or surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity.

Video Clip: **WQ1GeS3** – Target Group in G_e (*WQ1* Lesson 3)

Students A, B and D did not log on the computers. There was no operation on their screen. The computer operations found on the screen of student C's computer were about:

1. running the slideshow of the PowerPoint document slowly in full screen,
2. checking for the meaning of some English words using the Yahoo Dictionary followed by clicking the audio pronunciation for the words, and
3. making a few minor changes on some slides.

Appendix 25b: Lesson Transcripts (Students' Screen Activities) of Five Case Groups in *WQ2*

Video Clip: **WQ2GaS1** – Target Group in G_a (*WQ2* Lesson 1)

The students first opened the WebQuest page followed by clicking directly into the *Process* section without checking other sections. The students copied the corresponding support files (templates) from the S: drive to their H: drives. During the inquiry process, students B and D visited a Web discussion forum for a few times. The other two could focus on the task without visiting any Websites, which were not related to the task.

Student A used to search for information about Visy at Yahoo but didn't use the information found for his research report. Student B used to search for information about which bag (paper or plastic) is more environmentally friendly at Yahoo Knowledge but didn't use the information found for his research report. Students B and C sometimes checked for the meaning of some English words found at different Websites using Dictionary.com.

Students C and D browsed the pre-selected Web materials only to look for information for the guiding questions.

Once any useful or related information were found at Websites, students A, C and D copied the information (relevant text or tables) from the Websites and pasted them directly to their reports in the boxes under the corresponding guiding questions. Student B did not use the copy-and-paste function. He typed slowly in the boxes under the guiding questions.

The students, except student A, could locate relevant and appropriate information from different Websites for the corresponding guiding questions in their research reports. Students A, B and C could complete their research reports about 15 minutes before the end of the lesson, while student D completed his research report just a few minutes before the end of the lesson. All of them visited a Web discussion forum (the one they visited in the previous lessons) after submitting their reports to eClass.

Video Clip: **WQ2GbS1** – Target Group in G_b (*WQ2* Lesson 1)

Students A, B and C first opened the WebQuest page followed by clicking directly into the *Process* section without checking other sections. Student D never opened the WebQuest page. The students copied the corresponding support files (templates) from the S: drive to their H: drives. During the inquiry process, student A sometimes visited Yahoo News and Xanga. The others could focus on the task without visiting any Websites, which were not related to the task.

Student B sometimes checked for the meaning of some English words found at different Websites using the Yahoo Dictionary.

The four students browsed the pre-selected Web materials only to look for information for the guiding questions.

Once any useful or related information were found at Websites, students A, B and D copied the information (relevant text) from the Websites and pasted it directly to their reports in the boxes under the corresponding guiding questions. Student C did not use the copy-and-paste function. She typed slowly in the boxes under the guiding questions.

The students, except student D, could locate relevant and appropriate information from different Websites for the corresponding guiding questions in their research reports. Student A could complete her research report about 10 minutes before the end of the lesson. She surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity, for the remaining time. The others completed their research reports a few minutes before the end of the lesson.

Video Clip: **WQ2GcS1** – Target Group in G_c (*WQ2* Lesson 1)

Students A, B and C first opened the WebQuest page followed by clicking directly into the *Process* section without checking other sections. Student D never opened the WebQuest page. The students copied the corresponding support files (templates) from the S: drive to their H: drives. During the inquiry process, student C visited Xanga from time to time. Student D also visited Xanga for a few times. The other two could focus on the task without visiting any Websites, which were not related to the task.

At the beginning, there was no operation on student C's screen for about 10 minutes.

Student A frequently checked for the meaning of some English words found at different Websites using the Yahoo Dictionary. Student B used to check the Wikipedia page about grocery store.

The four students browsed the pre-selected Web materials only to look for information for the guiding questions.

Once any useful or related information were found at Websites, students A, C and D copied the information (relevant text) from the Websites and pasted it directly to their reports in the boxes under the corresponding guiding questions. Student B did not use the copy-and-paste function. He typed slowly in the boxes under the guiding questions.

The students could all locate relevant and appropriate information from different Websites for the corresponding guiding questions in their research reports. Student D could complete her research report about 20 minutes before the end of the lesson. She visited Xanga for the remaining time. Students A and B could complete their research reports about 15 minutes before the end of the lesson. Student A visited Xanga and student B visited some Websites about the latest news of Microsoft Windows for the remaining time. Student C completed his research report just before the end of the lesson.

Video Clip: **WQ2GdS1** – Target Group in G_d (*WQ2* Lesson 1)

Students A, B and D first opened the WebQuest page followed by clicking directly into the *Process* section without checking other sections. Student C never opened the WebQuest page. The students copied the corresponding support files (templates) from the S: drive to their H: drives. Beginning from the middle of the lesson (after logging on the computers for about 28 minutes), students A and C visited an instant messaging website from time to time. The other two could focus on the task without visiting any Websites, which were not related to the task.

Student A sometimes checked for the meaning of some English words found at different Websites using the Yahoo Dictionary. Student C used an online translator (WorldLingo) to translate almost all the Websites, which were in English, given in the WebQuest page for his role into Chinese for reading. Student D also used the online translator (WorldLingo) to translate some Websites, in English, into Chinese for reading.

The four students browsed the pre-selected Web materials only to look for information for the guiding questions.

Once any useful or related information were found at Websites, student A copied the information (relevant text) from the Websites and pasted it directly to her report in the boxes under the corresponding guiding questions. Student B did not use the copy-and-paste function. She typed slowly in the boxes under the guiding questions. Students C and D used the copy-and-paste function to record the information (relevant text or figures) found from the Websites on their reports for two guiding questions. They typed slowly in the boxes under the other guiding questions.

The students could all locate relevant and appropriate information from different Websites for the corresponding guiding questions in their research reports. Student B could complete her research report about 12 minutes before the end of the lesson. She visited Yahoo Knowledge about using paper or plastic bags for the remaining time. Student D could complete his research report about 7 minutes before the end of the lesson. The, he logged of the computer. Students A and C completed their research reports a few minutes before the end of the lesson.

Video Clip: **WQ2GeS1** – Target Group in G_e (*WQ2* Lesson 1)

Students A, B and C first opened the WebQuest page followed by clicking directly into the *Process* section without checking other sections. Student D never opened the WebQuest page. The students copied the corresponding support files (templates) from the S: drive to their H: drives. During the inquiry process, student D visited a Web discussion forum for a few times. Student A used to read Yahoo News for a short period. The other two could focus on the task without visiting any Websites, which were not related to the task.

The four students sometimes checked for the meaning of some English words found at different Websites using the Yahoo Dictionary. Students C and D also used the Yahoo Dictionary to check the English words of some Chinese terms. Student D used to search for information about which bag (paper or plastic) is more environmentally friendly at Yahoo Knowledge but didn't use the information found for his research report.

Once any useful or related information were found at Websites, student A copied the information (relevant text) from the Websites and pasted it directly to her report in the boxes under the corresponding guiding questions. Students B, C and D used the copy-and-paste function to record the information (relevant text) found from the Websites on their reports for one or two guiding questions. They typed slowly in the boxes under the other guiding questions.

The students could all locate relevant and appropriate information from different Websites for the corresponding guiding questions in their research reports. Student C could complete his research report about 20 minutes before the end of the lesson. He visited a Web discussion forum for the remaining time. Students A, B and C completed their research reports a few minutes before the end of the lesson.

Video Clip: **WQ2GaS2** – Target Group in G_a (*WQ2* Lesson 2)

For the first 9 minutes, the four students opened their research reports using Microsoft Word. They sometimes visited a Web discussion forum (the one they visited in the previous lessons).

For the next 25 minutes, there was nearly no computer operation on the four screens. Occasionally, there were a few computer operations on individual screens. Those operations were mainly about:

1. scrolling up or down in Microsoft Word for looking at different pages of the research reports, and
2. checking the *Process* section of the WebQuest page.

For the next 10 minutes, student A mainly surfed on the Web by browsing various Websites, which were not related to the WebQuest activity. He sometimes switched to his report. There was nearly no computer operation on the screen of student B's computer. Occasionally, there were a few operations, on B's screen, about looking at the report or checking the *Process* section of the WebQuest page. Student C mainly looked at his report by scrolling up or down to different pages. Student D mainly worked on the PowerPoint document by typing slowly on the slides. He sometimes switched to his report for checking information.

For the last 20 minutes, there was nearly no operation on the computer screens of students A, B and C. Computer operations were mainly and only found on the screen of student D's computer. Those operations were mainly about:

1. typing slowly on different slides of the PowerPoint document,
2. checking the *Process* section of the WebQuest page,
3. checking the English words of a few Chinese terms using the Yahoo Dictionary, and
4. finding suitable pictures for the PowerPoint document at Yahoo and inserting some pictures to the PowerPoint document.

Video Clip: **WQ2GbS2** – Target Group in G_b (*WQ2* Lesson 2)

For the first 3 minutes, students B, C and D opened their research reports. Students A and D opened the WebQuest page and looked at the *Process* section.

For the next 32 minutes, there was almost no computer operation on the four screens. Occasionally, there were a few computer operations on individual screens. Those operations were mainly about:

1. scrolling up or down in Microsoft Word for looking at different pages of the research reports, and
2. checking the *Process* section of the WebQuest page.

For the rest of the time (about 25 minutes), student A extracted some key points from her report and put those key points in another Word document followed by saving the new Word document in their group folder. She then surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity, for the remaining time (about 20 minutes).

Student B worked on a PowerPoint document by reading her report and typing slowly on the slide entitled "The best reason for not using paper bags". She used to check the meaning of a few English words using the Yahoo Dictionary. Upon completion of the PowerPoint slide, she saved the PowerPoint document in their group folder. She then surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity, for the remaining time (about 18 minutes).

Student C worked on a PowerPoint document by reading her report and typing slowly on the slide entitled "The best reason for not using plastic bags". She used to read the *Process* section of the WebQuest page and also checked the English words of some Chinese terms. Upon completion of the PowerPoint slide, she saved the PowerPoint document in their group folder. She then surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity, for the remaining time (about 8 minutes).

Student D first read the *Process* section of the WebQuest page. Then, she created a new PowerPoint document followed by completing the cover slide. After that, she worked on the slide entitled "The best reason for using paper bags" by reading her report and typing slowly on the slide. After completing that slide, she copies the two PowerPoint slides done by students B and C, and put them into the PowerPoint document that she had been editing. After that, she worked the slide entitled "The best reason for using plastic bags" by copying the text in the Word document saved by student A and pasting the text on the slide. Lastly, she checked all the slides again by slightly formatting the text on each slide. By the end of the lesson (i.e. just before the students logged off the computers), the slide entitled "Our group's favorite choice" was still empty.

Video Clip: **WQ2GcS2** – Target Group in G_c (*WQ2* Lesson 2)

For the first 3 minutes, students A, B and C opened their research reports, while student D visited Xanga for a short while.

For the next 13 minutes, student B created a new PowerPoint document followed by completing the cover slide and the content slide. Student A kept reading her research report and, then, she browsed a Website (Visy) given in the WebQuest page for her role. Sometimes, there was no operation on her screen. Student C first checked his report and then he also browsed the Website of Visy given in the WebQuest page. There was almost no operation on student D's screen.

For the next 23 minutes, student A visited Xanga for the first 11 minutes. Then, she opened the PowerPoint document created by B and worked on the slide entitled "The best reason for using plastic bags" by copying some points from student C's report and pasting the points on the slide. Student B visited Xanga and an instant messaging website. For the last 6 minutes of that period, there was no operation on his screen. Students C and D visited Xanga and an instant messaging website, or surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity.

For the next 15 minutes, there was almost no computer operation on students B and D's screens. The computer operations found on student C's screen were mainly about browsing some Websites related to recycle bags, mainly "recyclebag.com.hk" and "recyclebag.net", and using the calculator for simple calculation. Student A kept working on the PowerPoint document by formatting the text on different slides.

For the rest of the time (about 18 minutes), there was almost no operation on student A's screen for the first few minutes. Then, she logged off the computer. Student B worked on two PowerPoint slides entitled "The best reason for using recycle bags" by typing slowly on the slides, and organizing and formatting the text on the slides. Student D searched for some Websites related to recycle bags at Yahoo. There was almost no operation on student C's screen. For the last few minutes in that period, student C also searched for some Websites related to recycle bags at Yahoo.

Video Clip: **WQ2GdS2** – Target Group in G_d (*WQ2* Lesson 2)

For the first 3 minutes, students A and C opened their research reports. Student B searched for some pictures related to paper bags and plastic bags at Yahoo. Student D created a new PowerPoint document but did nothing to it.

For the next 6 minutes, there was almost no operation on the four screens.

For the next 7 minutes, student A surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity, while student B visited a Web discussion forum. Student C opened the WebQuest page and checked the *Process* section. She used to visit an instant messaging website for a few times. Student D worked on two PowerPoint slides entitled "The benefits of using paper bags" and "The disadvantages of using paper bags" by typing slowly on the slides.

For the next 11 minutes, student A kept surfing freely on the Web. Student B kept visiting the Web discussion forum for the first 6 minutes. Then, he searched for some pictures related to recycling at Yahoo. Student C kept visiting the instant messaging website. There was a short period (about 2 minutes) with no operation on her screen. Student D kept working on the PowerPoint document by typing slowly on two slides entitled "The benefits of using plastic bags" and "The disadvantages of using plastic bags".

For the next 10 minutes, there was no operation on student A's screen. Student B kept searching for pictures related to environmental protection at Yahoo. There was nearly no operation on student C's screen. Student C sometimes visited the instant messaging website for a short while. Student D kept working on the slide entitled "The disadvantages of using plastic bags". After completing that slide, she inserted a new slide entitled "Our new ideas" and then typed slowly on the slide.

For the rest of the time (about 23 minutes), student A searched for information about recycle bags at Yahoo Knowledge. He also browsed the Website "recyclebag.net". He visited the instant messaging website from time to time. There were a few short periods of idling on his screen. Student B kept searching for pictures related to recycle bags at Yahoo. For the last 5 minutes, he visited the Web discussion forum again. Student C searched for information about recycle bags at Yahoo Knowledge. She also browsed the Websites "recyclebagfactory.com" and "recyclebag.net". She visited the instant messaging website from time to time. Student D first searched for information at Yahoo using the key words "what is recycle bag made of". Then, she clicked into 5 websites from the search results. She copied a few text from a Website found and pasted the text on the PowerPoint slide entitled "Our new ideas". Lastly, she typed slowly on a new slide entitled "The advantages of using recycle bags".

Video Clip: **WQ2GeS2** – Target Group in G_e (*WQ2* Lesson 2)

For the first 2 minutes, the four students visited the school discussion forum.

For the next 9 minutes, there was no operation on student D's screen. Students A and B opened their research reports and then there was no operation on their screens. Student C created a new PowerPoint document and then there was no operation on his screens.

For the next 7 minutes, students A, B and C visited a Web discussion forum. For last few minutes, there was nearly no operation on their screens. There was no operation on student D's screen for the whole period.

For the next 3 minutes, there was no operation on the four screens.

For the next 2 minutes, students A, B and C kept visiting the Web discussion forum while there was no operation on student D's screen.

For the next 4 minutes, there was no operation on the four screens.

For the next 9 minutes, student A worked on the cover slide of the PowerPoint document. She sometimes visited the Web discussion forum. Student B searched for some pictures related to plastic bags at Yahoo. There was nearly no operation on student C and D's screens.

For the next 3 minutes, student A kept working on the PowerPoint document. Student B opened the WebQuest page and checked the *Process* section. Student C searched for some pictures related to plastic bags at Yahoo. There was nearly no operation on student D's screens.

For the next 8 minutes, computer operations were mainly and only found on the screen of student A's computer. Those operations were mainly about:

1. copying text from a research report and pasting the text on a PowerPoint slide entitled "The best reason for using paper bags",
2. typing slowly on that PowerPoint slide, and
3. checking the English words of a few Chinese terms using the Yahoo Dictionary.

For the rest of the time (about 34 minutes), there was no operation on student D's screen. Student C typed slowly the disadvantages of using both paper and plastic bags, the disadvantages of using plastic bags, the advantages of using plastic bags, and the conclusion of their group on four different PowerPoint slides respectively. Then, he saved the PowerPoint document as a new file in their group folder followed by logging off the computer.

The computer operations found on student A's screen were about:

1. first keeping working on the slide entitled "The best reason for using paper bags",
2. then copying text from another research report and pasting the text on another PowerPoint slide entitled "The best reason not to use paper bags",
3. inserting the slides from the PowerPoint document saved by student C into the PowerPoint document being edited and formatting the text on three slides entitled "The best reason for using plastic bags", "The best reason not to use plastic bag", and "Our group's favorite choice",
4. checking the English words of a few Chinese terms using the Yahoo Dictionary, and
5. searching for some pictures related to paper bags, plastic bags and bamboo baskets at Yahoo, and inserting some pictures found into the PowerPoint document.

The computer operations found on student B's screen were about:

1. searching for information about plastic bags at Yahoo, and
2. copying text found at some Websites and pasting the text into a new Word document.

Then (after about 22 minutes), the Word document was saved in their group folder and the computer was logged off.

Video Clip: **WQ2GaS3** – Target Group in G_a (*WQ2* Lesson 3)

For the first 3 minutes, the four students opened the PowerPoint document and ran the slideshow slowly in full screen.

After that, students A, C and D visited a Web discussion forum (the one they visited in the previous lessons) until they logged off the computers. There were several short periods of idling on D's screen. Student B modified the PowerPoint document by formatting the text on different slides and changing the background images of some slides. He visited a Web discussion forum (the one being visited by students A, C and D) from time to time.

Video Clip: **WQ2GbS3** – Target Group in G_b (*WQ2* Lesson 3)

For the first 3 minutes, students A and B download a PowerPoint document from eClass and saved the PowerPoint document in their group folder. There was nearly no operation on student C's screen. Student D downloaded a file from her mailbox.

For the next 2 minutes, there was nearly no operation on student A's screen. There was still no operation on student C's screen. Student B opened the PowerPoint document and checked the slides one by one. Student D attempted to open the file she downloaded a few minutes ago but failed.

For the next 2 minutes, students A, C and D opened the PowerPoint document and checked the slides one by one. Student B kept checking the PowerPoint slides. She also opened the WebQuest page and clicked into the *Process* section.

For the next 1 minute, there was nearly no operation on students A, B and D's screens. Student C modified the PowerPoint document by formatting the text on one slide.

For the next 3 minutes, student A ran the slideshow of the PowerPoint document slowly in full screen. Student B first ran the slideshow of the PowerPoint document slowly in full screen. Then, she checked for the meaning of an English word using the Yahoo Dictionary followed by clicking the audio pronunciation for the word. There was nearly no operation on student C's screen. Student D first ran the slideshow of the PowerPoint document slowly in full screen. Then, she modified the PowerPoint document by formatting the text on one slide.

For the rest of the time (about 5 minutes), students A and C visited Xanga or surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity. Student B kept checking the pronunciation of some English words using the Yahoo Dictionary. She visited Xanga for the last few minutes. Student D kept formatting the text on a PowerPoint slide. After that, there was no operation on her screen.

Video Clip: **WQ2GcS3** – Target Group in G_c (*WQ2* Lesson 3)

For the first 3 minutes, there was nearly no operation on student B's screen. Students A and D opened the PowerPoint document and ran the slideshow slowly in full screen. Student C downloaded a PowerPoint document from his mailbox and saved the PowerPoint document in their group folder.

For the next 3 minutes, there was nearly no operation on student C's screen. Student A opened the PowerPoint document saved by student C and ran the slideshow slowly in full screen. Student B opened the PowerPoint document saved by student C and modified the document by formatting the text on the last few slides. Student D opened the PowerPoint document saved by student C. Then, there was no operation on her screen.

For the next 3 minutes, student A checked the PowerPoint slides one by one. Student B kept modifying the last few slides of the PowerPoint document by formatting the text and adding new text on the slides. Student C visited Xanga and student D surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity. Sometimes, there was no operation on their (C's and D's) screens.

For the rest of the time (about 3 minutes), there was no operation on student A's screen. Student B typed slowing on a PowerPoint slide entitled "Recycling a recycle bag". There was nearly no operation on student C's screen. Student D kept surfing freely on the Web.

Video Clip: **WQ2GdS3** – Target Group in G_d (*WQ2* Lesson 3)

There was no operation on student A's screen for the whole period.

For the first 3 minutes, student B opened the PowerPoint document and ran the slideshow slowly in full screen. Student C downloaded a PowerPoint document from his mailbox and saved the PowerPoint document in their group folder. Student D visited a Web discussion forum.

For the next 3 minutes, student B opened a Word document, which contained the presentation speech of all members, and made some changes to the content of the document followed by saving the document in their group folder. Student C opened the newly saved PowerPoint document and checked the slides one by one. Student D kept visiting the Web discussion forum. Then, he checked his email.

For the rest of the time (about 5 minutes), student B read Yahoo News and Xanga. Student C visited a Web discussion forum, while student D surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity.

Video Clip: **WQ2GeS3** – Target Group in G_e (*WQ2* Lesson 3)

There was no operation on student A's screen for the whole period.

For the first 4 minutes, student B opened the PowerPoint document and modified it by changing the background images of some slides and formatting the text on different slides. There was nearly no operation on students C and D's screens.

For the rest of the time (about 11 minutes), there was nearly no operation on students C and D's screens. The computer operations found on the screen of student B's computer were about:

4. running the slideshow of the PowerPoint document slowly in full screen,
5. formatting the text on some PowerPoint slides, and
6. checking all the PowerPoint slides one by one.

Appendix 25c: Lesson Transcripts (Students' Screen Activities) of Five Case Groups in *WQ3*

Video Clip: **WQ3GaS** – Target Group in G_a (*WQ3*)

For the first 18 minutes, both students A and B opened the WebQuest page. They clicked into the *Process* section and then clicked the link to the CIA database. Both of them also opened the spreadsheet template. Then, student A opened the page for Czech at the CIA database. Student B opened the page for Canada at the CIA database followed by entering the four data items for Canada into the spreadsheet. Then, he used the calculator to calculate the crowdedness and entered the result in the corresponding cell of the spreadsheet.

For the rest of the time, there was nearly no operation on student A's screen. Computer operations were mainly and only found on student B's screen. Those operations were about:

1. opening the page for Czech at the CIA database followed by entering the four data items for Canada into the spreadsheet,
2. checking the meaning of Czech using the Yahoo Dictionary,
3. using the calculator to calculate the crowdedness for Czech followed by entering the result in the corresponding cell of the spreadsheet,
4. opening the page for China at the CIA database followed by entering the four data items for China into the spreadsheet,
5. using the calculator to calculate the crowdedness for China followed by entering the result in the corresponding cell of the spreadsheet,
6. opening the page for Bahamas at the CIA database followed by entering the four data items for Bahamas into the spreadsheet,
7. using the calculator to calculate the crowdedness for Bahamas followed by entering the result in the corresponding cell of the spreadsheet,
8. copying the data table from the spreadsheet (Excel document) and pasting it in the report template (Word document),
9. making the graph for area in the spreadsheet followed by copying and pasting the graph to the report,
10. making the graph for population in the spreadsheet followed by copying and pasting the graph to the report,
11. making the graph for average life expectancy in the spreadsheet followed by copying and pasting the graph to the report,
12. making the graph for literacy rate in the spreadsheet followed by copying and pasting the graph to the report,
13. making the graph for crowdedness in the spreadsheet followed by copying and pasting the graph to the report,

14. typing the descriptions for the five graphs, in sequence, in the report, and
15. typing slowly in the boxes under the four questions for discussion in the report.

For the first 21 minutes, both students C and D opened the WebQuest page. They clicked into the *Process* section and then clicked the link to the CIA database. Both of them also opened the spreadsheet template.

Then, student C opened the page for Japan at the CIA database followed by entering the four data items for Japan into the spreadsheet. He also used the calculator to calculate the crowdedness and entered the result in the corresponding cell of the spreadsheet. At the same time, student D opened the page for Canada at the CIA database followed by entering the four data items for Canada into the spreadsheet. He also used the calculator to calculate the crowdedness and entered the result in the corresponding cell of the spreadsheet.

After that, student C opened the page for Japan at the CIA database again, while student D entered the four data items for Japan into the spreadsheet (the one student D had been editing) followed by using the calculator to calculate the crowdedness and entered the result in the corresponding cell of the spreadsheet.

After that, student C opened the page for China at the CIA database, while student D entered the four data items for China into the spreadsheet followed by using the calculator to calculate the crowdedness and entered the result in the corresponding cell of the spreadsheet.

After that, student C opened the page for Mexico at the CIA database, while student D entered the four data items for Mexico into the spreadsheet followed by using the calculator to calculate the crowdedness and entered the result in the corresponding cell of the spreadsheet.

After that, students C and D visited a Web discussion forum for about 2 minutes.

For the next 27 minutes, there was nearly no operation on student C's screen. Computer operations were mainly and only found on student D's screen. Those operations were about:

1. making the graph for area in the spreadsheet (Excel document) followed by copying and pasting the graph to the report template (Word document), and typing the description for Graph 1 in the report,
2. making the graph for population in the spreadsheet followed by copying and pasting the graph to the report, and typing the description for Graph 2 in the report,
3. copying the data table from the spreadsheet and pasting it in the report,
4. making the graph for average life expectancy in the spreadsheet followed by copying and pasting the graph to the report, and typing the description for Graph 4 in the report,
5. making the graph for crowdedness in the spreadsheet followed by copying and pasting the

graph to the report, and typing the description for Graph 3 in the report, and

6. making the graph for literacy rate in the spreadsheet followed by copying and pasting the graph to the report, and typing the description for Graph 5 in the report.

For the rest of the time, there was nearly no operation on student D's screen. Computer operations were mainly and only found on student C's screen. Those operations were about typing slowly in the boxes under the first two questions for discussion in the report. By the end of the lesson (i.e. just before the students logged off the computers), the two boxes under the last two questions for discussion were still empty.

Video Clip: **WQ3GbS** – Target Group in G_b (*WQ3*)

At the beginning, both students A and B opened the WebQuest page. They clicked into the *Process* section and then clicked the link to the CIA database. Both of them also opened the spreadsheet template but student A closed the spreadsheet shortly.

After that, student A opened the page for New Zealand at the CIA database, while student B entered the four data items for New Zealand into the spreadsheet. Student B attempted to use a formula in spreadsheet to calculate the crowdedness. She failed for the first few times due to incorrect syntax and succeeded after trying for a few times.

After that, student A opened the page for Canada at the CIA database, while student B entered the four data items for Canada into the spreadsheet followed by using a formula to calculate the crowdedness.

After that, student A opened the page for China at the CIA database, while student B entered the four data items for China into the spreadsheet followed by using a formula to calculate the crowdedness.

After that, student A opened the page for Dominican Republic at the CIA database, while student B entered the four data items for Dominican Republic into the spreadsheet followed by using a formula to calculate the crowdedness.

Then, student B saved the spreadsheet in their group folder and student A opened the newly saved spreadsheet followed by copying the data table from the spreadsheet (Excel document) to the report template (Word document). Student A made the graphs for area and population respectively in the spreadsheet followed by copying and pasting the graphs to the report, and typing the descriptions for the two graphs in the report. At the same time, student B made the graphs for average life expectancy, literacy rate, and crowdedness respectively in the spreadsheet followed by copying and pasting the graphs to the report, and typing the descriptions for the three graphs in the report. They sometimes referred to the sample graphs provided in the *Process* section of the WebQuest page.

Lastly, student A revised the report by formatting the text and resizing the graphs. At the same time, student B typed slowly in box under the first question for discussion in the report. By the end of the lesson (i.e. just before the students logged off the computers), the three boxes under the last three questions for discussion were still empty.

For the first 16 minutes, both students C and D opened the WebQuest page. They clicked into the *Process* section and then clicked the link to the CIA database. Both of them also opened the

spreadsheet template.

Then, student D opened the page for China at the CIA database followed by entering the four data items for China into the spreadsheet and using a formula in spreadsheet to calculate the crowdedness.

After that, student D opened the page for Mexico at the CIA database followed by entering the four data items for Mexico into the spreadsheet and using a formula to calculate the crowdedness.

After that, student D opened the page for the United States at the CIA database followed by entering the four data items for the United States into the spreadsheet and using a formula to calculate the crowdedness.

After that, student D opened the page for the United Kingdom at the CIA database followed by entering the four data items for the United Kingdom into the spreadsheet and using a formula to calculate the crowdedness.

While student D was looking for data and entering data into the spreadsheet, student C examined the CIA database by selecting different countries and checking the pages for the selected countries.

For the rest of the time, there was nearly no operation on student C's screen. Computer operations were mainly and only found on student D's screen. Those operations were about:

1. making the graph for area in the spreadsheet (Excel document) followed by copying and pasting the graph to the report template (Word document), and typing the description for Graph 1 in the report,
2. making the graph for population in the spreadsheet followed by copying and pasting the graph to the report, and typing the description for Graph 2 in the report,
3. making the graph for average life expectancy in the spreadsheet followed by copying and pasting the graph to the report, and typing the description for Graph 3 in the report,
4. making the graph for literacy rate in the spreadsheet followed by copying and pasting the graph to the report, and typing the description for Graph 4 in the report,
5. making the graph for crowdedness in the spreadsheet followed by copying and pasting the graph to the report, and typing the description for Graph 5 in the report,
6. copying the data table from the spreadsheet and pasting it in the report, and
7. typing slowly in the boxes under the four questions for discussion in the report.

Video Clip: **WQ3GcS** – Target Group in G_c (*WQ3*)

For the first 13 minutes, both students A and B opened the WebQuest page. They clicked into the *Process* section and then clicked the link to the CIA database. Student A also opened the spreadsheet template.

Then, student A opened the page for France at the CIA database followed by entering the four data items for France into the spreadsheet and using a formula in spreadsheet to calculate the crowdedness.

After that, student B opened the page for Egypt at the CIA database again, while student A entered the four data items for Egypt into the spreadsheet and used a formula to calculate the crowdedness.

After that, student A opened the page for China at the CIA database followed by entering the four data items for China into the spreadsheet and using a formula to calculate the crowdedness.

After that, student B opened the page for Dominican Republic at the CIA database again, while student A entered the four data items for Dominican Republic into the spreadsheet and used a formula to calculate the crowdedness.

For the next 33 minutes, there was nearly no operation on student B's screen. Computer operations were mainly and only found on student A's screen. Those operations were about:

1. copying the data table from the spreadsheet (Excel document) and pasting it in the report template (Word document),
2. making the graph for area in the spreadsheet followed by copying and pasting the graph to the report,
3. making the graph for population in the spreadsheet followed by copying and pasting the graph to the report,
4. making the graph for crowdedness in the spreadsheet followed by copying and pasting the graph to the report,
5. making the graph for average life expectancy in the spreadsheet followed by copying and pasting the graph to the report,
6. making the graph for literacy rate in the spreadsheet followed by copying and pasting the graph to the report, and
7. saving the spreadsheet and the report in their group folder.

For the rest of the time, the computer operations shown on student A's screen were about typing slowly in the boxes under the first two questions for discussion in the report, while those shown on student B's screen were about:

1. typing the descriptions for the five graphs, in sequence, in the report, and
2. typing slowly in the boxes under the last two questions for discussion in the report.

For the first 22 minutes, both students C and D opened the WebQuest page. They clicked into the *Process* section and then clicked the link to the CIA database. Student C also opened the spreadsheet template.

Then, student C opened the page for Germany at the CIA database followed by entering the four data items for Germany into the spreadsheet.

After that, student C opened the page for Japan at the CIA database followed by entering the four data items for Japan into the spreadsheet.

After that, student C opened the page for China at the CIA database followed by entering the four data items for China into the spreadsheet.

After that, student C opened the page for Mexico at the CIA database followed by entering the four data items for Mexico into the spreadsheet.

After that, student C used a formula in spreadsheet to calculate the crowdedness for each of the four countries.

While student C was looking for data and entering data into the spreadsheet, student D examined the CIA database by selecting the four countries chosen by student C and checking the pages for those countries. Student D also opened the spreadsheet being edited by student C.

After that, student C copied the data table from the spreadsheet (Excel document) and pasted it in the report template (Word document). Then, student C made the graphs for area, average life expectancy and literacy rate respectively in the spreadsheet followed by copying and pasting the graphs to the report. At the same time, student D made the graphs for population and crowdedness respectively in the spreadsheet followed by copying and pasting the graphs to the report.

For the rest of the time, there was nearly no operation on student D's screen. Computer operations were mainly and only found on student C's screen. Those operations were about:

1. typing the descriptions for the five graphs, in sequence, in the report, and
2. typing slowly in the boxes under the four questions for discussion in the report, and switching frequently between the spreadsheet and the report.

Video Clip: **WQ3GdS** – Target Group in G_d (*WQ3*)

For the first 12 minutes, both students A and B opened the WebQuest page. They clicked into the *Process* section and then clicked the link to the CIA database. Student B also opened the spreadsheet template.

Then, student A opened the page for Japan at the CIA database, while student B entered the four data items for Japan into the spreadsheet.

After that, student A opened the page for Korea at the CIA database, while student B entered the four data items for Korea into the spreadsheet.

After that, student A opened the page for China at the CIA database, while student B entered the four data items for China into the spreadsheet followed by using a formula in spreadsheet to calculate the crowdedness for each of the three countries.

After that, student A opened the page for Mexico at the CIA database, while student B entered the four data items for Mexico into the spreadsheet followed by using a formula to calculate the crowdedness.

For the next 20 minutes, student B made the graphs for area, population and average life expectancy respectively in the spreadsheet. At the same time, student A typed the descriptions for the five graphs, in sequence, in the report.

For the next 23 minutes, student A typed slowly in the boxes under the three questions (Q1, Q2 & Q4) for discussion in the report. At the same time, student B made the graphs for literacy rate and crowdedness respectively in the spreadsheet followed by typing slowly in the box under one question (Q3) for discussion in the report.

For the rest of the time, there was nearly no operation on student A's screen. Computer operations were mainly and only found on student B's screen. Those operations were about:

1. copying the data table from the spreadsheet (Excel document) and pasting it in the report (Word document),
2. copying the five graphs from the spreadsheet and pasting them in the report one by one, and
3. formatting the text and resizing the graphs in the report.

For the first 5 minutes, student C visited a Web discussion forum. Student D opened the WebQuest page. He clicked into the *Process* section and then clicked the link to the CIA database. He examined the CIA database by selecting different countries and checking the pages

for the selected countries.

For the next 10 minutes, student C opened the spreadsheet template. Then, student D opened the page for the United Kingdom at the CIA database, while student C entered the four data items for the United Kingdom into the spreadsheet followed by using a formula in spreadsheet to calculate the crowdedness.

After that, student D opened the page for Japan at the CIA database, while student C entered the four data items for Japan into the spreadsheet followed by using a formula to calculate the crowdedness.

After that, student D opened the page for China at the CIA database, while student C entered the four data items for China into the spreadsheet followed by using a formula to calculate the crowdedness.

After that, student D opened the page for Mexico at the CIA database, while student C entered the four data items for Mexico into the spreadsheet followed by using a formula to calculate the crowdedness.

During the above period, student C sometimes visited the Web discussion forum.

For the rest of the time, student C copied the data table from the spreadsheet (Excel document) and pasted it in the report template (Word document). He then made the five graphs in the spreadsheet followed by copying and pasting the graphs to the report. After that, he typed the descriptions for the five graphs, in sequence, in the report followed by typing slowly in the boxes under the last two questions for discussion in the report. He used to visit the Web discussion forum for about 10 minutes.

During that period, student D typed slowly in the boxes under the first two questions for discussion in the report. He also switched frequently between the spreadsheet and the report.

Video Clip: **WQ3GeS** – Target Group in G_e (*WQ3*)

For the first 20 minutes, both students A and B opened the WebQuest page. They clicked into the *Process* section and then clicked the link to the CIA database. Both of them also opened the spreadsheet template.

Then, student A opened the page for Canada at the CIA database, while student B entered the four data items for Canada into the spreadsheet.

After that, student B opened the page for the United Kingdom at the CIA database followed by entering the four data items for the United Kingdom into the spreadsheet. Then, she used a formula in spreadsheet to calculate the crowdedness for each of the two countries.

After that, student B opened the page for China at the CIA database. She entered the four data items for China into the spreadsheet followed by using a formula to calculate the crowdedness.

After that, both students A and B opened the page for Dominican Republic at the CIA database. Student B entered the four data items for Dominican Republic into the spreadsheet followed by using a formula to calculate the crowdedness.

For the next 17 minutes, there was nearly no operation on student A's screen. Student B made the five graphs in the spreadsheet followed by saving the spreadsheet in their group folder.

For the next 7 minutes, there was no operation on student B's screen. Student A copied the data table from the spreadsheet (Excel document) and pasting it in the report template (Word document). Then, she copied the five graphs from the spreadsheet and pasting them in the report one by one.

For the next 20 minutes, student A typed slowly in box under the first question for discussion in the report, while student B typed the descriptions for the five graphs, in sequence, in the report.

For the rest of the time, student A typed slowly in the boxes under the last two questions for discussion in the report, while student B typed slowly in the box under another question (Q2) for discussion in the report.

For the first 30 minutes, both students C and D opened the WebQuest page. They clicked into the *Process* section and then clicked the link to the CIA database. Both of them also opened the spreadsheet template.

Then, student D opened the page for Greece at the CIA database, while student C entered the

four data items for Greece into the spreadsheet.

After that, student D opened the page for the United States at the CIA database, while student C entered the four data items for the United States into the spreadsheet. Then, student C used a formula in spreadsheet to calculate the crowdedness for each of the two countries.

After that, student D opened the page for China at the CIA database, while student C entered the four data items for China into the spreadsheet followed by using a formula to calculate the crowdedness.

After that, both students C and D opened the page for Mexico at the CIA database. Student C entered the four data items for Mexico into the spreadsheet followed by using a formula to calculate the crowdedness.

After that, student C opened the spreadsheet template again and entered all the data items for the four countries again by reading the related pages at the CIA database. At the same time, student D tried to use the graphing function in the spreadsheet.

For the rest of the time, there was nearly no operation on student D's screen. Computer operations were mainly and only found on student C's screen. Those operations were about:

1. making the five graphs in the spreadsheet,
2. copying the data table from the spreadsheet (Excel document) and pasting it in the report template (Word document),
3. copying and pasting the graph for area to the report, and typing the description for Graph 1 in the report,
4. copying and pasting the graph for population to the report, and typing the description for Graph 2 in the report,
5. copying and pasting the graph for crowdedness to the report, and typing the description for Graph 3 in the report,
6. copying and pasting the graph for average life expectancy to the report, and typing the description for Graph 4 in the report,
7. copying and pasting the graph for literacy rate to the report, and typing the description for Graph 5 in the report, and
8. typing slowly in the boxes under the four questions for discussion in the report, and scrolling frequently to the pages containing the relevant graphs in the report.

Appendix 25d: Lesson Transcripts (Students' Screen Activities) of Five Case Groups in *WQ4*

Video Clip: **WQ4GaS** – Target Group in G_a (*WQ4*)

For the first 3 minutes, both students A and B opened the WebQuest page. They clicked into the *Process* section and then clicked the link to the Washington Post Fast Food Calorie Counter. Both of them also opened the spreadsheet template.

For the next 35 minutes, student A opened the report template followed by typing the names of the four selected fast food restaurants in the spreadsheet and the report. Then, for each of the chosen fast food restaurants, he selected a number of food items at the Washington Post Fast Food Calorie Counter followed by entering the names of the food items and their calories and grams of fat into the spreadsheet. After entering the data for each restaurant, he used a formula in spreadsheet to calculate the total calories and the total grams of fat of the food items from that restaurant. After that, he typed the total calories and the total grams of fat of each restaurant in the table at the bottom of the spreadsheet.

During the same period, student B answered the two questions at the beginning of the report by browsing the pre-selected Web materials. Once any useful or related information were found at Websites, he copied the information (relevant text) from the Websites and pasted it directly to the report in the boxes under the two questions. During the inquiry process, student B visited YouTube for a few times.

For the next 13 minutes, student A copied the five tables in the spreadsheet and pasted them to the report. Then, for each of the chosen restaurants, he made a graph showing the calories and grams of fat of each food item in the spreadsheet followed by copying and pasting the graph to the report. After that, he typed slowly in the box for conclusion.

During the same period, student B surfed freely on the Web by browsing various Websites, which were not related to the WebQuest activity.

For the rest of the time, student A typed slowly in the boxes under the two questions for discussion in the report, while student B kept surfing freely on the Web.

For the first 3 minutes, both students C and D opened the WebQuest page. They clicked into the *Process* section and then clicked the link to the Washington Post Fast Food Calorie Counter. Both of them also opened the spreadsheet template and the report template.

For the next 8 minutes, student C answered the first question at the beginning of the report by browsing the pre-selected Web materials, while student D answered the second question at the beginning of the report by browsing the pre-selected Web materials. Once any useful or related information were found at Websites, they copied the information (relevant text) from the Websites and pasted it directly to the report in the boxes under the corresponding questions. During the inquiry process, student D used to visit a Web discussion forum for a few times.

For the next 8 minutes, student C selected a number of food items from two fast food restaurants at the Washington Post Fast Food Calorie Counter followed by entering the names of the food items, their calories and grams of fat, and the total calories and the total grams of fat of the food items into the spreadsheet. During the same period, student D just checked various food items from different fast food restaurants at the Washington Post Fast Food Calorie Counter.

For the next 7 minutes, student D selected a number of food items from another two fast food restaurants at the Washington Post Fast Food Calorie Counter, while student C entered the names of the food items, their calories and grams of fat, and the total calories and the total grams of fat of the food items into the spreadsheet. After that, student C typed the total calories and the total grams of fat of each restaurant in the table at the bottom of the spreadsheet.

For the next 13 minutes, student C typed the names of the four selected fast food restaurants in the report followed by copying the five tables in the spreadsheet and pasting them to the report. After that, student C made two graphs showing the total calories and the total grams of fat of the four chosen restaurants respectively in the spreadsheet followed by copying and pasting the two graphs to the report. After that, he typed slowly in the box for conclusion. During the same period, student D typed slowly in the box under the first question for discussion in the report.

For the next 6 minutes, student C typed slowly in the box under the second question for discussion in the report. He often switched between the spreadsheet and the report. During the same period, student D kept typing slowly in the box under the first question for discussion in the report. He sometimes browsed the pre-selected Web materials for the two questions at the beginning of the *Process* section.

For the next 10 minutes, student C answered the first question at the beginning of the report again by typing slowly in the box under the question, while there was nearly no operation on student D's screen.

For the rest of the time, student D logged off the computer, while student C visited a Web discussion forum.

Video Clip: **WQ4GbS** – Target Group in G_b (*WQ4*)

For the first 2 minutes, both students A and B opened the WebQuest page. They clicked into the *Process* section and then clicked the link to the Washington Post Fast Food Calorie Counter.

For the next 19 minutes, student A opened the spreadsheet template, while student B opened the report template. Student A selected a number of food items from four fast food restaurants at the Washington Post Fast Food Calorie Counter followed by entering the names of the food items, their calories and grams of fat, and the total calories and the total grams of fat of the food items into the spreadsheet. After that, student A typed the total calories and the total grams of fat of each restaurant in the table at the bottom of the spreadsheet.

During the same period, student B answered the two questions at the beginning of the report by browsing the pre-selected Web materials and typing slowly in the boxes under the two questions. She often checked the meaning of some English words found in the Web materials using the Yahoo Dictionary.

For the next 10 minutes, student A made a graph showing the total calories and the total grams of fat of the four chosen restaurants in the spreadsheet followed by copying and pasting the five tables and the graph to the report. During the same period, student B kept answering the second question at the beginning of the report by browsing the pre-selected Web materials and typing slowly in the box under the question. She kept checking the meaning of some English words found in the Web materials using the Yahoo Dictionary.

For the next 13 minutes, student A typed slowly in the box for conclusion and in the box under the second question for discussion in the report, while student B typed slowly in the box under the first question for discussion in the report. Student B sometimes scrolled up to the previous pages of the report for reading the tables. She sometimes browsed the pre-selected Web materials for the two questions at the beginning of the *Process* section.

For the next 9 minutes, student B checked the report page by page followed by formatting the tables and text in the report and resizing the graph, while student A visited Xanga.

For the rest of the time, student A opened the report again and enriched the answer to the second question for discussion in the report by typing more text in the box under the question, while student B enriched the answer to the first question for discussion in the report by typing more text in the box under the question.

For the first 3 minutes, both students C and D opened the WebQuest page. Student C clicked into the *Process* section and then clicked the link to the Washington Post Fast Food Calorie Counter.

She also opened the report template. Student D opened the spreadsheet template.

For the next 26 minutes, student C first checked various food items from different fast food restaurants at the Washington Post Fast Food Calorie Counter. Then, she returned to the WebQuest page and clicked the link to the FastFood.com Calorie Guide. At the FastFood.com Calorie Guide, she clicked the links to four fast food restaurants one by one. On the page for each restaurant, she recorded the required date by entering the names, calories and grams of fat of some fast food items into the spreadsheet followed by using a formula in spreadsheet to calculate the total calories and the total grams of fat of the food items from that restaurant. After that, she typed the total calories and the total grams of fat of each restaurant in the table at the bottom of the spreadsheet. After that, student C made two graphs showing the total calories and the total grams of fat of the four chosen restaurants respectively in the spreadsheet followed by copying and pasting the five tables and the two graphs to the report.

During the same period, student D first searched for information at Yahoo using the key words "real burger world". After that, she browsed the Website "london-eating.co.uk", which was a search result from Yahoo, for a few minutes. Then, she answered the two questions at the beginning of the report by browsing the Website "london-eating.co.uk" together with the pre-selected Web materials and typing slowly in the boxes under the two questions. She often checked the meaning of some English words found in the Web materials using the Yahoo Dictionary.

For the next 18 minutes, there was nearly no operation on student D's screen. Computer operations were mainly and only found on student C's screen. Those operations were about:

1. typing slowly in the box for conclusion and frequently scrolling up and down in the Word document (the report) for reading the tables and typing in the box for conclusion,
2. typing slowly in the box under the first question for discussion in the report and sometimes browsing the pre-selected Web materials for the two questions at the beginning of the *Process* section, and
3. calculating, using a formula in spreadsheet, the average of the total calories of the four chosen restaurants and the average of the total grams of fat of the four chosen restaurants.

For the rest of the time, student D visited Yahoo News, while student C typed slowly in the box under the second question for discussion in the report. She often switched between the spreadsheet and the report.

Video Clip: **WQ4GcS** – Target Group in G_c (*WQ4*)

For the first 2 minutes, both students A and B opened the WebQuest page. Student B clicked into the *Process* section and then clicked the link to the Washington Post Fast Food Calorie Counter. He also opened the spreadsheet template. Student A opened the report template.

For the next 8 minutes, student A answered the two questions at the beginning of the report by browsing the pre-selected Web materials and typing slowly in the boxes under the two questions. During the same period, student B just checked various food items from different fast food restaurants at the Washington Post Fast Food Calorie Counter.

For the next 9 minutes, student B selected a number of food items from a fast food restaurant (Burger King) at the Washington Post Fast Food Calorie Counter followed by entering the names of the food items, their calories and grams of fat, and the total calories and the total grams of fat of the food items into the spreadsheet. After entering the data for the restaurant, he used a formula in spreadsheet to calculate the total calories and the total grams of fat of the food items from that restaurant.

During the same period, student A checked some food items from a fast food restaurant (Subway) at the Washington Post Fast Food Calorie Counter. He also visited the official Website of the fast food restaurant.

For the next 16 minutes, student A selected a number of food items from two fast food restaurants (Subway and McDonald's) at the Washington Post Fast Food Calorie Counter followed by entering the names of the food items, their calories and grams of fat, and the total calories and the total grams of fat of the food items into the spreadsheet. After entering the data for each restaurant, he used a formula in spreadsheet to calculate the total calories and the total grams of fat of the food items from that restaurant. He sometimes checked the meaning of some food items found at the two chosen restaurants using the Yahoo Dictionary and searched for the pictures of those food items at Yahoo.

During the same period, student B selected a number of food items from another fast food restaurant (KFC) at the Washington Post Fast Food Calorie Counter followed by entering the names of the food items, their calories and grams of fat, and the total calories and the total grams of fat of the food items into the spreadsheet. After entering the data for the restaurant, he used a formula in spreadsheet to calculate the total calories and the total grams of fat of the food items from that restaurant. After that, he copied the five tables in the spreadsheet and pasted them to the report.

For the next 11 minutes (A and B exchanged), student A formatted the tables and text in the report, while student B typed the total calories and the total grams of fat of each restaurant in the

table at the bottom of the spreadsheet. Student B also made two graphs showing the total calories and the total grams of fat of the four chosen restaurants respectively in the spreadsheet followed by copying and pasting the two graphs to the report. After that, student B typed slowly in the box for conclusion.

For the next 9 minutes (A and B exchanged), student A (B actually) typed again the total calories and the total grams of fat of each restaurant in the table at the bottom of the spreadsheet followed by copying and pasting the table to the report. Then, he typed slowly in the box under the second question for discussion in the report.

During the same period, student B (A actually) typed slowly in the box under the first question for discussion in the report. He sometimes scrolled up and down in the Word document (the report) for reading the tables and typing in the box under the first question for discussion.

For the rest of the time, student A enriched the answer to the first question for discussion in the report by typing more text in the box under the question, while student B launch a software development tool and attempted to design a simple computer program.

For the first 2 minutes, both students C and D opened the WebQuest page. They clicked into the *Process* section and then clicked the link to the Washington Post Fast Food Calorie Counter. Student C opened the spreadsheet template, while student D opened the report template.

For the next 38 minutes, student C selected a number of food items from four fast food restaurants at the Washington Post Fast Food Calorie Counter followed by entering the names of the food items, their calories and grams of fat, and the total calories and the total grams of fat of the food items into the spreadsheet. After that, student C typed the total calories and the total grams of fat of each restaurant in the table at the bottom of the spreadsheet. After that, student C made two graphs showing the total calories and the total grams of fat of the four chosen restaurants respectively in the spreadsheet.

During the same period, student D answered the two questions at the beginning of the report by browsing the pre-selected Web materials and typing slowly in the boxes under the two questions. She used to search for information at Yahoo using the phrases "what is meant by healthy fast food" and "what is healthy fast food" but did put any information found into the report. She also searched for information about healthy fast food at Yahoo Knowledge. During the inquiry process, student D used an online translator (Babel Fish Translator) to translate most of the pre-selected Web materials, which were in English, into Chinese for reading. While answering the second question, she often used the Yahoo Dictionary to check the English words of some Chinese terms. She also copied some information (relevant text) found at the given Websites and pasted it directly to the report in the box under the second question as part of the answer.

For the rest of the time, there was no operation on student D's screen. Computer operations were only found on student C's screen. Those operations were about:

1. copying the five tables and the two graphs in the spreadsheet and pasting them to the report,
2. typing slowly in the box for conclusion and sometimes scrolling up and down in the Word document (the report) for reading the tables and typing in the box for conclusion, and
3. typing slowly in the boxes under the two questions for discussion in the report and frequently scrolling up and down in the Word document (the report) for reading the tables and graphs and typing in the boxes under the questions.

Video Clip: **WQ4GdS** – Target Group in G_d (*WQ4*)

For the first 1 minute, both students A and B opened the WebQuest page. Student B clicked into the *Process* section and then clicked the link to the Washington Post Fast Food Calorie Counter, while student A opened the spreadsheet template.

For the next 23 minutes, student B selected a number of food items from four fast food restaurants at the Washington Post Fast Food Calorie Counter, while student A entered the names of the food items and their calories and grams of fat into the spreadsheet. After entering the data for the four restaurants, student A used a formula in spreadsheet to calculate the total calories and the total grams of fat of the food items from each restaurant. After that, student A typed the total calories and the total grams of fat of each restaurant in the table at the bottom of the spreadsheet, while student B typed the names of the four selected fast food restaurants in the report.

For the next 6 minutes, student A made two graphs showing the total calories and the total grams of fat of the four chosen restaurants respectively in the spreadsheet, while student B typed slowly in the box under the first question for discussion in the report.

For the next 13 minutes, student A answered the two questions at the beginning of the report by browsing the pre-selected Web materials and typing slowly in the boxes under the two questions, while student B copied the five tables and the two graphs in the spreadsheet and pasted them to the report followed by typing slowly in the box for conclusion with frequent switching between the spreadsheet and the report.

For the next 11 minutes, there was no operation on student A's screen. Computer operations were only found on student B's screen. Those operations were about typing slowly in the boxes under the two questions for discussion in the report and sometimes switching between the spreadsheet and the report.

For the rest of the time, student A browsed the pre-selected Web materials for the two questions at the beginning of the *Process* section, while student B revised the report by formatting the text and checking the grammar of the answer to the two questions for discussion.

For the first 26 minutes, student C opened the WebQuest page followed by clicking into the *Process* section and then clicking the link to the Washington Post Fast Food Calorie Counter, while student D opened the spreadsheet template. Then, student C selected a number of food items from four fast food restaurants at the Washington Post Fast Food Calorie Counter, while student D entered the names of the food items and their calories and grams of fat into the spreadsheet. After entering the data for each restaurant, student D used a formula in spreadsheet to calculate the total calories and the total grams of fat of the food items from that restaurant.

For the next 19 minutes, student C answered the two questions at the beginning of the report by browsing the pre-selected Web materials. Once any useful or related information were found at Websites, he copied the information (relevant text) from the Websites and pasted it directly to the report in the boxes under the two questions.

During the same period, student D typed the total calories and the total grams of fat of each restaurant in the table at the bottom of the spreadsheet. Then, he made a graph showing the total calories and the total grams of fat of the four chosen restaurants in the spreadsheet followed by copying and pasting the five tables and the graph to the report. After that, he typed slowly in the box for conclusion and in the box under the first question for discussion in the report. He frequently scrolled up and down in the Word document (the report) for reading the tables and graph and typing in the boxes.

For the rest of the time, there was nearly no operation on student C's screen. Computer operations were mainly and only found on student D's screen. Those operations were about:

1. typing slowly in the box under the second question for discussion in the report and sometimes switching between the spreadsheet and the report,
2. formatting the text in the box under the second question at the beginning of the report, and
3. enriching the answer to the second question at the beginning of the report by typing more text in the box under the question.

Video Clip: **WQ4GeS** – Target Group in G_e (*WQ4*)

For the first 60 minutes, student A opened the report template. She first searched for information at Yahoo Canada using the phrase "what is the meaning of healthy fast food" followed by clicking into and browsing the first 2 websites from the search results. She also visited the FastFood.com Calorie Guide through a website from her search results. After that, she searched again at Yahoo Canada using the same phrase followed by clicking into and browsing the third website from the search results. After that, she searched for information at Yahoo UK using the same phrase followed by opening a report (in PDF format) entitled "Are you paying more for 'healthy' fast food?" and reading the report page by page. After that, she answered the first question at the beginning of the report by typing slowly in the box under the question. After that, there was short period of idling on her screen. After that, she searched for information at Yahoo (HK) Knowledge using the same phrase. Then, she searched again at Yahoo (Canada) Knowledge using the same phrase. Then, she searched again at Yahoo (China) Knowledge using the same phrase. Then, she searched for information at Yahoo using the phrases "what is meant by healthy fast food", "the meaning of healthy fast food". After that, she answered the two questions at the beginning of the report by typing slowly in the boxes under the two questions and sometimes switching between the report and the PDF document found previously. After answering the two questions, she typed slowly in the boxes under the two questions for discussion in the report. For the last two minutes, she typed slowly in the box for conclusion.

During the same period, student B opened the WebQuest page followed by clicking into the *Process* section and then clicking the links to the Washington Post Fast Food Calorie Counter and the FastFood.com Calorie Guide. She also opened the spreadsheet template. Then, she either selected a number of food items from four fast food restaurants at the Washington Post Fast Food Calorie Counter or looked for the required data on the corresponding pages (pages for the four chosen restaurants) at the FastFood.com Calorie Guide followed by entering the names of the food items and their calories and grams of fat into the spreadsheet. After entering the data for each restaurant, she used a calculator to calculate the total calories and the total grams of fat of the food items from that restaurant followed by entering the results in the corresponding cells of the spreadsheet. She sometimes checked the meaning of some food items found at the chosen restaurants using the Yahoo Dictionary. After that, she typed the total calories and the total grams of fat of each restaurant in the table at the bottom of the spreadsheet and made a graph showing the total calories and the total grams of fat of the four chosen restaurants in the spreadsheet.

For the rest of the time, there was no operation on student B's screen. Computer operations were only found on student A's screen. Those operations were about:

1. keeping typing in the box for conclusion,
2. copying the graph and the five tables in the spreadsheet and pasting them to the report,
3. typing slowly in the boxes under the two questions for discussion in the report,

4. selecting a few food items from one fast food restaurant at the Washington Post Fast Food Calorie Counter followed by re-entering into the spreadsheet,
5. making again a graph showing the total calories and the total grams of fat of the four chosen restaurants in the spreadsheet,
6. copying the graph and one table in the spreadsheet and pasting them to the report, and
7. enriching the answers to the two questions for discussion in the report by typing more text in the boxes under the questions.

For the first 4 minutes, both students C and D opened the WebQuest page. Student C clicked into the *Process* section and then clicked the link to the Washington Post Fast Food Calorie Counter. He also opened the spreadsheet template. Student D opened the report template.

For the next 18 minutes, student C selected a number of food items from two fast food restaurants at the Washington Post Fast Food Calorie Counter followed by entering the names of the food items, their calories and grams of fat, and the total calories and the total grams of fat of the food items into the spreadsheet. During the same period, student D answered the two questions at the beginning of the report by typing slowly in the boxes under the two questions without browsing the pre-selected Web materials or any websites.

For the next 12 minutes, student C selected a number of food items from another two fast food restaurants at the Washington Post Fast Food Calorie Counter followed by entering the names of the food items, their calories and grams of fat, and the total calories and the total grams of fat of the food items into the spreadsheet, while student D also selected a number of food items from a fast food restaurant (one of the restaurants chosen by C) at the Washington Post Fast Food Calorie Counter followed by entering the names of the food items, their calories and grams of fat, and the total calories and the total grams of fat of the food items into the spreadsheet.

For the next 16 minutes, there was nearly no operation on student D's screen. Computer operations were mainly and only found on student C's screen. Those operations were about:

1. typing the total calories and the total grams of fat of each restaurant in the table at the bottom of the spreadsheet,
2. making a graph showing the total calories and the total grams of fat of the four chosen restaurants in the spreadsheet,
3. typing slowly in the boxes under the two questions at the beginning of the report,
4. recording again the grams of fat of one food item from one fast food restaurant at the Washington Post Fast Food Calorie Counter followed by re-entering the data into the spreadsheet and modifying the table at the bottom of the spreadsheet accordingly,
5. copying the five tables and the graph in the spreadsheet and pasting them to the report, and
6. typing slowly in the box for conclusion.

For the rest of the time, student C typed slowly in the boxes under the two questions for discussion in the report. He sometimes switched between the spreadsheet and the report. Student D visited some websites about online games for a few minutes and then logged off his computer.

Appendix 26a: Learning Product Completed by a Working Group during Trial Implementation of WQ1

About global warming and greenhouse effect

- By 3C(28)Action consultant
- 3C(32) Climate Consultant
- 3C(36) Emission Consultant
- 3C(38) Impact Consultant

Emission Consultant of Global Warming

Once upon a time, the Earth's climate changed naturally. Over the years, human activity has contributed to the changes in the Earth's climate through population growth, deforestation (砍伐森林), the burning of fossil fuels (化石燃料), and daily human activity. Exactly what are these gases doing to the Earth? Is this a serious problem? You will be the judge

Scientist:How is the Earth's atmosphere like a greenhouse (溫室)?

Most greenhouses look like a small glass house Greenhouses are used to grow plants, especially in the winter Greenhouses work by trapping heat from the sun The glass panels of the greenhouse let in light but keep heat from escaping This causes the greenhouse to heat up, much like the inside of a car parked in sunlight, and keeps the plants warm enough to live in the winter
The Earth's atmosphere is all around us It is the air that we breathe Greenhouse gases in the atmosphere behave much like the glass panes in a greenhouse

Student:What is the greenhouse effect (溫室效應)? And how does it contribute to global warming?

1)The greenhouse effect is the rise in temperature that the Earth experiences because certain gases in the atmosphere (water vapor, carbon dioxide, nitrous oxide and methane, for example) trap energy from the sun Without these gases, heat would escape back into space and Earth s average temperature would be about 60°F colder Because of how they warm our world, these gases are referred to as greenhouse

2)The greenhouse effect is important. Without the greenhouse effect, the Earth would not be warm enough for humans to live But if the greenhouse effect becomes stronger, it could make the Earth warmer than usual Even a little extra warming may cause problems for humans, plants, and animals gases

PS:Two examples of greenhouse gases are Carbon dioxide and Nitrous oxide

People:When do humans send greenhouse gases into the air?

Whenever you
Watch TV, Use the Air Conditioner, Turn on a Light, Use a Hair Dryer, Ride in a Car Play a Video Game, Listen to a Stereo,Wash or Dry Clothes, Use a Dish Washer and Microwave a Meal

To perform many of these functions, you need to use electricity. Electricity comes from power plants. Most power plants use coal and oil to make electricity. Burning coal and oil produces greenhouse gases

Knowledge

American:How many tons of greenhouse gases does each person emit in the United States each year?

Each person emit 5tons of greenhouse gases in the United States each year.

The End

Appendix 26a: Learning Product Completed by a Working Group during Trial Implementation of WQ1

Action Consultant

- The United States contains 4% of the worlds population, however, it is responsible for 22% of the world's greenhouse gas emissions. This means that she needs to take action to help reduce and hopefully stop global warming. Answer the questions below with help from the Internet links provided, in order to find out what can be done.

We know something needs to be done to stop global warming. Give an overview of what action is urgent.

- **Reduce' Reuse' Recycle'**
  Producing new paper glass and metal products from recycled materials saves 70 to 90 percent of the energy and pollution including CO_2 that would result if the product came from virgin materials Recycling a stack of newspapers only 4 feet high will save a good-sized tree Please buy recycled products'
- **Mount a local campaign against global warming**
  Educate your community about how it can cut global warming pollution Support measures at the national state and local level that
- Make automobiles go further on a gallon of gas
- Accelerate the use of clean renewable energy sources such as solar and wind
- Increase energy efficiency and conservation and
- Preserve forests around the world

- **Become a smart water consumer**
  Install low flow showerheads and faucets and you'll use half the water without decreasing performance. Then turn your hot water heater down to 120°F and see hot water costs go down by as much as 50 percent.
- **Buy energy-efficient electronics and appliances**
  Replacing an old refrigerator or an air conditioner with an energy-efficient model will save you money on your electricity bill and cut global warming pollution Look for the Energy Star label on new appliances or visit their website at www.energystar.gov to find the most energy-efficient products
- **Plant a Tree, protect a forest**
  Protecting forests is a big step on the road to curbing global warming, Trees "breathe in" carbon dioxide but slash and burn farming practices intensive livestock production, and logging have destroyed 90 percent of the native forests in the United States And you can take action in your own backyard — planting shade trees around your house will absorb CO_2 and slash your summer air-conditioning bills

Support clean, renewable energy
Renewable energy solutions, such as wind and solar power can reduce our reliance on coal-burning power plants, the largest source of global warming pollution in the United States Call your local utility and sign up for renewable energy if they don't offer it, ask them why not?

Also, support a national renewable electricity standard (RES) The Energy Bill signed in 2007 lacked key components that address our energy security and global warming emissions a renewable electricity standard of 15% by 2020 and a tax package that will provide investment incentives for clean energy alternatives Use our action center to urge your members of congress to support the renewable electricity standard and tax package!

Replace incandescent light bulbs with compact fluorescent bulbs
Especially those that burn the longest each day Compact fluorescents produce the same amount of light as normal bulbs but use about a quarter of the electricity and last ten times as long Each switch you make helps clean the air today curb global warming, and save you money on your electricity bill

Saving energy at home is good for the environment and for your wallet

There are lots of things we can do in our community to help reduce the pollution that cause global warming but there may be times we can make an even bigger impact How can politicians (政客) make a difference? What sorts of information do they need to know?

- **Working to cap U.S. emissions** WWF is working with other institutions to advance legislation that commits the United States to effective reductions in emissions, such as the Global Warming Pollution Reduction Act introduced by Senator Barbara Boxer (D Calif) This legislation would put the United States on a path to deliver greenhouse gas emission reductions in line with what the best scientific evidence suggests is necessary to prevent dangerous interference with the climate system
- **Shaping the emerging global carbon market** WWF is working to shape the international regulatory framework and standards for emerging global carbon markets Our goal is to ensure the emerging market for carbon emissions is structured in a way that will curb emissions while supporting biodiversity conservation and sustainable development.

Instead of continuing to burn fossil fuels (化石燃料) what are some clean energy alternatives? Explain why these forms of energy are more environmentally friendly

- They can use the nature power like solar power geothermal power & wind power and so on
- All of them can produce electricity to us and does not cause the air pollution

Appendix 26a: Learning Product Completed by a Working Group during Trial Implementation of WQ1

What are some things that you and your families can do around the house to use less energy and cause less pollution?

- **Choose clean energy**
  Where possible select a power plan that uses at least 50% clean energy. To see if it is available in your state, visit the Department of Energy. If not, send this card with your utility bill. 7,000 Pounds of CO2 Savings Per Year
- **Wash clothes in cold or warm water**
  Skip the hot water on 2 loads per week. You'll save energy and should have less wrinkled cloths.
  500 Pounds of CO2 Savings Per Year
- **Use compact fluorescent bulbs**
  It's a bright idea to replace 3 incandescent bulbs with fluorescent bulbs that last up to 10 times as long and use 1/4 of the energy.
  300 Pounds of CO2 Savings Per Year

Somehow we need to meet all of our energy needs without threatening our future. The "Earth Day Clean Energy Agenda" outlines some ways to "clean" up our environment. Describe the components of the agenda and how they will influence our future?

It is launching a global campaign to bring about a swift transition to clean, renewable energy sources and a giant leap forward in energy efficiency. We will have a clean and also renewable energy future.

What is climate?

Climate describes the total of all weather occurring over a period of years in a given place. This includes average weather conditions, regular weather sequences (like winter, spring, summer, and fall), and special weather events (like tornadoes and floods). Climate tells us what it's usually like in the place where you live. San Diego is known as having a mild climate, New Orleans a humid climate; Buffalo a snowy climate, and Seattle a rainy climate.

How are weather and climate similar or different?

- They are different.
- Weather describes whatever is happening outdoors in a given place at a given time. Weather is what happens from minute to minute. The weather can change a lot within a very short time.
- Weather is a part of climate. Climate has a lot of things included many things. This includes average weather conditions, regular weather sequences (like winter, spring, summer, and fall), and special weather events (like tornadoes and floods). Climate tells us what it's usually like in the place where you live. It can not change a lot within a very short time.

The climate where we live?

Hong Kong's climate is sub-tropical, tending towards temperate for nearly half the year. Severe weather phenomena that can affect Hong Kong include tropical cyclones, strong winter monsoon winds, and thunderstorms with associated squalls that are most frequent from April to September. Waterspouts and hailstorms occur infrequently, while snow and tornadoes are rare.

Is it possible that human activity is changing the climate? Did you find that your activities are contributing to these changes?

Yes.

Human activities can also change the climate. The atmospheric amounts of many greenhouse gases are increasing, especially that of carbon dioxide, which has increased by 30% over the last 200 years, primarily as a result of changes in land use (e.g., deforestation) and of burning coal, oil, and natural gas (e.g., in automobiles, factories, and electricity generation). If current trends in emissions were to continue, the amount of carbon dioxide in the atmosphere would double during the twenty-first century, with further increases thereafter. The amounts of several other greenhouse gases would increase substantially as well.

The accumulation of greenhouse gases in the atmosphere due to human activities will change the climate by enhancing the natural greenhouse effect, leading to an increase in the Earth's average surface temperature. This warming may be partially off-set in certain regions where air pollution leads to high concentrations of small particles in the atmosphere that block sunlight.

The current best estimate of the expected rise of globally averaged surface temperature relative to 1990 is 1 to 3.5°C (about 2 to 6°F) by the year 2100, with continued increases thereafter. Because most greenhouse gases remain in the atmosphere for a long period of time, even if emissions from human activities were to stop immediately, effects of accumulated past emissions would persist for centuries.

Appendix 26a: Learning Product Completed by a Working Group during Trial Implementation of WQ1

How do we know that the climate is changing? What changes have already happened to the environment?

- ***It includes that***

Climate change and human activities could cause natural disasters that have great and certain impacts on some area and especially some countries where their natural resources and economy are main dependent on agricultural production and its export.

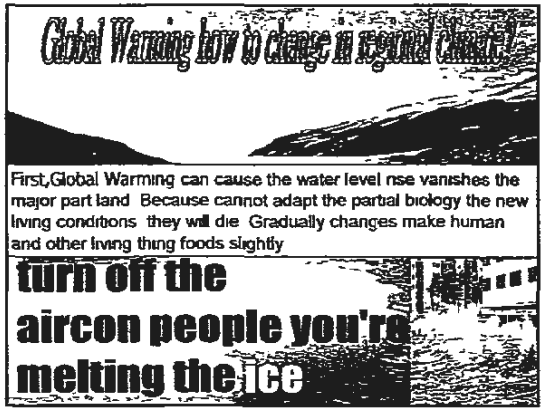
In East Pakistan, its economy much relies on cotton growing which shares more than 60% GDP and employment of the country, the country high alerts the problem of flood as due to too much rain and dry weather during cotton growing seasons from Apr to Sep. The dry weather and climate of part African countries that agricultural population is the way to develop and results in wide spread famines

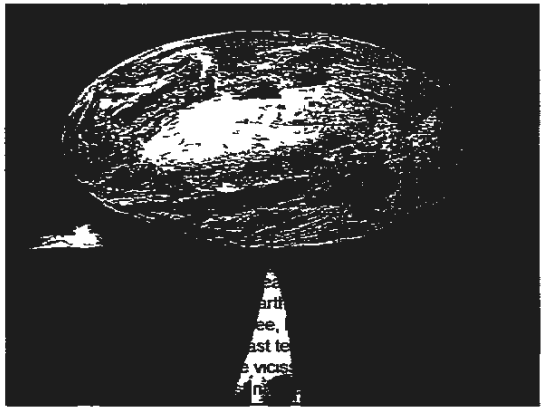
The Philippines, so called the Asian rich state, the country locates in hard climate and weather area where tropical cyclones are passing by and results in disaster in economic damages yearly

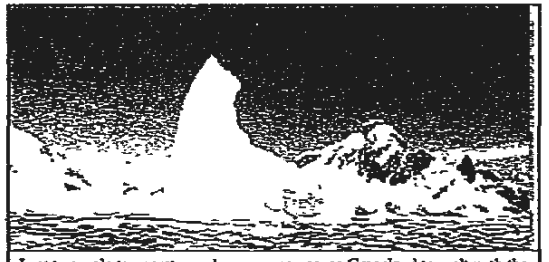
Extra heavy rainfalls result in flooding, thunderstorms, tornados and hurricanes destroy buildings, roads and the supply of electricity and the like, that all have harmful effects on economic development, therefore, natural disasters can also damage industrial production, governments need to resume the productions, recover and rebuild economy with lot of funding

Does Global Warming's impact serious?

The Earth's temperature has increased by almost 1 degree over the past century, and scientists predict that the climate may change between 2-6 more degrees over the next one hundred years. This does not sound like much of a change, but it is enough to change the Earth's climate like never before. When the climate changes, there may be significant impacts on the things that people depend on. As an impact consultant, research what changes in global climate mean for life on Earth.



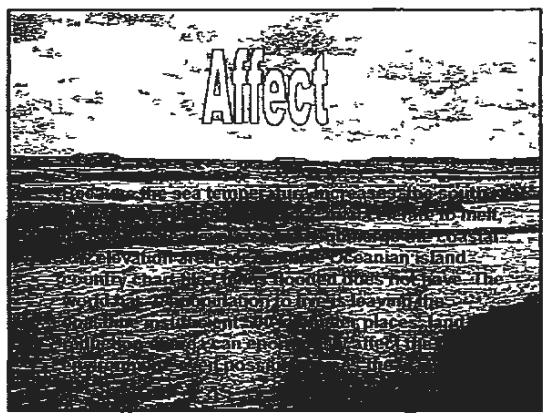


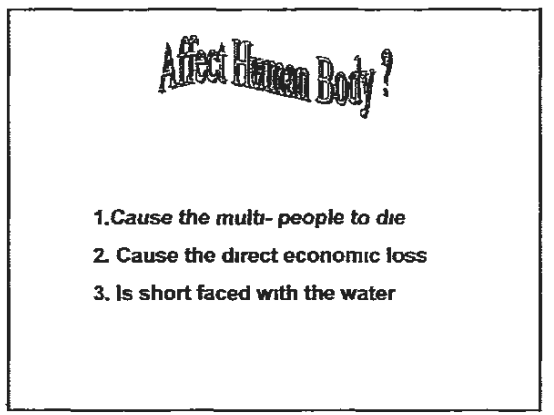

Last,two-pole temperature advancing, can cause Greenland to melt with the south polar ice hat, the sea level will possibly rise 0.2 to 1 4 meters, the land turns the boundless sea, many cities are submerged, live in the coastline 60 kilometer within inhabitant, will account for the world 1/3 population, will suffer its evil.

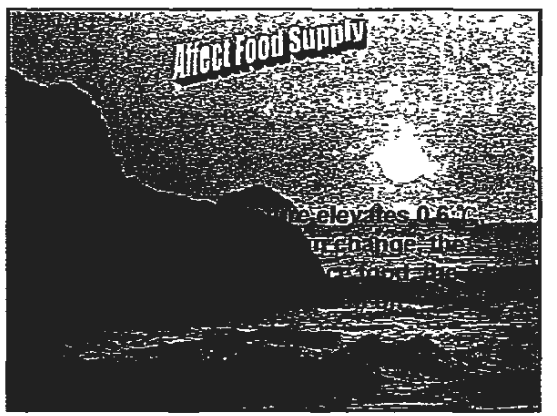
What will occur in weather patterns?

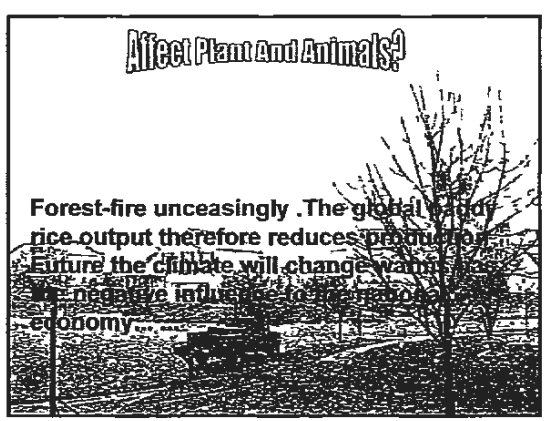
The global average surface temperature rose 0.6 in 20th century ℃. In the past in 12 years, some 11 years have been since 1850 have the global surface temperature instrument record in the warmest 12 years. In the past 50 years warm tendency (every 10 years 0.13 ℃) was past 100 years two times.

Appendix 26a. Learning Product Completed by a Working Group during Trial Implementation of WQ1

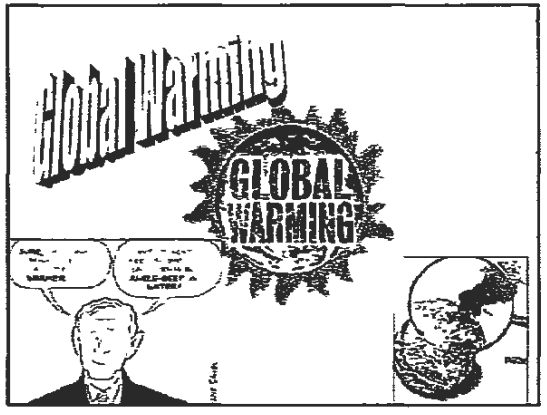








Appendix 26b: Learning Product Completed by a Working Group during Trial Implementation of WQ1



Climate Consultant

- Climate is the long-term average of a region's weather events lumped together.
- For example, it's possible that a winter day in Buffalo, New York, could be sunny and mild, but the average weather – the climate – tells us that Buffalo's winters will mainly be cold and include snow and rain.

- Weather describes whatever is happening outdoors in a given place at a given time. Weather is what happens from minute to minute. The weather can change a lot within a very short time.
- Climate describes the total of all weather occurring over a period of years in a given place. This includes average weather conditions, regular weather sequences (like winter, spring, summer, and fall), and special weather events (like tornadoes and floods).

•Describe Hong Kong's climate is cold in winter, sunny in summer , rainy in spring and windy in autumn

- It is possible that human activity is changing the climate because if we always have deforestsation , the trees cannot adsorb the carbon dioxide, then it adsorbs and stores heat in the atmosphere , the global temperatures increase and leads to global warming.
- Also, our activities are contributing to these changes such as using paper and buying hardwood furniture.

- The climate is changing by the temperature rise. Greenhouse effect and global warming have already happened to the environment

Impact Consultant

The global warming may cause many impacts It changes in temperature and climate affects the Earth and identify future impacts due to the damage caused by global warming

- Sea Level Higher temperatures are expected to further raise sea level by expanding ocean water melting mountain glaciers and small ice caps and causing portions of Greenland and the Antarctic ice sheets to melt.

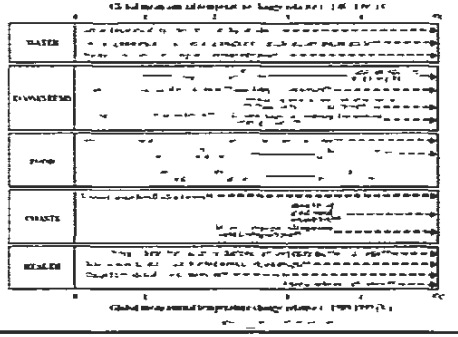
  Rising sea levels inundate wetlands and other low-lying lands erode beaches intensify flooding and increase the salinity of rivers bays and groundwater tables Some of these effects may be further compounded by other effects of a changing climate

Appendix 26b: Learning Product Completed by a Working Group during Trial Implementation of WQ1

plants and animals Significant extinctions around the globe Widespread coral mortality Ecosystem changes due to weakening of the meridional overturning circulation An ecosystem is an interdependent, functioning system of plants, animals and micro organisms An ecosystem can be as large as the Mojave Desert, or as small as a local pond Without the support of the other organisms within their own ecosystem, life forms would not survive, much less thrive Such support requires that predators and prey, fire and water, food and shelter, clean air and open space remain in balance with each other and with the environment around them

affect our food supply Agriculture is highly sensitive to climate variability and weather extremes, such as droughts, floods and severe storms The forces that shape our climate are also critical to farm productivity Human activity has already changed atmospheric characteristics such as temperature, rainfall levels of carbon dioxide (CO2) and ground level ozone. The scientific community expects such trends to continue While food production may benefit from a warmer climate, the increased potential for droughts floods and heat waves will pose challenges for farmers Additionally, the enduring changes in climate, water supply and soil moisture could make it less feasible to continue crop production in certain regions

- Air pollution harm to human health The extent and nature of climate change impacts on human health vary by region, by relative vulnerability of population groups, by the extent and duration of exposure to climate change itself and by society's ability to adapt to or cope with the change.



Emission Consultant

Human activity over the years and climate are affecting the Earth and identify future impacts due to the damage caused by global warming

- 5 tons of greenhouse gases that each person emits in the United States each year

-Greenhouse gases are created and emitted solely through human activities.

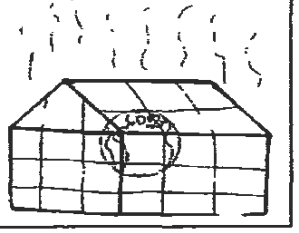
- **Carbon dioxide and nitrous oxide** are the examples of greenhouse gases

- **Human activities including the burning of fossil fuels, solid waste, trees and wood products, agricultural and industrial activities**

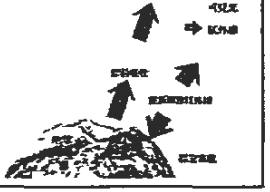
- Greenhouses work by trapping heat from the sun

-The glass panels of the greenhouse let in light but keep heat from escaping Thus causes the greenhouse to heat up

- Greenhouse gases in the atmosphere behave much like the glass panes in a greenhouse



- Sunlight enters the Earth's atmosphere, passing through the blanket of greenhouse gases
- As it reaches the Earth s surface , land, water, and biosphere absorb the sunlight's energy Once absorbed, this energy is sent back into the atmosphere
- Some of the energy passes back into space, but much of it remains trapped in the atmosphere by the greenhouse gases , causing our world to heat up



Appendix 26b: Learning Product Completed by a Working Group during Trial Implementation of WQ1

- The greenhouse effect is the rise in temperature that the Earth experiences because certain gases in the atmosphere trap energy from the sun
- Then the Earth become warmer and warmer It leads to global warming

CO^2 CO^2 CO^2 CO^2 CO^2 CO^2 CO^2 CO^2 CO^2 CO^2

Action Consultant

The United States contains 4% of the worlds population, however, it is responsible for 22% of the world's greenhouse gas emissions. This means that she needs to take action to help reduce and hopefully stop global warming.

CO^2 CO^2 CO^2 CO^2 CO^2 CO^2 CO^2 CO^2 CO^2 CO^2

What can we do??

Individuals

Support clean, renewable energy

(solar, wind, and other clean energy sources)

Reduce! Reuse! Recycle! →

(Recycle 50% of your glass, aluminum, plastic, cardboard, and newspapers. 2,000 Pounds of CO_2 Savings Per Year)

Wash clothes in cold or warm water

CO^2 CO^2 CO^2 CO^2 CO^2 CO^2 CO^2 CO^2 CO^2 CO^2

Plant a Tree, protect a forest

(Shading shade trees around your house will absorb CO_2, and shrink your summer air-conditioning bills.

Replace incandescent light bulbs with compact fluorescent bulbs.

(Each switch you make helps clean the air locally, curb global warming, and save you money on your electric

CO^2 CO^2 CO^2 CO^2 CO^2 CO^2 CO^2 CO^2 CO^2 CO^2

Replace a worn-out refrigerator with an Energy Star model

(The US would 20 more power plants if all Americans used the most efficient refrigerators. 1,000 Pounds of CO_2 Savings Per Year)

Turn your computer off overnight and put it into a power save mode

(A standard monitor left on overnight uses enough energy to print 3,500 copies. 500 Pounds of CO_2 Savings Per Year)

THX!!

3C NNN 8,10,18,20

Appendix 27: Coding Scheme of Students' Responses to Pre-test and Post-test Items

Students' responses and answers to all test items, except those for Task 2 and Task 3, in the collected test papers were coded and entered into two spreadsheets by the research assistant. Data from the collected pre-test papers were entered into one spreadsheet, while those from the collected post-test papers were entered into another spreadsheet.

There were 54 columns in the spreadsheet for the pre-test papers. Columns A and B were for class and class number respectively.

Columns C to G stored the five keywords (mainly in Chinese) jotted by students for the first given Website in Task 1, while columns H to L stored the five keywords (mainly in English) jotted by students for the second given Website in Task 2.

Columns M to AF stored students' responses to the twenty test items in Task 4, where the codes for "True", "Mostly True", "Cannot Decide", and "False" were 1, 2, 3, and 4 respectively.

Columns AG and AH stored students' first choice for "during the eruption" in Task 5 and its reason (in text). Columns AI and AJ stored students' second choice for "during the eruption" in Task 5 and its reason (in text). The codes for the eight choices (from up to down in the pre-test) for "during the eruption" in Task 5 were 1, 2, 3, 4, 5, 6, 7, and 8 respectively.

Columns AK and AL stored students' first choice for "after the eruption" in Task 5 and its reason (in text). Columns AM and AN stored students' second choice for "after the eruption" in Task 5 and its reason (in text). The codes for the eight choices (from up to down in the pre-test) for "after the eruption" in Task 5 were 1, 2, 3, 4, 5, 6, 7, and 8 respectively.

Columns AO and AP stored the two questions written by students for Question 6.1(a) in Task 6 (in text). Columns AQ to AS stored the three items of information given by students for Question 6.1(b) in Task 6 (in text). Columns AT to AV stored the three items of information given by students for Question 6.2 in Task 6 (in text). Columns AW to AY stored

the three viewpoints given by students for Question 6.3 in Task 6 (in text). Column AZ to BB stored the three kinds of experts given by students for Question 6.4 in Task 6 (in text).

There were 50 columns in the spreadsheet for the post-test papers. Columns A and B were for class and class number respectively.

Columns C to G stored the five keywords (mainly in Chinese) jotted by students for the first given Website in Task 1, while columns H to L stored the five keywords (mainly in English) jotted by students for the second given Website in Task 2.

Columns M to AF stored students' responses to the twenty test items in Task 4, where the codes for "True", "Mostly True", "Cannot Decide", and "False" were 1, 2, 3, and 4 respectively.

Columns AG and AH stored students' first choice in Task 5 and its reason (in text). Columns AI and AJ stored students' second choice in Task 5 and its reason (in text). The codes for the fourteen choices (from up to down in the post-test) in Task 5 were 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14 respectively.

Columns AK and AL stored the two questions written by students for Question 6.1(a) in Task 6 (in text). Columns AM to AO stored the three items of information given by students for Question 6.1(b) in Task 6 (in text). Columns AP to AR stored the three items of information given by students for Question 6.2 in Task 6 (in text). Columns AS to AU stored the three viewpoints given by students for Question 6.3 in Task 6 (in text). Column AV to AX stored the three kinds of experts given by students for Question 6.4 in Task 6 (in text).

Appendix 28: Numerical Results of Each Item in Both Pre-test and Post-test (Main Study)

This appendix presents the numerical results of the pre-test and the post-test, which include the scores obtained by G_a, G_b, G_c, G_d, and G_e in the main study and those obtained by the control group.

In the main study, there were 199 test papers collected. As reported in Chapter 5, one student in G_a quitted the case school in the middle of the WebQuests. As a result, there were 100 pre-test papers and 99 post-test papers completed by the students. To facilitate the comparison of the pre-test and post-test results, data collected from the pre-test paper completed by the student who quitted the school in the middle of the WebQuests was ignored. Therefore, there were 99 pre-test papers and 99 post-test papers involved in the main study, together with 40 pre-test papers and 40 post-test papers completed by the control group, for analysis.

Descriptive Statistics

The table below presents the descriptive statistics of each task in the pre-test and the post-test, completed by the participants of the main study. The results also include the scores of the items in each task.

Pre-test	N	Min	Max	Mean	Std D	Post-test	N	Min	Max	Mean	Std D
Task 1 (Score 1)	99	0	3 5	1 556	9310	Task 1 (Score 1)	99	5	4 5	2 121	9370
Task 1 (Score 2)	99	0	3 5	1 045	9532	Task 1 (Score 2)	99	0	5	2 16	999
Task1 (Total)	99	0	7	2 60	1 537	Task 1 (Total)	99	5	7 5	4 278	1 5105
Task 2 (Score 1)	99	1	4	2 62	829	Task 2 (Score 1)	99	1	4	2 84	666
Task 2 (Score 2)	99	1	4	2 27	682	Task 2 (Score 2)	99	1	4	2 77	740
Task 2 (Total)	99	2	8	4 89	1 115	Task 2 (Total)	99	3	8	5 61	1 150
Task 3 (Score 1)	99	0	4	2 03	801	Task 3 (Score 1)	99	1	4	2 26	723
Task 3 (Score 2)	99	0	4	2 43	745	Task 3 (Score 2)	99	1	4	2 72	590
Task 3 (Total)	99	0	8	4 46	1 416	Task 3 (Total)	99	2	8	4 98	1 186
Task 4 (Total)	99	4	16	10 91	2 458	Task 4 (Total)	99	6	16	11 51	2 106
Task 5 (Score 1)	99	3	2 0	1 396	4345	Task 5 (Score 1)	99	0	2 0	1 237	4966
Task 5 (Score 2)	99	0	2 0	1 394	5152	Task 5 (Score 2)	99	0	2	1 16	710
Task 5 (Total)	99	1	4	2 79	877	Task 5 (Total)	99	0	4 0	2 399	1 1111
Task 6 Q6 1 (a)	99	0	2	53	456	Task 6 Q6 1 (a)	99	0	2	77	531
Task 6 Q6 1 (b)	99	0	3	49	534	Task 6 Q6 1 (b)	99	0	2 0	505	6488
Task 6 Q6 2	99	0	2 5	500	6814	Task 6 Q6 2	99	0	3	76	790
Task 6 Q6 3	99	0	3	1 28	907	Task 6 Q6 3	99	0	3	1 43	619
Task 6 Q6 4	99	0	3	1 72	937	Task 6 Q6 4	99	0	3	2 29	693
Task 6 (Total)	99	0	9 0	4 525	2 0571	Task 6 (Total)	99	5	9 5	5 753	1 4715
Total	99	16 0	39 0	30 179	4 6453	Total	99	26 0	43 5	34 520	4 0120

Table 28 1a Descriptive Statistics of the Six Tasks in Pre-test and Post-test (Main Participants)

The table below presents the descriptive statistics of each task in the pre-test and the post-test, completed by the control group of the main study. The results also include the scores of the items in each task.

Pre-test (Control Group)	N	Min	Max	Mean	Std D	Post-test (Control Group)	N	Min	Max	Mean	Std D
Task 1 (Score 1)	40	0	3 5	1 750	9058	Task 1 (Score 1)	40	0	4 0	2 163	9015
Task 1 (Score 2)	40	0	3 5	750	8397	Task 1 (Score 2)	40	0	4	2 08	1 147
Task1 (Total)	40	0	7	2 50	1 476	Task 1 (Total)	40	5	7 0	4 238	1 6172
Task 2 (Score 1)	40	0	4	2 45	846	Task 2 (Score 1)	40	1	4	2 63	628
Task 2 (Score 2)	40	0	4	2 28	847	Task 2 (Score 2)	40	1	4	2 30	791
Task 2 (Total)	40	0	7	4 73	1 219	Task 2 (Total)	40	3	8	4 93	1 141
Task 3 (Score 1)	40	1	4	1 95	677	Task 3 (Score 1)	40	1	3	1 93	616
Task 3 (Score 2)	40	1	4	2 40	672	Task 3 (Score 2)	40	1	3	2 40	591
Task 3 (Total)	40	2	8	4 35	1 210	Task 3 (Total)	40	2	6	4 33	1 095
Task 4 (Total)	40	5	15	10 40	2 447	Task 4 (Total)	40	6	14	10 48	1 935
Task 5 (Score 1)	40	0	2 0	1 250	5489	Task 5 (Score 1)	40	0	2 0	1 238	5309
Task 5 (Score 2)	40	0	2 0	1 263	6252	Task 5 (Score 2)	40	0	2	1 19	757
Task 5 (Total)	40	0	4	2 51	1 127	Task 5 (Total)	40	0	4 0	2 425	1 1240
Task 6 Q6 1 (a)	40	0	1	43	446	Task 6 Q6 1 (a)	40	0	2	43	488
Task 6 Q6 1 (b)	40	0	2	58	513	Task 6 Q6 1 (b)	40	0	1 0	288	3904
Task 6 Q6 2	40	0	2 0	450	6485	Task 6 Q6 2	40	0	2	43	526
Task 6 Q6 3	40	0	3	1 24	884	Task 6 Q6 3	40	0	2	99	460
Task 6 Q6 4	40	0	2	1 30	714	Task 6 Q6 4	40	0	3	1 51	780
Task 6 (Total)	40	0	7 5	3 988	1 8622	Task 6 (Total)	40	0	6 0	3 638	1 4805
Total	40	19 0	39 0	28 475	5 1831	Total	40	21 0	35 5	30 025	3 6479

Table 28 1b Descriptive Statistics of the Six Tasks in Pre-test and Post-test (Control Group)

Distribution of Scores of Each Task in Pre-test and Post-test

The six figures below present the distribution of the scores of the six tasks in the pre-test respectively.

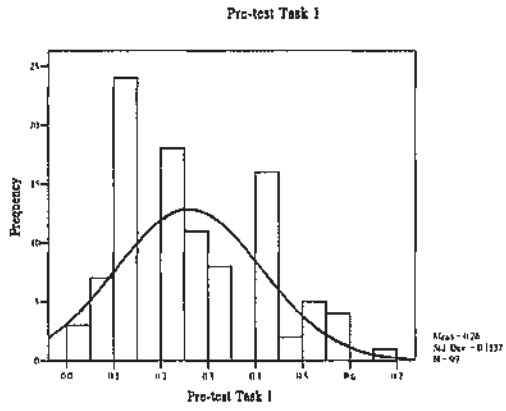


Figure 28.1a: Distribution of Scores of Task 1 in Pre-test

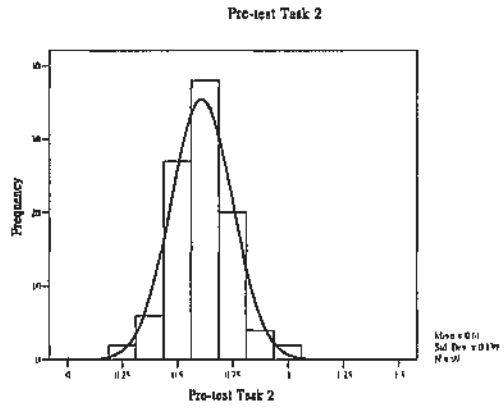


Figure 28.1b: Distribution of Scores of Task 2 in Pre-test

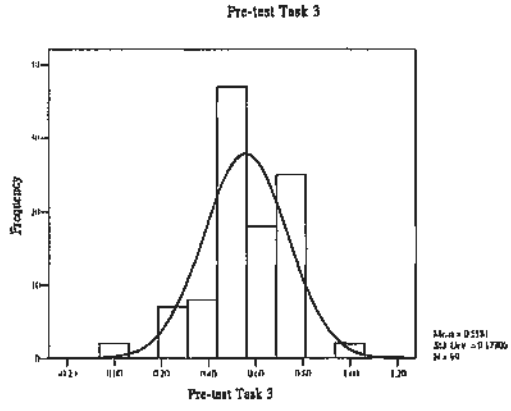


Figure 28.1c: Distribution of Scores of Task 3 in Pre-test

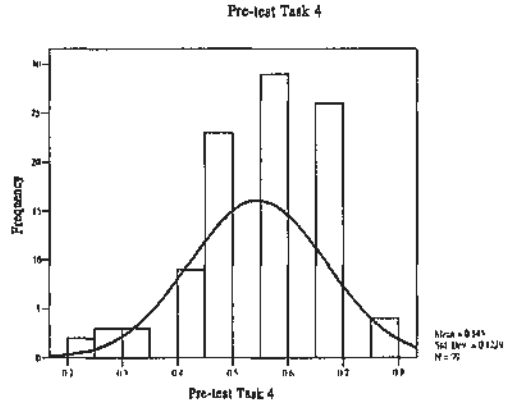


Figure 28.1d: Distribution of Scores of Task 4 in Pre-test

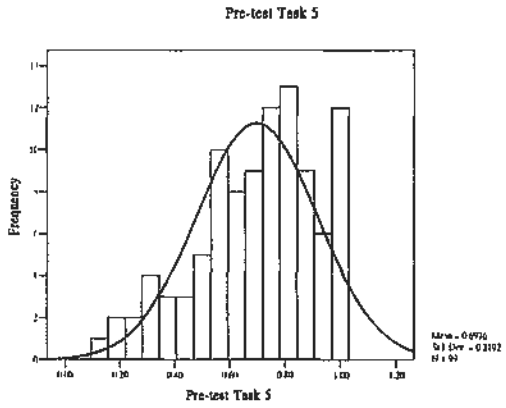


Figure 28.1e: Distribution of Scores of Task 5 in Pre-test

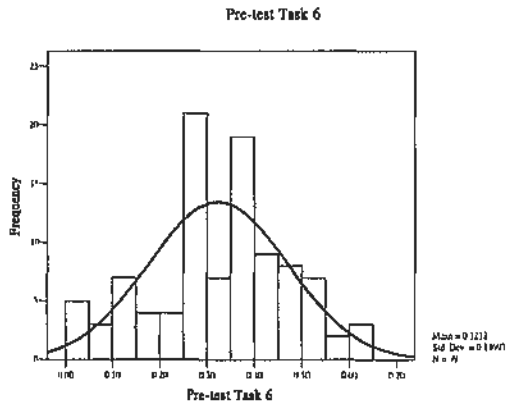


Figure 28.1f: Distribution of Scores of Task 6 in Pre-test

The six figures below present the distribution of the scores of the six tasks in the post-test respectively.

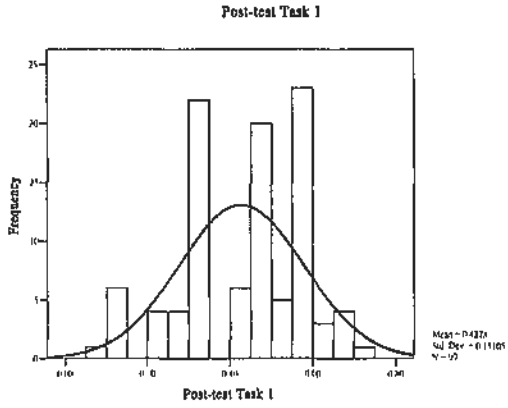


Figure 28.2a: Distribution of Scores of Task 1 in Post-test

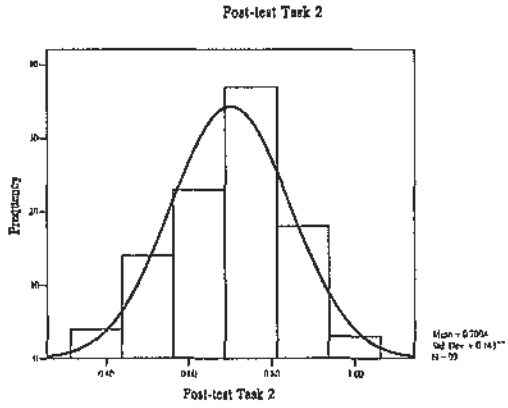


Figure 28.2b: Distribution of Scores of Task 2 in Post-test

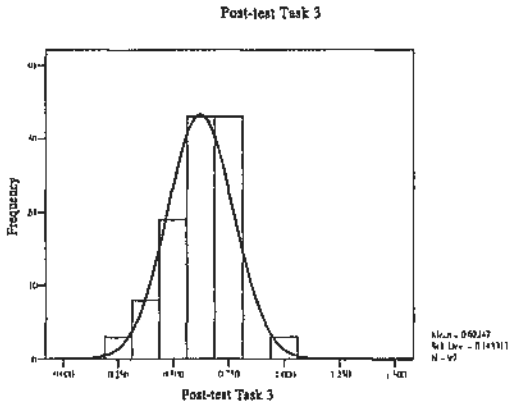


Figure 28.2c: Distribution of Scores of Task 3 in Post-test

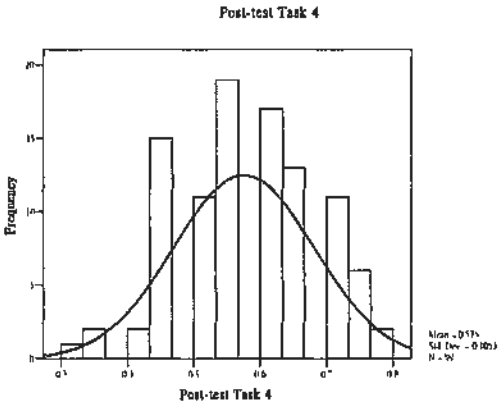


Figure 28.2d: Distribution of Scores of Task 4 in Post-test

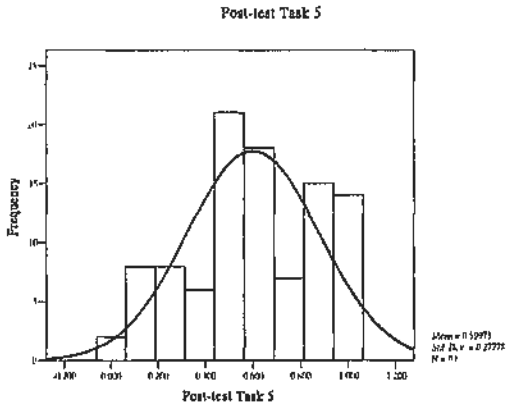


Figure 28.2e: Distribution of Scores of Task 5 in Post-test

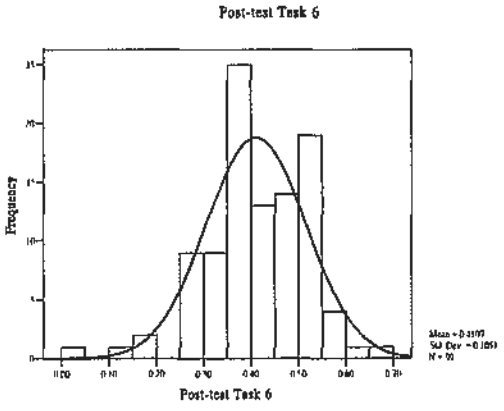


Figure 28.2f: Distribution of Scores of Task 6 in Post-test

Results from Analysis of Covariance

The six tables below present the results of testing for the equivalent slopes assumption for individual tasks in the pre-test and the post-test.

Tests of Between-Subjects Effects (Dependent Variable Post-test Task 1)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig
Corrected Model	248	3	083	3 715	013
Intercept	3 504	1	3 504	157 271	000
PretestTask1	237	1	237	10 614	001
Group	014	1	014	606	438
Group * PretestTask1	017	1	017	765	383
Error	3 008	135	022		
Total	28 555	139			
Corrected Total	3 257	138			

Table 28 2a Results of Testing the Equivalent Slopes Assumption for Pre-test and Post-test Scores

(Task 1)

Tests of Between-Subjects Effects (Dependent Variable Post-test Task 2)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig
Corrected Model	240	3	080	3 879	011
Intercept	2 602	1	2 602	126 124	000
PretestTask2	004	1	004	190	664
Group	001	1	001	039	844
Group * PretestTask2	019	1	019	936	335
Error	2 785	135	021		
Total	66 594	139			
Corrected Total	3 025	138			

Table 28 2b Results of Testing the Equivalent Slopes Assumption for Pre-test and Post-test Scores

(Task 2)

Tests of Between-Subjects Effects (Dependent Variable: Post-test Task 3)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.258	3	.086	4.117	.008
Intercept	2.434	1	2.434	116.555	.000
PretestTask3	.021	1	.021	.985	.323
Group	.000	1	.000	.019	.891
Group * PretestTask3	.010	1	.010	.491	.485
Error	2.819	135	.021		
Total	52.938	139			
Corrected Total	3.077	138			

Table 28.2c: Results of Testing the Equivalent Slopes Assumption for Pre-test and Post-test Scores

(Task 3)

Tests of Between-Subjects Effects (Dependent Variable: Post-test Task 4)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.166	3	.055	5.489	.001
Intercept	1.426	1	1.426	141.391	.000
PretestTask4	.014	1	.014	1.369	.244
Group	.019	1	.019	1.848	.176
Group * PretestTask4	.039	1	.039	3.904	.550
Error	1.361	135	.010		
Total	45.185	139			
Corrected Total	1.527	138			

Table 28.2d: Results of Testing the Equivalent Slopes Assumption for Pre-test and Post-test Scores

(Task 4)

Tests of Between-Subjects Effects (Dependent Variable: Post-test Task 5)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.085	3	.028	.362	.781
Intercept	4.280	1	4.280	54.731	.000
PretestTask5	.083	1	.083	1.064	.304
Group	7.97E-005	1	7.97E-005	.001	.975
Group * PretestTask5	.001	1	.001	.018	.892
Error	10.558	135	.078		
Total	60.953	139			
Corrected Total	10.643	138			

Table 28.2e: Results of Testing the Equivalent Slopes Assumption for Pre-test and Post-test Scores

(Task 5)

Tests of Between-Subjects Effects (Dependent Variable: Post-test Task 6)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.802	3	.267	26.408	.000
Intercept	1.694	1	1.694	167.295	.000
PretestTask6	.036	1	.036	3.603	.060
Group	.020	1	.020	1.974	.162
Group * PretestTask6	.038	1	.038	3.778	.620
Error	1.367	135	.010		
Total	20.934	139			
Corrected Total	2.169	138			

Table 28.2f: Results of Testing the Equivalent Slopes Assumption for Pre-test and Post-test Scores

(Task 6)

The six tables below present the ANCOVA source tables produced by SPSS for individual tasks in the pre-test and the post-test.

Tests of Between-Subjects Effects (Dependent Variable: Post-test Task 1)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.231	2	.116	5.199	.007
Intercept	4.343	1	4.343	195.226	.000
PretestTask1	.231	1	.231	10.377	.002
Group1ExpGrp2CtrlGrp	4.81E-005	1	4.81E-005	.002	.963
Error	3.025	136	.022		
Total	28.555	139			
Corrected Total	3.257	138			

Table 28.3a: ANCOVA Source Table for Pre-test and Post-test Scores (Task 1)

Tests of Between-Subjects Effects (Dependent Variable: Post-test Task 2)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.221	2	.110	5.354	.006
Intercept	2.757	1	2.757	133.675	.000
PretestTask2	.014	1	.014	.695	.406
Group1ExpGrp2CtrlGrp	.199	1	.199	9.630	.002
Error	2.805	136	.021		
Total	66.594	139			
Corrected Total	3.025	138			

Table 28.3b: ANCOVA Source Table for Pre-test and Post-test Scores (Task 2)

Tests of Between-Subjects Effects (Dependent Variable: Post-test Task 3)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.248	2	.124	5.952	.003
Intercept	3.115	1	3.115	149.727	.000
PretestTask3	.057	1	.057	2.732	.101
Group1ExpGrp2CtrlGrp	.183	1	.183	8.780	.004
Error	2.830	136	.021		
Total	52.938	139			
Corrected Total	3.077	138			

Table 28.3c: ANCOVA Source Table for Pre-test and Post-test Scores (Task 3)

Tests of Between-Subjects Effects (Dependent Variable: Post-test Task 4)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.127	2	.063	6.150	.003
Intercept	1.483	1	1.483	143.972	.000
PretestTask4	.051	1	.051	4.964	.028
Group1ExpGrp2CtrlGrp	.064	1	.064	6.185	.014
Error	1.401	136	.010		
Total	45.185	139			
Corrected Total	1.527	138			

Table 28.3d: ANCOVA Source Table for Pre-test and Post-test Scores (Task 4)

Tests of Between-Subjects Effects (Dependent Variable: Post-test Task 5)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.083	2	.042	.537	.586
Intercept	4.396	1	4.396	56.622	.000
PretestTask5	.082	1	.082	1.059	.305
Group1ExpGrp2CtrlGrp	.005	1	.005	.067	.796
Error	10.559	136	.078		
Total	60.953	139			
Corrected Total	10.643	138			

Table 28.3e: ANCOVA Source Table for Pre-test and Post-test Scores (Task 5)

Tests of Between-Subjects Effects (Dependent Variable: Post-test Task 6)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.764	2	.382	36.968	.000
Intercept	1.802	1	1.802	174.389	.000
PretestTask6	.114	1	.114	11.002	.001
Group1ExpGrp2CtrlGrp	.577	1	.577	55.821	.000
Error	1.405	136	.010		
Total	20.934	139			
Corrected Total	2.169	138			

Table 28.3f: ANCOVA Source Table for Pre-test and Post-test Scores (Task 6)

Appendix 29: Results of Analysis of Student Work

This appendix presents the results of the analysis of student work. As reported in Section 4.3.2, four teams of raters were involved in scoring the participants' work based upon four specially designed rubrics (i.e. *RB1*, *RB2*, *RB3*, and *RB4*). Results of the rubric scores given to students' work in regard to individual learning outcomes are presented below.

Rubric Scores on the Criteria for Identifying the Achievement of the Learning Outcome [C6.1]

The table below summarizes the rubric scores assigned to all the working groups on the criteria, which were designed for identifying the achievement of the learning outcome [C6.1], in the four rubrics.

Working Group	Rubric Score on the Criterion for Assessing [C6.1] in *RB1*	Rubric Score on the Criteria for Assessing [C6.1] in *RB2*		Rubric Score on the Criterion for Assessing [C6.1] in *RB4*	Mean Score on the Criteria for Assessing [C6.1] in *RB1*, *RB2*, and *RB4*
	Identification: Achievement of [C6.1] in *WQ1*	Identification: Achievement of [C6.1] in *WQ2*		Identification: Achievement of [C6.1] in *WQ4*	Identification: Overall Achievement of [C6.1] in the WebQuests
Group 1 in G_a	3	2	2	3.5	2.63
Group 2 in G_a	3	3	3	3.5	3.13
Group 3 in G_a	3	3	2	4	3.00
Group 4 in G_a	3	3	4	4	3.50
Group 5 in G_a	3	3	2	4	3.00
Group 1 in G_b	3	2	2	3	2.50
Group 2 in G_b	3	2	3	4	3.00
Group 3 in G_b	2	3	3	3.5	2.88
Group 4 in G_b	3	4	3	3.5	3.38
Group 5 in G_b	3	3	3	3.5	3.13
Group 1 in G_c	3	3	3	4	3.25
Group 2 in G_c	3	3	2	3.5	2.88
Group 3 in G_c	3	3	2	3.5	2.88
Group 4 in G_c	4	3	4	3.5	3.63
Group 5 in G_c	2	3	1	3	2.25
Group 1 in G_d	2	3	2	4	2.75
Group 2 in G_d	4	2	4	4	3.50
Group 3 in G_d	3	3	3	3.5	3.13
Group 4 in G_d	2	3	3	4	3.00
Group 5 in G_d	2	3	4	4	3.25
Group 1 in G_e	3	3	2	4	3.00
Group 2 in G_e	3	3	2	3.5	2.88
Group 3 in G_e	2	3	3	4	3.00
Group 4 in G_e	3	3	3	4	3.25
Group 5 in G_e	3	2	3	3.5	2.88
					Mean: 3.03 SD: 0.31

Table 29.1: Rubric Scores Assigned to All Working Groups on the Criteria for Assessing [C6.1]

Rubric Scores on the Criteria for Identifying the Achievement of the Learning Outcome [C7.1a]

The table below summarizes the rubric scores assigned to all the working groups on the criteria, which were designed for identifying the achievement of the learning outcome [C7.1a], in the four rubrics.

Working Group	Rubric Score on the Criterion for Assessing [C7.1a] in *RB1*	Rubric Score on the Criterion for Assessing [C7.1a] in *RB3*	Rubric Score on the Criterion for Assessing [C7.1a] in *RB4*	Mean Score on the Criteria for Assessing [C7.1a] in *RB1*, *RB3*, and *RB4*
	Identification Achievement of [C7.1a] in *WQ1*	Identification Achievement of [C7.1a] in *WQ3*	Identification Achievement of [C7.1a] in *WQ4*	Overall Achievement of [C7.1a] in the WebQuests
Group 1 in G_a	2	3	4	3.00
Group 2 in G_a	3	3	4	3.33
Group 3 in G_a	2	3.5	4	3.17
Group 4 in G_a	2	3	4	3.00
Group 5 in G_a	2	3	4	3.00
Group 1 in G_b	1	3	2.5	2.17
Group 2 in G_b	2	3	3	2.67
Group 3 in G_b	1	4	2.5	2.50
Group 4 in G_b	2	3	2	2.33
Group 5 in G_b	3	3.5	2.5	3.00
Group 1 in G_c	4	3	4	3.67
Group 2 in G_c	2	3	4	3.00
Group 3 in G_c	1	3	4	2.67
Group 4 in G_c	3	4	4	3.67
Group 5 in G_c	3	3	2.5	2.83
Group 1 in G_d	3	3	3.5	3.17
Group 2 in G_d	4	3.5	3	3.50
Group 3 in G_d	1	3	3	2.33
Group 4 in G_d	2	3	4	3.00
Group 5 in G_d	2	3	4	3.00
Group 1 in G_e	2	3	3	2.67
Group 2 in G_e	2	3	4	3.00
Group 3 in G_e	2	3	4	3.00
Group 4 in G_e	3	4	4	3.67
Group 5 in G_e	2	3.5	3	2.83
				Mean 2.97, SD 0.41

Table 29.2 Rubric Scores Assigned to All Working Groups on the Criteria for Assessing [C7.1]

Rubric Scores on the Criteria for Identifying the Achievement of the Learning Outcome [C11.1]

The table below summarizes the rubric scores assigned to all the working groups on the criteria, which were designed for identifying the achievement of the learning outcome [C11.1], in the four rubrics.

Working Group	Rubric Score on the Criteria for Assessing [C11.1] in *RB3*		Rubric Score on the Criteria for Assessing [C11.1] in *RB4*		Mean Score on the Criteria for Assessing [C11.1] in *RB3* and *RB4*
	Identification Achievement of [C11.1] in *WQ3*		Identification Achievement of [C11.1] in *WQ4*		Overall Achievement of [C11.1] in the WebQuests
Group 1 in G_a	3.5	3.25	4	4	3.69
Group 2 in G_a	3.5	3.5	2	3.5	3.13
Group 3 in G_a	4	3.25	3.5	4	3.69
Group 4 in G_a	4	3.75	4	4	3.94
Group 5 in G_a	3.75	3	3	3	3.19
Group 1 in G_b	3.5	2	2	3	2.63
Group 2 in G_b	3.25	2	3.5	2	2.69
Group 3 in G_b	2.5	2	2.5	3	2.50
Group 4 in G_b	3.25	2	2	3.5	2.69
Group 5 in G_b	4	2.25	2.5	3	2.94
Group 1 in G_c	3.75	2.75	2.5	4	3.25
Group 2 in G_c	3.75	2.5	3	3.5	3.19
Group 3 in G_c	3.75	2.25	2.5	3	2.88
Group 4 in G_c	3.5	2	3.5	3.5	3.13
Group 5 in G_c	3.75	3.25	2.5	3	3.13
Group 1 in G_d	4	2	3.5	3	3.13
Group 2 in G_d	3.75	2.25	2.5	3	2.88
Group 3 in G_d	3.5	2.25	4	4	3.44
Group 4 in G_d	2.25	1.5	4	4	2.94
Group 5 in G_d	3.5	3	4	2.5	3.25
Group 1 in G_e	3.75	2.75	3.5	4	3.50
Group 2 in G_e	3.75	2.75	2.5	4	3.25
Group 3 in G_e	4	3.25	4	3.5	3.69
Group 4 in G_e	3.75	3.25	3	4	3.50
Group 5 in G_e	4	3.25	3.5	3.5	3.56
					Mean 3.19, SD 0.37

Table 29.3 Rubric Scores Assigned to All Working Groups on the Criteria for Assessing [C11.1]

Appendix 30a: Interview Transcripts with Five Case Groups Concerning *WQ1*

Target Group in G_a (*WQ1* Lesson 1)

Q to A, C & D:	**Why did you often visit a discussion forum during the lesson?**
C:	Just for fun. We joined this forum some days ago, so wanted to see who posted any messages there. There were lots of things to see there.
Q to A & B:	**Why did you search for information at Wikipedia instead of checking the links provided in the WebQuest page?**
B:	I thought it's easy to find information about global warming using Wikipedia.
A:	It's easy to find information using Wikipedia. We could find almost any information there.
Q to A & B:	**Did you think about the accuracy or correctness of information provided by Wikipedia?**
B:	No, I thought it's like an encyclopedia on the Web.
A:	No.
Q1 to all:	**What did you say about the Web materials provided by the WebQuest page?**
B:	It's difficult to me. I needed to use the Yahoo Dictionary to look up the meaning of many words.
A:	The Website of the Hong Kong Observatory was okay. There was a Chinese version.
C:	It's difficult to read so much English information.
D:	So much text in English was difficult.
Q2 to all:	**When you found any useful information for a guiding question, how would you record the information?**
B:	Simply copied the information from the Web page and pasted the paragraphs or pictures into my report.
A:	Copied the useful part and pasted it in my report.
C and D:	Yes, same as A.
Q3 to all:	**Did you think about recording the source of the information?**
B:	Yes.
A, C & D:	No.
Q4 to all:	**Did you find the information that you acquired in the WebQuest activity useful? Especially in helping you study other subjects?**
A, B, C, D:	Yes, useful.

Q5 to all:	**If so, what subjects or topics? How could the information help you?**
A, C, D:	Geography. We knew more about pollution and greenhouse effect.
B:	Geography and Integrated Humanities. I knew more about pollution, how human affected the world, and how worse the world would be in the future.
Q6 to all:	**Were you informed that such a global issue, like global warming, was complicated?**
A, C, D:	Yes.
B:	Yes, it's very complicated. We need electricity but, at the same time, it requires burning fossil fuels and will cause global warming.
Q7 to all:	**Why should we collect information from multiple roles or areas for considering such issue?**
A, C, D:	To get more information from different people.
B:	Since this problem is complicated and it is a world-wide problem, we need to consult different experts and people from different countries, and also to think about the problem from different views.
Q8 to all:	**Would you apply such way of handling a real-life problem to other issues with similar nature? If so, what real-life problems could you think about?**
C & D:	Yes, we will use such way for pollution and environmental protection.
A:	Yes, same as C and D.
B:	Definitely. I will apply such way to looking at problems like environmental protection, and some urban problems, like land use, use of natural resources, etc.

Target Group in G_a (*WQ1* Lesson 2)

Q9 to all:	**Did each of you try to conclude the findings of your research report before joining the group for preparing the presentation?**
A, B, C, D:	No.
Q10 to all:	**Did you try to give an overview of the area that you researched to other group members?**
B:	Yes, I did. I told my group members the effects of global warming on our health.
A, C, D:	No.
Q11 to all:	**Did your group determine what were the causes and effects of global warming in the past?**
B:	We just discussed the effects of global warming in the past, like climate change, melting of glaciers, rise of sea level, etc, and how it would affect us in the future.

Q12 to all:	**Did your group determine how human behaviors will affect the global conditions in the future?**
C:	We just discussed about how global warming would affect us and the world in the future. We didn't talk about how human behaviors would affect global warming in the future.
Q13 to all:	**Did you try to categorize the information brought by the different roles?**
D:	No, each of us was responsible for the corresponding slide according to his role. We didn't put all the information brought by the different roles together and then categorize the information.
Q14 to all:	**How did you combine the information?**
B:	Just like what D said, first, each of us was responsible for his own slide. Then, we made the slides for conclusion and suggestions together.
D:	First, we completed our own slides about the findings by the different roles. Then, we saved the PowerPoint files as new files. B would open our files and cut the information in our files and put it into his file.
Q15 to all:	**Did you vary in the arguments on a particular point regarding global warming? How did you bring the agreement and disagreement from information sources together?**
B:	No, we had no argument on the points about global warming.
Q16 to all:	**How did you plan what content should be included in the presentation?**
D:	We used the presentation template given by the teacher and completed all the slides created in the template. Each of us extracted some key information from his research report and put it on the corresponding slide according to the role.
Q17 to all:	**How did you organize the content into a logical order?**
C:	Just followed the order of the slides in the template.
Q18 to all:	**Did you revise the presentation content, as well as its order, and the ways for presenting information based on your on-going discussion?**
B & D:	Yes, we made the slide about suggestions together. We revised the points on that slide for a few times according to our discussion.
B:	I used PhotoImpact to make the background of the cover slide looked better.
Q to A & D:	**During the first half of the lesson, why did you often visit a discussion forum?**
A & D:	Just for fun, we thought we could complete our own slides on time. Then, B would complete the rest.

Q to C:	**Why did you install and play Little Fighter during the first half of the lesson?**
C:	Just wanted to know whether I could install games on the school computer. It didn't allow me to run that game. After that, I concentrated on my work.

Target Group in G_a (*WQ1* Lesson 3)

Q19 to all:	**How did your group use the 15 minutes given by the teacher to prepare for the presentation?**
B:	Just revised the PowerPoint file for the last time and also added some attractive graphics to it.
D:	Just tried to add more attractive graphics to the PowerPoint file and also went through all the slides once again.
C:	Yes, same as *D*.
Q to A, C, D:	**Why did you three often visit a Web discussion forum instead of preparing for the presentation?**
A & C:	We were prepared. So, we had extra free time.
D:	Yes, I was prepared and also some useful pictures, about global warming, could be found at the discussion forum.
Q20 to all:	**Do you have any opportunities to present a topic, a project or your work to your class with the use of I.T. tools, such as presentation software, computer and multimedia projector, in other lessons?**
A, B, C, D:	No.
Q21 to all:	**What do you say about the performance of your group for the presentation?**
B:	It's not bad but we can do it even better next time.
D:	Yes, agree with B.
A & C:	It's okay.
Q22 to all:	**What do you say about the feedback given by the teacher right after your presentation?**
B:	It's so useful. It let us know, in which parts or sections that our group needed to do better.
A, C, D:	Yes, it's useful.

Target Group in G_b (*WQ1* Lesson 1)

Q to A:	**Why did you search for information about greenhouse effect at Yahoo instead of using the links provided in the WebQuest Page?**
A:	I just wanted to get some basic information about greenhouse effect at the beginning.
Q to A & B:	**Why did you search for information at Wikipedia instead of checking the links provided in the WebQuest page?**
B:	I could find information about global warming easily using Wikipedia.
A:	Yes, agree with B. It's so easy to find the answer to the questions in the report using Wikipedia. We often used Wikipedia to find information for our projects.
Q to A & B:	**Did you think about the accuracy or correctness of information provided by Wikipedia?**
A & B:	No.
Q1 to all:	**What did you say about the Web materials provided by the WebQuest page?**
B:	There were many English words that I didn't understand. I needed to use the Yahoo Dictionary to look up the meaning of the words.
C & D:	We could find lots of useful information at the Website of the Hong Kong Observatory. The information was in Chinese. There were also some useful pictures and figures.
A:	It's difficult to read English information. Sometimes, if there were pictures, I could look at the pictures and guess the meaning of the paragraphs next to the pictures.
Q2 to all:	**When you found any useful information for a guiding question, how would you record the information?**
B:	Just copied the information from the Website and put it in my report as it's useful information.
C:	I would like to understand the information and then translated the information into English, and then answered the questions by myself. However, owing to the limitation of class time, I could just copy and paste information from a Web page for the last question in the report.
A and D:	Copied the useful text or pictures and pasted them in my report.
Q3 to all:	**Did you think about recording the source of the information?**
A, B, C, D:	No.
Q4 to all:	**Did you find the information that you acquired in the WebQuest activity useful? Especially in helping you study other subjects?**

A, B, C, D:	Yes, useful.
Q5 to all:	**If so, what subjects or topics? How could the information help you?**
A, B, D:	Geography. We could know more information about global warming and greenhouse effect.
C:	Geography. I knew more about pollution. I also learnt some other forms of energy and we should do something to save our Earth.
Q6 to all:	**Were you informed that such a global issue, like global warming, was complicated?**
A, B, C:	Yes.
D:	Yes, it will change the weather and temperature. It will affect our lives.
Q7 to all:	**Why should we collect information from multiple roles or areas for considering such issue?**
A, B, C:	To understand more about the issue.
D:	We may not have enough knowledge about the issue. So, we need to ask different experts in order to understand the true reasons.
Q8 to all:	**Would you apply such way of handling a real-life problem to other issues with similar nature? If so, what real-life problems could you think about?**
A & B:	Yes, for air pollution.
C:	Yes, for environmental protection.
D:	Yes, for problems like environmental protection, and industrial development.

Target Group in G_b (*WQ1* Lesson 2)

Q9 to all:	**Did each of you try to conclude the findings of your research report before joining the group for preparing the presentation?**
A, B, D:	No.
C:	We selected some important information from our research reports.
Q10 to all:	**Did you try to give an overview of the area that you researched to other group members?**
A, B, D:	No.
C:	Yes, I remember that I told them something about how climate and weather was different, and when we sent greenhouse gases into the air.
Q11 to all:	**Did your group determine what were the causes and effects of global warming in the past?**
C:	We talked about the causes of global warming. We agreed that sending greenhouse gases into the atmosphere was the main reason and that would make global warming worse and worse.
Q12 to all:	**Did your group determine how human behaviors will affect the**

	global conditions in the future?
C:	Yes, as we said, when we sent greenhouse gases into the atmosphere, it would cause global warming. We agreed that if we kept doing this, the problem of global warming will become worse and worse and the temperature of the world would get higher and higher.
Q13 to all:	**Did you try to categorize the information brought by the different roles?**
C:	No, each of us prepared her own slides according to her role. We then grouped these slides together into one file.
Q14 to all:	**How did you combine the information?**
C:	Each of us selected some important information from her research report and then put the information onto the PowerPoint slides for her role. Then, I opened their PowerPoint files and put the information on their slides into my file. Then, we sat together and discussed how to complete the slides for conclusion and suggestions, but we did not have time to complete the slide for suggestions within the lesson.
Q to all:	**So, how did your group complete the slide for suggestions?**
C:	We wanted to complete that slide before Lesson 3. However, we forgot to do it. At the beginning of Lesson 3, we just found that we hadn't completed the slide for suggestions. So, we worked on that slide in Lesson 3.
Q to all:	**So, how did your group complete the slide for suggestions in Lesson 3?**
C:	In Lesson 3, as we suddenly found that we hadn't completed the slide and we were only given a few minutes to have a rehearsal for the presentation, we just thought of a rapid way by searching for information about how to solve global warming at Yahoo and putting the information found on that slide.
Q15 to all:	**Did you vary in the arguments on a particular point regarding global warming? How did you bring the agreement and disagreement from information sources together?**
D:	No, basically, we had no argument on the points about global warming. Our opinions were mostly negative. It's all about human sending greenhouse gases into the atmosphere and those negative effects.
Q16 to all:	**How did you plan what content should be included in the presentation?**
D:	We just followed the presentation template given by the teacher. We completed all the slides in the template.
Q17 to all:	**How did you organize the content into a logical order?**

C:	We followed those slides in the template and completed them one by one.
Q18 to all:	**Did you revise the presentation content, as well as its order, and the ways for presenting information based on your on-going discussion?**
C:	Yes, when I prepared the corresponding slide of my role, I found that just putting all the text and figures on one slide was not good. So, I changed it by adding one more slide for my role and the information could be evenly shown on two slides.
A:	Yes, similar to me.
Q to all:	**During the last 15 minutes, why did your group simply copy the information from Wikipedia for the conclusion slide, instead of having discussion followed by putting your group's conclusion on the slide?**
C:	We did have discussion on it. We also got some ideas or conclusion on global warming after discussion but we found that it's not easy to express to our ideas into some key points. Besides, we just found that we were running out of time. It was almost the end of the lesson and we still hadn't completed the conclusion slide, the suggestions slide, and the slide about "What is Global Warming". So, we thought that finding some key points from Wikipedia about global warming was a rapid way to complete that slide.

Target Group in G_b (*WQ1* Lesson 3)

Q19 to all:	**How did your group use the 15 minutes given by the teacher to prepare for the presentation?**
B & C:	As we said, we suddenly found that we hadn't completed two slides. So, we just wanted to complete them as soon as possible.
A:	I had prepared my part by typing my speech on a paper. So, I just went through the PowerPoint slides again and practiced my speech again and again.
D:	I had also prepared my part but the vocabulary in my part was not easy. So, I needed to hear the pronunciation using the Yahoo Dictionary.
B:	Yes, I also needed to hear the pronunciation of some words using the Yahoo Dictionary.
Q20 to all:	**Do you have any opportunities to present a topic, a project or your work to your class with the use of I.T. tools, such as presentation software, computer and multimedia projector, in other lessons?**
A, B, D:	No.
C:	We just had some short talks in the Chinese lessons and the English

	lessons but there was no need to use computer and PowerPoint.
Q21 to all:	**What do you say about the performance of your group for the presentation?**
C:	We were not well prepared as we forgot to complete two important slides.
B:	Yes, agree with C.
A & D:	We had prepared our parts. So, it's okay.
Q22 to all:	**What do you say about the feedback given by the teacher right after your presentation?**
A, B, C, D:	It's useful.

Target Group in G_c (*WQ1* Lesson 1)

Q to B:	**Why did you often visit the Websites about the latest computer hardware products during the lesson?**
B:	I was interested in the latest computer hardware products. I wanted to know if there were any new releases and I thought I could complete the task before the end of the lesson.
Q to D:	**Why did you search for information at Yahoo instead of checking the links provided in the WebQuest page?**
D:	I just thought it's easy to find information about the effects of global warming at Yahoo. It's my habit to use Yahoo for searching different kinds of information. The information found was in Chinese while the links given by you were all in English. I just used Yahoo to find information for one or two questions. I used the links given by you for the other questions.
Q to D:	**Did you think about the accuracy or correctness of the information found by you?**
D:	No.
Q1 to all:	**What did you say about the Web materials provided by the WebQuest page?**
B:	It's okay. They could provide all the information for the questions in the report.
A:	They contained plenty of information. The information was all related to the questions in the report.
C:	The English of the given Web materials was quite difficult. I liked to read Chinese information. I didn't mind translated Chinese information into English for answering the questions as I could at least understand the information.
D:	I could find the answer for the questions in the report through the given Web materials.
Q2 to all:	**When you found any useful information for a guiding question, how would you record the information?**
C:	It's not easy to understand so much information in English. So, once I found any useful information at a Website, I just copied all the text and put it in my report.
B:	I only copied the important sentences and related pictures, or a few key terms, and put them in my report.
A & D:	Copied the useful part from the Web page and pasted it in my report.
Q3 to all:	**Did you think about recording the source of the information?**
B:	Yes, I knew that I should do this but I didn't do.

A, C & D:	No.
Q4 to all:	**Did you find the information that you acquired in the WebQuest activity useful? Especially in helping you study other subjects?**
B, C, D:	Yes, useful.
A:	Yes, there was much information, which was also useful for other subjects.
Q5 to all:	**If so, what subjects or topics? How could the information help you?**
B:	I think it's useful for both Geography and Integrated Science. We could know more about climate, weather, and atmosphere, and understand more about our Earth.
C:	Geography. We could know more about how human polluted the Earth and caused global warming, and also what we could do to protect our Earth.
A & D:	Yes, same as C.
Q6 to all:	**Were you informed that such a global issue, like global warming, was complicated?**
A, C, D:	Yes.
B:	Yes, this is really a complicated issue. Burning fossil fuels is necessary for our daily lives. However, this will cause global warming. Therefore, we need to think about using other forms of energy.
Q7 to all:	**Why should we collect information from multiple roles or areas for considering such issue?**
A, C, D:	To collect different opinions from different people.
B:	Global warming is a complicated issue. Different countries have different level of development. People in different countries may have different problems related to global warming. Also, we need different kinds of experts to help us solve global warming.
Q8 to all:	**Would you apply such way of handling a real-life problem to other issues with similar nature? If so, what real-life problems could you think about?**
C:	Yes, of course. I will apply this way to other issues, like environmental protection.
A & D:	Yes, same as C.
B:	Yes. I will, for issues like the economic development of a country and the pollution caused by such development.

Target Group in G_c (*WQ1* Lesson 2)

Q9 to all:	**Did each of you try to conclude the findings of your research**

	report before joining the group for preparing the presentation?
A, B, C, D:	No.
Q10 to all:	**Did you try to give an overview of the area that you researched to other group members?**
A, B, C, D:	No.
Q11 to all:	**Did your group determine what were the causes and effects of global warming in the past?**
B, C, D:	Yes, we discussed about what caused global warming and how global warming affected nature and us. We kept these on the conclusion slide.
Q12 to all:	**Did your group determine how human behaviors will affect the global conditions in the future?**
B & C:	No.
D:	I mentioned to B and C how global warming would affect us in the future if it kept going on.
Q13 to all:	**Did you try to categorize the information brought by the different roles?**
B:	I think so. When we (B, C, D) discussed about global warming, I kept all the points from our discussion in a plain text file using Notepad and we also classified those points according to causes of global warming, effects of global warming, and what we can do to stop this problem.
Q14 to all:	**How did you combine the information?**
D:	I did not want to use the PowerPoint template given by you since I thought all groups would use this template. So, I selected another template from the built-in samples provided by PowerPoint for creating a new file. Then, I just followed your template to create all the slides that could be found in your template. Then, I selected some key information, mainly the impacts of global warming, from my report and put the information on the corresponding slides of my role. Then, I saved the PowerPoint file and asked B to open it.
B (& C):	While D was making the PowerPoint document, I checked my report again. I wanted to enhance my report. When she asked me to open the PowerPoint file, we (B & C) put the key text and pictures of our reports onto the corresponding slides of our roles. Then, I saved it as a new file and asked A to open it.
A:	I was the last one who put the information onto the corresponding slide. When they were using the PowerPoint file, I extracted the key words and key points from my report and put them into another Word file by organizing them in point form and classifying them under different groups. So, when the PowerPoint file came to me, I could save time by

	putting the organized points directly onto my slides.
Q15 to all:	**Did you vary in the arguments on a particular point regarding global warming? How did you bring the agreement and disagreement from information sources together?**
B:	No, we had no argument. We were so united.
Q16 to all:	**How did you plan what content should be included in the presentation?**
B:	For the corresponding slides of the different roles, each of us extracted the key information from his/her report and put the information onto the corresponding slides. For the conclusion slide and the suggestions slides, we got some points after our discussion. Then, we put those points onto the slides.
Q17 to all:	**How did you organize the content into a logical order?**
C:	The same as the content slide given in your template.
Q18 to all:	**Did you revise the presentation content, as well as its order, and the ways for presenting information based on your on-going discussion?**
B & C:	We didn't revise the slides for the four roles. We kept changing the points to be used for our conclusion and suggestions through the discussion.
D:	Yes, agree with B and C.
B & C:	After A and D left the computer room, we still kept revising our points for conclusion and suggestions.
Q to A:	**From the video clip, it seemed that you rarely talked to the others. Why didn't you discuss with your group members?**
A:	We are good friends or else we would not form this group. I just had nothing to talk and I had already put the key points of my report on my slides. The points were also well organized.

Target Group in G_c (*WQ1* Lesson 3)

Q19 to all:	**How did your group use the 15 minutes given by the teacher to prepare for the presentation?**
A:	Just had a rehearsal again by practicing how to present the content in English. However, there were so many English words that I didn't know how to pronounce. So, I used the Yahoo Dictionary to hear their pronunciation.
D:	Yes, my case was very similar to A.
B & C:	Yes, we also had rehearsal together by reading the PowerPoint slides again.
Q to B & C:	**Why you two often visited some Websites about guillotine instead of preparing for the presentation? It seemed that those**

	Websites had nothing to do with your presentation.
B:	That's about our history exercise. Since we had finished preparing our presentation, we wanted to use the computer to check some information about it.
Q20 to all:	**Do you have any opportunities to present a topic, a project or your work to your class with the use of I.T. tools, such as presentation software, computer and multimedia projector, in other lessons?**
A, C, D:	No.
B:	We had some oral presentation practices called short talks in the Chinese and English lessons but it's different from the one we did in the WebQuest activity.
Q21 to all:	**What do you say about the performance of your group for the presentation?**
A & C:	We think we were okay.
B:	I think we were good, better than the other groups.
D:	Yes, agree with B.
Q22 to all:	**What do you say about the feedback given by the teacher right after your presentation?**
A, C, D:	It's quite good, quite useful.
B:	You pointed out how we could do better and what parts we needed improvement.

Target Group in G_d (*WQ1* Lesson 1)

Q1 to all:	**What did you say about the Web materials provided by the WebQuest page?**
B:	The Website of the Hong Kong Observatory was very useful. I could find a lot of useful information about the weather and climate of Hong Kong there and also it provided many graphs and figures that made me easy to understand the information. Most importantly, it had a Chinese version. Sometimes, I used an online translator to translate the text in English into Chinese for reading.
A:	Yes, I agreed with B. I also found some useful information and figures at the Website of the Hong Kong Observatory. For the other Web materials, if there were figures or charts, I usually looked at them since the English information was not easy to understand.
C:	Yes, agree with A.
D:	Yes, I needed to use the Yahoo Dictionary to check the meaning of some English words found in the information.
Q2 to all:	**When you found any useful information for a guiding question, how would you record the information?**
A:	I would copy the pictures or figures from the Web page first and paste them in my report since I thought they were the most important and useful. Then, I would find and copy the related text and paste it under the pictures or figures in my report.
B:	I just copied the useful paragraphs and pasted them in the boxes below the questions.
C:	Yes, similar to B.
D:	Yes, similar to B. I would try to keep the information simple, like keeping the information in point form or keeping only a few key words or only some short sentences.
Q3 to all:	**Did you think about recording the source of the information?**
A, B, C, D:	No.
Q4 to all:	**Did you find the information that you acquired in the WebQuest activity useful? Especially in helping you study other subjects?**
A, B, C, D:	Yes, useful.
Q5 to all:	**If so, what subjects or topics? How could the information help you?**
A:	Integrated Science. I could know more about different greenhouse gases. I also knew more about how the greenhouse gases affected our atmosphere and when we sent greenhouse gases into the air in our daily

	lives.
B & C:	Geography. We knew more about how human polluted the Earth, and how pollution affected our lives.
D:	Geography and Integrated Humanities. I knew more about how we and government could do to protect our Earth and what other forms of energy that we should use.
Q6 to all:	**Were you informed that such a global issue, like global warming, was complicated?**
A, B, C, D:	Yes.
Q7 to all:	**Why should we collect information from multiple roles or areas for considering such issue?**
C & D:	To collect more information from different people since different people will give you different information.
A & B:	This issue will affect the whole world. So, we must ask related experts as they know much information about this issue.
Q8 to all:	**Would you apply such way of handling a real-life problem to other issues with similar nature? If so, what real-life problems could you think about?**
C & D:	Yes, such as pollution and the establishment of laws about environmental protection.
B:	Yes, same as C and D.
A:	Yes, I would apply such way to study other global issues and environmental issues.

Target Group in G_d (*WQ1* Lesson 2)

Q9 to all:	**Did each of you try to conclude the findings of your research report before joining the group for preparing the presentation?**
A, B, C, D:	No.
Q10 to all:	**Did you try to give an overview of the area that you researched to other group members?**
D:	Yes, I did briefly describe the impacts of global warming on us to them.
A, B, C:	No.
Q11 to all:	**Did your group determine what were the causes and effects of global warming in the past?**
C:	Yes, we did. Simply speaking, we thought it was caused by human activities and pollution.
Q12 to all:	**Did your group determine how human behaviors will affect the global conditions in the future?**
C:	Yes, we had the conclusion that we must find some ways to slow down global warming or else it would further affect our lives and the natural

	environment.
Q13 to all:	**Did you try to categorize the information brought by the different roles?**
C:	No, each of us completed the corresponding slide of his/her role.
Q14 to all:	**How did you combine the information?**
B:	First, each of us worked on the corresponding slide of his/her role by finding some important information from his/her report and putting the information on the slide.
C & D:	We two were responsible for finding and editing some suitable pictures and background image for the PowerPoint file.
B (& A):	We also had discussion on the conclusion and suggestions, and we two were responsible for typing our discussion results on the two slides.
Q15 to all:	**Did you vary in the arguments on a particular point regarding global warming? How did you bring the agreement and disagreement from information sources together?**
C:	No, we were so consistent in our opinions about global warming.
Q16 to all:	**How did you plan what content should be included in the presentation?**
C:	We followed the presentation template given by you and filled all the slides in the template one by one. Each of us was responsible for deciding what should be put on his/her own slide. Our group had discussion about the conclusion and suggestions, and A and B were responsible for typing our discussion results on the two slides for conclusion and suggestions.
Q17 to all:	**How did you organize the content into a logical order?**
C:	No need to organize, just followed the slides in the template.
Q18 to all:	**Did you revise the presentation content, as well as its order, and the ways for presenting information based on your on-going discussion?**
B, C, D:	Before the end of the lesson, we checked and went through the slides in our PowerPoint file again. We made some words and pictures looked better. We also made changes to the conclusion slide, the suggestions slide and the one about "What is Global Warming".
Q to B, C, D:	**During the first half of the lesson, why did you three often visit an instant messaging website?**
C:	We were not playing. We just used it for discussion. We had verbal discussion. We also found that it's so interesting to use MSN to discuss our project. Besides, since it's computer lesson, we should use computers to discuss.
B:	There was another good point. Our discussion points could be found

there. So, no need to type them again.

Q to B: **From the video clip, it showed that you simply copy information from Wikipedia for completing the slide entitled "What is Global Warming". Why did you do this?**

B: We just found that we hadn't discussed about this slide and we were afraid that we didn't have enough time to do it, or else we could not complete the PowerPoint document within the lesson. So, we thought that was a rapid way to complete the slide.

Target Group in G_d (*WQ1* Lesson 3)

Q19 to all: **How did your group use the 15 minutes given by the teacher to prepare for the presentation?**

C: We were well-prepared for the presentation before the lesson. We typed the speech for each of us and the order among us on the paper. We all had the paper and read the paper before the lesson.

B: So, we just needed to practice reading the speech once again and made sure no wrong pronunciation.

A & D: Yes, it's correct.

Q to all: **That's why all of you visited discussion forums or surfed freely on the Web for the rest of the preparation time.**

A, B, C, D: Yes, exactly.

Q20 to all: **Do you have any opportunities to present a topic, a project or your work to your class with the use of I.T. tools, such as presentation software, computer and multimedia projector, in other lessons?**

A & D: No.

B & C: We had short talks in the Chinese lessons and the English lessons. It's like telling a short story or presenting a topic to the class but no need to use computer and no need to make PowerPoint file.

Q21 to all: **What do you say about the performance of your group for the presentation?**

C & D: We were okay, could finish the presentation with no problem.

A & B: Yes, also, we were well-prepared.

Q22 to all: **What do you say about the feedback given by the teacher right after your presentation?**

C: It's quite useful. It let us know in which parts that we could do better.

B: Yes, and also let us know what we should pay attention to during the presentation.

A & D: Yes, agree with them.

Target Group in G_e (*WQ1* Lesson 1)

Q to A:	**Why did you search for information at Wikipedia instead of checking the links provided in the WebQuest page?**
A:	First, I tried to find the information about Hong Kong's climate at the Website of the Hong Kong Observatory. I tried to type information I found point by point. Later, I thought about Wikipedia. It's easy to find lots of information using Wikipedia. I could get complete information about the climate of Hong Kong in a few seconds. So, I didn't need to find and type the information point by point and also the information that I got at Wikipedia was so complete. I did use the links given in the WebQuest page for most of the questions.
Q to A & B:	**Did you think about the accuracy or correctness of information provided by Wikipedia?**
A:	No, I thought the information found at Wikipedia was so complete and true.
Q1 to all:	**What did you say about the Web materials provided by the WebQuest page?**
B:	It's not easy to know which links should be used for finding the answers for which questions. Also, the Web materials were all in English. I needed to use frequently the Yahoo Dictionary to check the meaning of different English words. The teacher told me that there was an online translator that could translate English information into Chinese. Thus, I tried it. It could help me understand some English information but the translated Chinese information was so strange.
D:	Yes, agree with B and same as B. B told me that there was an online translator that I could use. The translator was so useful but the translated Chinese sentences looked so strange.
A:	I also tried that online translator. It's so useful and, at least, it could help me understand a lot of text in English.
C:	No special comment.
Q2 to all:	**When you found any useful information for a guiding question, how would you record the information?**
D:	Just copied the useful information from the Web page and pasted the information in my report.
C:	Yes, same as D.
B:	I would only copy the sentences or paragraphs that were useful for the question and paste the copied information under the question.
A:	Yes, same as B.
Q3 to all:	**Did you think about recording the source of the information?**

B:	Yes, but I didn't do.
A, C & D:	No.
Q4 to all:	**Did you find the information that you acquired in the WebQuest activity useful? Especially in helping you study other subjects?**
A, B, C, D:	Yes, useful.
Q5 to all:	**If so, what subjects or topics? How could the information help you?**
C & D:	Geography. We should save energy and try other forms of energy.
A:	Geography. I could learn more about climate and more about Hong Kong's climate.
B:	Geography and Integrated Science. I could learn more about pollution, how greenhouse gases polluted our Earth, and how greenhouse effect affected our Earth.
Q6 to all:	**Were you informed that such a global issue, like global warming, was complicated?**
A, C, D:	Yes.
B:	Yes, this issue was caused by us and also affected us.
Q7 to all:	**Why should we collect information from multiple roles or areas for considering such issue?**
A, C, D:	We need to listen to different people since the issue is complicated. More people can give more wisdom for solving the problem.
B:	Global warming affects all human in the world, so we need more people, different people, and, certainly, different experts to think of how to solve the problem.
Q8 to all:	**Would you apply such way of handling a real-life problem to other issues with similar nature? If so, what real-life problems could you think about?**
C & D:	Yes, for problems like how to protect our Earth.
B:	Yes, for problems like how to balance the use or development of new land and its negative effects on the environment and human.
A:	Yes, same as B.

Target Group in G_e (*WQ1* Lesson 2)

Q9 to all:	**Did each of you try to conclude the findings of your research report before joining the group for preparing the presentation?**
B:	Yes, I did. At the beginning of the lesson, I read my report again and again for figuring out and concluding the key points of my report. I also typed those key points one by one on the corresponding PowerPoint slide of my role.

A:	Yes, I did. I wanted to conclude the findings of my role before joining their discussion. However, I was so slow in concluding my report. So, I could hardly join the discussion.
C & D:	No.
Q10 to all:	**Did you try to give an overview of the area that you researched to other group members?**
B:	Yes, I did. I explained to C and D the meaning of greenhouse gases and the meaning of greenhouse effect. I also mentioned to them those common greenhouse gases and why there were so many greenhouse gases produced.
A:	I wanted to do it but it was too late after but I finished concluding my report.
C & D:	No.
Q11 to all:	**Did your group determine what were the causes and effects of global warming in the past?**
B:	Yes, I did. I explained to C the major causes of global warming. It's all about greenhouse effect and greenhouse effect was from burning fossil fuels, cutting trees, and our daily activities. He (C) also mentioned the effects of global warming, like Earth becoming warmer, lots of water from melting glaciers, climate change, and extinction of endangered animals, etc.
C:	Yes, I did.
Q12 to all:	**Did your group determine how human behaviors will affect the global conditions in the future?**
C:	Yes, we talked about the greenhouse effect would be more serious, Earth would be warmer and warmer, lots of water from melting glaciers would cover lowland. There might be more infectious diseases and also extinction of endangered animals.
Q13 to all:	**Did you try to categorize the information brought by the different roles?**
B:	Yes, I always discussed with C and we could classify our information clearly into the causes, those about greenhouse effect and why there was greenhouse effect, and the effects of global warming.
Q14 to all:	**How did you combine the information?**
A & B:	We read our research reports again for recalling what we had done in the previous lesson. We tried to get the most important points from the reports, and typed the points on the corresponding slides of our roles using some simple words, and then organized those points according to the main points.

C & D:	Yes, we also selected the important information from our reports and put the information on the slides for our roles.
B:	Since the others hadn't completed their slides, I searched some useful pictures for our PowerPoint document on the Web. Then, when I saw C had completed his slide, I discussed with him and we combined our information for getting some key points for making the slide about "What is Global Warming".
C:	Later, when D had completed his slide, we (B & C) discussed with him (D) for getting some key points for making the suggestions slide.
B:	Lastly, when A had completed her slide, we discussed altogether for the conclusion of our group and made the conclusion slide together.
Q15 to all:	**Did you vary in the arguments on a particular point regarding global warming? How did you bring the agreement and disagreement from information sources together?**
B & C:	Basically, we had no argument since nearly everything about global warming was negative.
A & D:	Yes, agree.
Q16 to all:	**How did you plan what content should be included in the presentation?**
B:	For the slide about findings by a consultant, each of us decided what should be put on the slide according to his/her role. For the other three slides, we discussed together to decide what should be put on them.
Q17 to all:	**How did you organize the content into a logical order?**
B:	If you meant the order of the slides in the PowerPoint file, we just followed the content slide of the template given by you.
Q18 to all:	**Did you revise the presentation content, as well as its order, and the ways for presenting information based on your on-going discussion?**
A & B:	Yes, when we were making our own slides, we always thought about whether we should include this point or exclude another point on the slides.
B:	Also, when we were making the three common slides together, we often made changes to the points on the slides based on our discussion. We wanted to keep only the important points on the slides and we also wanted to express the points using better wording.
C & D:	Yes, agree.

Target Group in G_e (*WQ1* Lesson 3)

Q19 to all:	**How did your group use the 15 minutes given by the teacher to prepare for the presentation?**

B:	We just sat together and used only one computer to have rehearsal for our presentation.
D:	There were some English words that we didn't know how to read. So, we also used the Yahoo Dictionary to hear their pronunciation.
A:	We had practice on reading the presentation content in turn according to the order decided previously.
Q20 to all:	**Do you have any opportunities to present a topic, a project or your work to your class with the use of I.T. tools, such as presentation software, computer and multimedia projector, in other lessons?**
A, C, D:	No.
B:	We had short talks in the Chinese and English lessons.
Q21 to all:	**What do you say about the performance of your group for the presentation?**
B:	It's not good. In fact, we didn't know how to conduct a good presentation.
D:	We were nervous to present in English in front of our classmates.
A & C:	Yes, we agree that our performance was not good.
Q22 to all:	**What do you say about the feedback given by the teacher right after your presentation?**
B:	You explained our problems to us. It's so clear. We knew more about our problems during the presentation and we also knew more about what we should pay attention to while coming out for presentation.
D:	It helped us to do better next time.
A & C:	Yes, agree.

Appendix 30b: Interview Transcripts with Five Case Groups Concerning *WQ2*

Target Group in G_a (*WQ2* Lesson 1)

Q to B & D:	**Why did you sometimes visit a discussion forum during the lesson?**
B:	Nothing, just for fun. We visited the forum for a few times only.
Q to A:	**Why did you search for information about Visy at Yahoo?**
A:	At the beginning, I had totally no idea about what Visy was. Later, I knew it's the name of a big company. Before I knew this, I just thought that it would be a special term. That's why I searched it at Yahoo and wanted to know what it was.
Q to B:	**Why did you search for information about which bag, paper or plastic, was more environmentally friendly at Yahoo Knowledge?**
B:	Just wanted to see if there was anyone who had already posted similar questions there. If so, I could get some ideas about the question first.
Q to B:	**Did you think about the accuracy or correctness of information/responses posted at Yahoo Knowledge?**
B:	I think they are usually correct and it's okay for me to use them, but I just wanted to get some ideas about the question, like having a look at what did people say.
Q1 to all:	**What did you say about the Web materials provided by the WebQuest page?**
B:	It's okay, not so difficult to understand.
A:	No, that's not the case. The Web materials for my role were so difficult to understand. I could not find the relevant information for the guiding questions. Especially the Websites of the two international companies, it's very hard to find the information I needed there, so many difficult words.
C:	Yes, so much English for reading.
D:	They were okay. I could find the required information and I could also understand the information by first looking at the figures.
Q2 to all:	**When you found any useful information for a guiding question, how would you record the information?**
C & D:	Like what we did for the previous WebQuest, copied the information from the Websites and put them in our reports.
A:	Yes, just like the previous activity.
B:	No, this time I didn't do that. As the questions in my report were not so

	difficult, I just tried to read and understand the information. After reading and understanding the information, I tried to answer the questions by myself. I thought simply copying and pasting the information was not good.
Q3 to all:	**Did you think about recording the source of the information?**
B:	Yes, but all links to the Websites were already at the bottom of the report. So, I thought there was no need to record them again.
A, C & D:	No.
Q4 to all:	**Did you find the information that you acquired in the WebQuest activity useful? Especially in helping you study other subjects?**
A, B, C, D:	Yes, useful.
Q5 to all:	**If so, what subjects or topics? How could the information help you?**
D:	Integrated Science. I knew more about the recycle symbols under different plastics products and also knew more about plastic recycling.
C:	Geography. I learned more about paper recycling and plastic recycling.
B:	Geography and Integrated Humanities. I knew more about the relation between the use of paper bags and global warming. It requires cutting down a lot of trees that can filter a lot of pollutants from the air. So, as a responsible citizen, we should use less paper bags or reuse paper bags.
A:	Yes, similar to B. The paper industry should reduce the use of fossil fuels so as to reduce greenhouse gas emissions.
Q6 to all:	**Were you informed that people from different background would hold different attitudes and viewpoints towards a real-world issue?**
A, C, D:	Yes.
B:	Yes, someone agree with an issue, while the others disagree with the issue. It always happens in our society.
Q7 to all:	**Why should we collect information from people with different viewpoints for considering such issue?**
A, C, D:	We can collect information from different people.
B:	Since someone may agree with an issue and the others may disagree with it, we should listen to both sides. Therefore, we can make a good decision.
Q8 to all:	**Would you make use of such way of handling a real issue to deal with other real-world issues with similar nature? If so, what real-world issues could you think about?**
C & D:	Yes, we would use this way for considering issues like prohibiting

smoking in public area.

A: Yes, same as C and D.

B: Yes, we can use this way to consider many real-world issues happened in our society, especially those arguable issues. I can think of the social issue about whether the government should establish a law to enforce minimum salary.

Target Group in G_a (*WQ2* Lesson 2)

Q9 to all: **How did your group reach a consensus on the answer to the question "Paper of Plastic"?**

B: I was the Paper Advocated. I stated so many reasons about why paper bags should be used. I had my strong arguments. All of them were good reasons but D didn't listen to me and he argued with me all the time.

D: No, you should listen to me why plastic bags should be used. My reasons were all good.

C: In the lesson, they (B and D) disputed for a long period about which one was better. B didn't agree with what D said, while D didn't agree with what B said. We (C and A) just sat there and listened to their debate. Fortunately, the teacher came to us and told us how to study their (B's and D's) arguments.

A: The teacher also told us how to ask them (B and D) questions.

C: Yes, so we knew when we should agree with and disagree with B, and when we should agree with and disagree with D.

B: The activity was interesting. At the beginning, we just thought about choosing paper or plastic bags. At the end of our discussion, we found that both paper and plastic bags had disadvantages. Finally, we thought about another choice. So, we thought of recycle bags, which had less disadvantages than paper bags and plastic bags. If we could be aware of this at the beginning, we could save much time on debating.

D: Yes, agree with B. If we could think about both paper and plastic bags were not good, we could save much time and there was no need to argue with him (B).

Q10 to all: **In the process of reaching a consensus, as the four of you varied in your viewpoints on the topic, how did you integrate both agreement and disagreement, which came from different information sources supporting different viewpoints, for the topic?**

A: At the beginning of the lesson, we didn't integrate any agreement or disagreement. B and D had intensive debate. We (A and C) just listened to the huge argument between B and D. We just found that sometimes B

	was correct and sometimes D was correct, but it's not easy to put them together since we thought plastic bags could never have some advantages of paper bags and vice versa.
C:	Yes, agree with A. It's so strange. Now, when I recall the lesson, I don't know how to say. It seemed that there was a moment in the lesson. Before that, we all followed the teacher's instruction by discussing and debating whether paper and plastic bags should be chosen. Suddenly, after we found both of them were not good, it seemed that we could put the arguments given by B and D together into our new idea.
B & D:	Yes, agree with C. It's exactly like what C described.
Q11 to all:	**How did your group make an informed decision for the issue?**
B:	We thought that, through our discussion, we had made a good decision. In our discussion, we had discussed so much about using paper bags or plastic bags. The major problems of using paper or plastic bags were all about environmental protection. Using either paper or plastic bag was not environmental friendly. So, we thought about recycle bag, which was reusable and recyclable. Thus, our new idea could be environmental friendly and helped environmental protection.
Q12 to all:	**How did you plan what content should be included in the presentation?**
D:	It's written clearly in the WebQuest page that there were five main things that should be included in the presentation. We followed this requirement with nothing missing in our presentation.
Q13 to all:	**How did you organize the content into a logical order?**
D:	First, just talked about the reasons of using and not using paper and plastic bags, and then presented our new idea and also gave reasons to our new idea.
Q14 to all:	**Did you revise the presentation content, as well as its order, and the ways for presenting information based on your on-going discussion?**
B & D:	No, since we had a long discussion already. After the discussion, we all agreed with our new choice. So, we just followed the requirement in the WebQuest page to include the five major parts and also added some suitable pictures to the PowerPoint document.
Q to A:	**In the middle of the lesson, while the other members were working on the PowerPoint document, why did you just browse various Websites, which were not related to the WebQuest activity, without taking part in the group work?**
A:	As we had finished our discussion already and we also had our

	conclusion, it's enough for making the presentation. Besides, as they (B, C & D) were working on the PowerPoint document already, I just had nothing to do and also no need to discuss. So, I surfed on the net for a while.

Target Group in G_a (*WQ2* Lesson 3)

Q15 to all:	**How did your group use the 15 minutes given by the teacher to prepare for the presentation?**
D:	We went through all the slides again to get familiar with the presentation content for each one.
B:	After reading all the slides again, I made some changes to the PowerPoint document in order to make it looked better.
B:	Besides, as our new idea was to use recycle bag, we had also brought a recycle bag to the lesson, so that we could show it to our classmates during the presentation.
Q to A, C, D:	**Besides the first 3 minutes, why did you three visit a Web discussion forum instead of preparing for the presentation?**
A & C:	We had gone through all the slides again. We were prepared. So, just to have some free time.
Q16 to all:	**What do you say about the performance of your group for the presentation?**
B:	We did well. Our classmates were so engaged in our presentation and they also gave us many questions.
D:	Yes, agree with B.
Q17 to all:	**What do you say about the feedback given by the teacher right after your presentation?**
B:	It's so useful. After learning from the feedback given by the teacher in the last WebQuest activity, we thought we did better than the previous presentation.
A, C, D:	Yes, agree with B. It's useful.

Target Group in G_b (*WQ2* Lesson 1)

Q to A:	**Why did you sometimes visit Yahoo News and Xanga during the lesson?**
A:	Nothing, just to have a look and I thought my role was not so difficult. I thought I could complete the report for my role within the lesson.
Q to D:	**Why didn't you open the WebQuest page to have a look but just opened the research report for your role?**
D:	You had explained so clearly about the activities and also the background. Moreover, those useful links were all in the report. I thought there was no need to read the WebQuest page. So, I opened the report directly.
Q1 to all:	**What did you say about the Web materials provided by the WebQuest page?**
A, B, C:	It's okay, not very difficult to understand.
C:	For a few guiding questions, there was even no need to read the given Web materials but I could still answer them.
B:	Some Websites still contained difficult English words. So, I needed to use the Yahoo Dictionary to check those words.
D:	Those Web materials for me were not easy to understand. They are difficult. I couldn't find the information for a few questions. It's not easy to locate information at a company's Website, like the two companies in my report. With the help from the teacher, I could find some information for a question.
Q2 to all:	**When you found any useful information for a guiding question, how would you record the information?**
A & B:	Like what we did for WebQuest 1, just copied the words from the Websites and then pasted them in the reports.
D:	Yes, same as A and B. Especially for my role, the given Websites were difficult to understand. So, once I found the information I needed, I just copied it directly and put it in my report.
C:	This time, I didn't copy and paste the information. As the teacher told us to keep only the useful and key points in the report and also the questions were not so difficult for answering, plus I had enough class time to do it, so I attempted to answer the questions by myself after reading the Web materials. I could organize my answer into point form. This would also help me to extract the required information for making the PowerPoint presentation in the next lesson.
Q3 to all:	**Did you think about recording the source of the information?**
A, B, C, D:	No.
Q4 to all:	**Did you find the information that you acquired in the**

	WebQuest activity useful? Especially in helping you study other subjects?
A, B, C, D:	Yes, useful.
Q5 to all:	**If so, what subjects or topics? How could the information help you?**
D:	Geography. It helped me to understand how the paper industry and the plastic industry affected our environment and what they should do to help protect our environment.
B:	Yes, also Geography. I learned more about plastic recycling.
A:	Integrated Science. I thought the most useful information for me was the two different recycle symbols under the plastic goods.
C:	Integrated Science. I knew more about paper recycling, especially the process of paper recycling.
Q6 to all:	**Were you informed that people from different background would hold different attitudes and viewpoints towards a real-world issue?**
A, B, C, D:	Yes.
Q7 to all:	**Why should we collect information from people with different viewpoints for considering such issue?**
A, B, D:	To get more opinions.
C:	Yes, we should listen to people holding different opinions.
Q8 to all:	**Would you make use of such way of handling a real issue to deal with other real-world issues with similar nature? If so, what real-world issues could you think about?**
C:	Yes, I would use this way to consider whether the supermarkets in Hong Kong should stop providing plastic bags to customers.
A & B:	Yes, same as C.
D:	Yes, I would also use this way to think about whether the supermarkets should charge for the plastic bags they provide. So, we can ask the customers, the staff of the supermarkets, the management of the supermarkets, and those who seldom buy things in supermarkets.

Target Group in G_b (*WQ2* Lesson 2)

Q9 to all:	**How did your group reach a consensus on the answer to the question "Paper of Plastic"?**
C:	At the beginning, we all agreed that both paper bags and plastic bags had their advantages. Through our discussion, we found that paper bags were not so practical for being used in supermarkets. Besides, although both paper and plastic bags had their disadvantages, we found that the disadvantages of paper bags were more than that of plastic bags in the

context of supermarkets.

D: Yes, although I was the Paper Advocate, I accepted that paper bags were less suitable than plastic bags for being used in supermarkets. Besides, using paper bags required cutting lots of trees. It's a problem about environmental protection.

C: In our discussion, we agreed that using plastic bags also caused environmental problem. So, initially, we decided to use recycle bag to replace both paper and plastic bags. After thinking about the practical context in supermarkets, we decided to keep plastic bags only for wet goods, like meat or ice-cream, and use recycle bags for other goods.

A & B: Yes, we thought that's the most suitable solution for the question.

Q10 to all: **In the process of reaching a consensus, as the four of you varied in your viewpoints on the topic, how did you integrate both agreement and disagreement, which came from different information sources supporting different viewpoints, for the topic?**

D: I thought our discussion was all about two issues. They were environmental protection and practical usage in supermarkets.

C: At the beginning of our discussion, we had already agreed that both paper bags and plastic bags had their advantages and both of them also had their disadvantages. So, we wanted to choose neither of them. We wanted to use recycle bags, which were not only environmental friendly but also suitable for being used in supermarkets. That could fit the two issues.

A & B: Yes, that's right.

Q11 to all: **How did your group make an informed decision for the issue?**

C: As we said, we found that both paper and plastic bags had their advantages and disadvantages. So, we didn't want either and we thought of recycle bags. Later, when we also considered the practical issue, we decided to use recycle bags together with plastic bags, which were only for wet goods.

D: Yes, therefore, we could reduce the use of plastic bags and stop using paper bags.

Q12 to all: **How did you plan what content should be included in the presentation?**

C: No need to plan. You told us clearly about the five things that should be included in the presentation.

Q13 to all: **How did you organize the content into a logical order?**

D: First, we talked about the reasons for using and not using paper bags. Then, we talked about the reasons for using and not using plastic bags.

	Finally, we mentioned our solution, which was about using recycle bags together with plastic bags but plastic bags were only for wet goods.
Q14 to all:	**Did you revise the presentation content, as well as its order, and the ways for presenting information based on your on-going discussion?**
D:	No, each of us was responsible for making one of the four slides (best reasons for using paper bags, best reasons for not using paper bags, best reasons for using plastic bags, and best reasons for not using plastic bags) by summarizing the relevant points from our discussion. Then, I was responsible for grouping all the slides together and A was responsible for summarizing our conclusion and preparing the slide for our solution.
A:	Yes, but I didn't have enough time to complete the last slide in the lesson. So, I made it at home.
Q to A, B, C:	**Three of you could all complete your corresponding slides at least 10 minutes before the end of the lesson. Why didn't you help prepare the slide for the solution of your group, but just surfing on the net?**
A:	We needed to wait until D had finished making her slide and combining our slides into the PowerPoint document, and then I could open the PowerPoint document and work on it. However, D finished editing the PowerPoint document just before the end of the lesson.

Target Group in G_b (*WQ2* Lesson 3)

Q15 to all:	**How did your group use the 15 minutes given by the teacher to prepare for the presentation?**
C:	We discussed together which one would present which slide.
A:	We had a rehearsal of the presentation by reading the points on the slides one by one.
B:	I also checked the pronunciation of some English words in my part using the Yahoo Dictionary.
D:	Other than having a rehearsal, I also modified the PowerPoint document in order to make it looked better.
Q16 to all:	**What do you say about the performance of your group for the presentation?**
C & D:	It's not very good but we thought it's better than the last presentation. At least, we were prepared and we had completed all the slides before the lesson.
A & B:	Yes, it's okay.
Q17 to all:	**What do you say about the feedback given by the teacher right after your presentation?**

A, B, D: It's useful.

C: It helped us to do better next time.

Target Group in G_c (*WQ2* Lesson 1)

Q to C & D:	**Why did you sometimes visit Yahoo News and Xanga during the lesson?**
C:	Just wanted to see the photos of my friends and the photos of my relatives. They put many photos there.
D:	Nothing, just for fun and looked at the lyric of a pop song posted by my friend.
Q to D:	**Why didn't you open the WebQuest page to have a look but just opened the research report for your role?**
D:	You told us already the background of the activity and our mission for the lesson. Also, according to the previous activity, the report contained all the Websites that we needed to visit. So, I just wanted to save the time by opening the report directly.
Q to C:	**At the beginning, you left your seat for about 10 minutes. Where did you go? What did you do during that period?**
C:	Sorry, I can't remember. I think it should be talking with other classmates but I can't remember.
Q1 to all:	**What did you say about the Web materials provided by the WebQuest page?**
D:	It's okay. The questions were not difficult and the given Web materials were also not difficult to read. It's not difficult to find the required information from the given Web materials.
A:	Those for my role were so difficult. First, the questions for my roles were not easy to understand. There were some English words that I didn't understand. Also, the given Websites were so difficult to read. It's not easy to find information at those Western companies' Websites, just like finding their environmental commitments and policies. There were so much text in English and also so many English words I didn't understand. I needed to check their meaning all the time. I could only finish answering the questions in my report with the help from the teacher.
B:	It's okay, not too difficult to understand.
C:	The Web materials were okay. Some of them were interesting, especially the pictures were funny and they were also easy to understand.
Q2 to all:	**When you found any useful information for a guiding question, how would you record the information?**
A, C, D:	Just like what we did in the last activity. We copied the useful text from the Websites and then put it in our reports for the corresponding questions.
B:	This time, I didn't want to use copy-and-paste to record the information

	since I thought it's not a good idea and not a good way. We should understand the information and then apply the information to the questions in the report instead of simply copying the information into the report. Moreover, the questions were not so difficult. So, I read and understood the information and then used my own words to answer the questions. This could also help me organize my answers.
Q3 to all:	**Did you think about recording the source of the information?**
A, C, D:	No.
B:	Yes, I used to think about this but all the Websites were shown in the report already. So, I thought it was not necessary to mark the source in each question. Also, my answer for each question was not from only one Website. I grouped some information I read from different Websites to answer the question.
Q4 to all:	**Did you find the information that you acquired in the WebQuest activity useful? Especially in helping you study other subjects?**
A, B, C, D:	Yes, useful.
Q5 to all:	**If so, what subjects or topics? How could the information help you?**
D:	I don't know it's about which subject but I think, at least, I understood more about the process of making and recycling paper.
B:	I think Integrated Science or Geography. Like D, I also knew more about paper recycling. Before this activity, I thought that any paper could be recycled. After reading and understanding the information from the Websites, I knew that some paper could not be recycled if it's not pure enough and such paper was dumped into landfills, like other rubbish.
A:	Integrated Humanities. I understood more about why people said those big companies should bear social responsibility. The big companies earned money from our society but, at the same time, they also caused pollution to our environment. So, they should contribute more to our society.
C:	Yes, similar to B & D. I learned more about the process of recycling plastic, especially the major steps involved.
Q6 to all:	**Were you informed that people from different background would hold different attitudes and viewpoints towards a real-world issue?**
A, B, C, D:	Yes.
Q7 to all:	**Why should we collect information from people with different viewpoints for considering such issue?**

C & D: People with different viewpoints will give you different opinions. Therefore, we can collect more ideas and thoughts.

A: Yes, agree with A.

B: Usually, such issue is complicated and arguable. Different people may have different preferences and hold different arguments on the issue. Also, they may obtain different interests from the issue. So, we need to make a balance by listening to people with different viewpoints.

Q8 to all: **Would you make use of such way of handling a real issue to deal with other real-world issues with similar nature? If so, what real-world issues could you think about?**

C & D: Yes, we would use this way to deal with a real issue like whether it's a good thing for China to conduct the Olympic Games. So, we can collect information from people with different viewpoints, like the Chinese Government, the businessmen in China, the people of Hong Kong, and the Chinese athletes, etc.

A: Yes, same as C and D.

B: Yes, certainly. I would use such way to deal with our school issue, just like whether the school should allow us to bring our mobile phones to school. In this case, I would collect information from teachers, students, and parents.

Target Group in G_c (*WQ2* Lesson 2)

Q9 to all: **How did your group reach a consensus on the answer to the question "Paper of Plastic"?**

D: I can still remember that, at the beginning of the discussion, I tried to convince them to accept that using paper bags was a good choice. However, both B and C strongly opposed my points.

C: As a Plastic Advocate, I had to oppose you and supported the use of plastic bags.

B: As a Recycling Pessimist, I had to oppose both of you because using either paper or plastic bags was not a good idea. Both of them had problems about environment protection.

C: So, through our discussion, we all agreed that both paper and plastic bags were not good. We decided to choose neither of them and we thought of using recycle bags.

B: Yes, recycle bags could solve the problems coming from paper bags and plastic bags, like its cost was lower, it could be used for many times, it's not easy to break, etc. As it's easy for us to get such conclusion, we didn't need to discuss for too much time.

C: Yes, and later, we could focus on discussing the reasons for our choice

and finding information to support our choice.

Q10 to all: **In the process of reaching a consensus, as the four of you varied in your viewpoints on the topic, how did you integrate both agreement and disagreement, which came from different information sources supporting different viewpoints, for the topic?**

B: I think it's easy for us to put the good points and the bad points of using paper and plastic bags together. Since we agreed that neither paper nor plastic bags should be chosen, we just thought about how we could solve the problems coming from using paper and plastic bag and we found that our choice could solve those problems but also included the good points of paper and plastic bags.

C: Yes, our choice could include the good points of paper and plastic bags and solve their bad points.

Q11 to all: **How did your group make an informed decision for the issue?**

B: As we said, we agreed that both paper and plastic bags were not good at the beginning of our discussion, we decided to use recycle bags, which were made of degradable material and also lower in cost. We thought our choice could include some advantages of paper and plastic bags and exclude their disadvantages.

Q12 to all: **How did you plan what content should be included in the presentation?**

B: We just followed the requirement stated in the WebQuest pages by first talking about the advantages and disadvantages of using paper and plastic bags. Then, we talked about our choice.

Q13 to all: **How did you organize the content into a logical order?**

B: As I said, first, we talked about the pros and cons of using paper bags, and the pros and cons of using plastic bags. Then, we told the others that we could solve the problems brought by using paper and plastic bags. We first reviewed the disadvantages of using paper bags and plastic bags. Then, we brought out our idea and talked about the reasons and advantages of our choice by comparing the cost, practical usage in supermarkets, and material with paper and plastic bags.

C: Yes, that's right.

Q14 to all: **Did you revise the presentation content, as well as its order, and the ways for presenting information based on your on-going discussion?**

B: No, since we all agreed with the use of recycle bags and we thought our order of presenting the content was good, there was no need to revise

	them.
C & D:	Just, sometimes, we revised the reasons for our choice since we thought some of them might not be good enough. We could even include some better reasons or information to support our choice.
Q to all:	**In the middle of the lesson, why did all of you visit Xanga and an instant messaging website or surf freely on the net instead of working on your group presentation?**
B:	Just took a break after discussing the issue. Besides, we had such a division of work. A was responsible for making the first four slides about the reasons for using and not using paper and plastic bags. We three (B, C & D) were responsible for making the other slides about presenting our choice and the reasons. We needed to wait until A finished making the four slides. Then, we could open the PowerPoint document and further worked on it.
C:	We three (B, C & D) also found that it's interesting to use MSN to discuss our project. Also, as we were having computer lesson, we would like to talk to each other using computers. So, we just had a try to chat through MSN about our choice and what to be presented on the last few slides.
C & D:	Yes, we just took a break while we were waiting. We still stayed in the computer room after the end of the lesson and we spent the whole recess on working on the PowerPoint slides.

Target Group in G_c (*WQ2* Lesson 3)

Q15 to all:	**How did your group use the 15 minutes given by the teacher to prepare for the presentation?**
A:	Just went through the slides again and again in order to get familiar with the presentation content and also had a rehearsal of the presentation for my part.
D:	Yes, similar to A. I had a rehearsal of the presentation for my part.
B & C:	We revised the PowerPoint document by adding one more slide to present extra information for our choice.
Q16 to all:	**What do you say about the performance of your group for the presentation?**
C & D:	We think we were not bad.
B:	We did a good presentation and we were well-prepared. In our presentation, we had prepared real data and evidence to support our choice and show that our choice was a good one. Our classmates were also interested in our choice and they gave us many questions.
Q17 to all:	**What do you say about the feedback given by the teacher right after your presentation?**

A, C, D: It's quite useful.

B: We learned from the feedback you gave us for our previous presentation. So, we thought we did better than the last time.

Target Group in G_d (*WQ2* Lesson 1)

Q to A & C:	**Why did you visit an instant messaging website from time to time since the middle of the lesson?**
A:	As I sat far way from C and also B sat between us, we (with C) thought of this way to chatted with each other and for discussion.
C:	Yes, this was our way of communication. We also used it to discuss and communicate in the last activity.
Q to C:	**Why didn't you open the WebQuest page to have a look but just opened the research report for your role?**
C:	According to the previous experience in such activity, I found that the report contained everything I needed. So, there was no need to open the WebQuest page. Besides, you explained everything about the activity already. So, I thought no need to read it again.
Q to all:	**A few classmates used to come to your group for talking separately to you? What did they talk about?**
B:	I can't remember clearly.
A:	The questions for my role were really difficult to answer. Besides, it's not easy to find the information for the questions. My classmates, who took the same role as mine, encountered the same problem and asked me how to find the information from the given Websites for the questions. They even didn't understand what the questions were asking.
C & D:	We can't remember clearly. It should be about asking how to find the information for the questions for their roles.
Q1 to all:	**What did you say about the Web materials provided by the WebQuest page?**
A:	Those for my role were absolutely difficult for reading, so much text in English and so much vocabulary. It's absolutely difficult to find the information I needed at the Websites of the two companies, so many options and links provided on each page, so many difficult English words. So, I needed to check for their meaning using the Yahoo Dictionary. Fortunately, with the help and hints given by the teacher, I could find some relevant information for the questions in my report. Simply speaking, those given Web materials were more difficult, for reading, than those given in the last activity.
C:	I found a useful online translator that could translate the entire Website into Chinese. Although the translation looked strange, I could at least understand the information. So, to me, the given Web materials were not difficult to understand. The questions for my role were also not too difficult.

D:	Yes, agree with C. The questions for my role were also not so difficult. After C introduced the online translator to me, I used it for those Websites with lots of English text. It's really interesting and useful. It could keep the layout of the Website unchanged but all English text became Chinese.
B:	It's okay. The questions for my role were not so difficult and the Websites for my role were also not so difficult.
Q2 to all:	**When you found any useful information for a guiding question, how would you record the information?**
A:	As I said, the questions for my role were so difficult and the Websites for my role were also not easy to read. Once I could find the relevant information for a question, it was too great. I just copied the information and put it in my report immediately.
B:	Since my questions and those Websites for my role were not so difficult, I could understand the information and tried to answer the questions using my own words. I thought it would be better than just copying and pasting the information.
D:	Yes, similar to B. After reading the information from the Websites, I used my own words to answer the first two questions. I also thought it's better. Since the information found at the Websites for another two questions contained much text and pictures, I could only copy the text and pictures and paste them in my report.
C:	Yes, same as D.
Q3 to all:	**Did you think about recording the source of the information?**
A, B, C:	No.
D:	Yes, I used to think about that. However, the answer for a question was from different Websites and I could see that all the Websites were listed at the bottom of the report. So, I thought I didn't need to record the Websites any more. I also thought about recording the Website of the online translator at the bottom of my report as it helped me so much, but I just forgot to do that.
Q4 to all:	**Did you find the information that you acquired in the WebQuest activity useful? Especially in helping you study other subjects?**
A, B, C, D:	Yes, useful.
Q5 to all:	**If so, what subjects or topics? How could the information help you?**
B:	Geography. I gained more information about the situation of environmental protection, especially the situation of paper recycling, in the U.S.

A: Yes, also Geography. I knew more about how two international big companies helped protect our environment.

C: Integrated Science. People just said recycling was good. Through finding the information for the questions, I learned more about the drawbacks of recycling paper and the drawbacks of recycling plastic.

D: Yes, also Integrated Science, but I learned more about how to recycle plastic and the steps of recycling plastic.

Q6 to all: **Were you informed that people from different background would hold different attitudes and viewpoints towards a real-world issue?**

A, B, C, D: Yes.

Q7 to all: **Why should we collect information from people with different viewpoints for considering such issue?**

A & B: Just like the issue in the last activity, it's complicated. So, we should consult more people with different viewpoints.

D: Yes, they (A & B) are correct. Since nearly all people need to go to supermarkets to buy things, the issue will affect many people. So, we should ask different people to collect their opinions and consider their opinions.

C: Yes, agree with D. Besides, the issue will affect our environment and cause pollution to the Earth. So, we need to collect information from more people with different background.

Q8 to all: **Would you make use of such way of handling a real issue to deal with other real-world issues with similar nature? If so, what real-world issues could you think about?**

C & D: Yes, we would use this way to handle some issues like whether the government should establish a law to enforce drivers to turn off the engines when their cars are idling. So, we can collect information from the government, drivers, people who don't drive, and pedestrians.

A & B: We can think about another issue. That is whether organic farming or inorganic farming should be adopted.

Target Group in G_d (*WQ2* Lesson 2)

Q9 to all: **How did your group reach a consensus on the answer to the question "Paper of Plastic"?**

D: At the beginning of the discussion, I suggested that paper bags should be used and I also gave my reasons.

C: After discussing for a short while, we all found that both paper and plastic bags had their drawbacks. Neither of them was good enough and neither of them should be chosen. So, we thought of an alternative

quickly. That's to use recycle bags.

A: So, we can say that we reached a consensus on the answer in a short time. After having discussion for a short period, we quickly had our conclusion and we all agreed that both paper bags and plastic bags were not good choices. We all agreed with the use of recycle bags.

D: So, to us, it's easy to reach a consensus.

Q10 to all: **In the process of reaching a consensus, as the four of you varied in your viewpoints on the topic, how did you integrate both agreement and disagreement, which came from different information sources supporting different viewpoints, for the topic?**

D: As A said, since we found that both paper and plastic bags had their drawbacks, we could come to the consensus in a few minutes. So, we didn't have much disagreement about the issue.

A: Yes, like what D said, once we had our conclusion, it seemed that we could get the problem solved as our new idea could include the advantages of using paper bags and plastic bags. Thus, there was no need to argue whether paper or plastic bags should be used, and also no disagreement.

C: Yes, as I can remember, there was nearly no argument and no disagreement in our discussion.

Q11 to all: **How did your group make an informed decision for the issue?**

A: As mentioned, first, we all agreed that both paper and plastic bags were not good. Then, we thought of our new idea. We decided to use recycle bags instead of paper or plastic bags. We thought our new idea could include the advantages of paper bags and plastic bags and it could also avoid those harmful effects caused by paper bags and plastic bags on the natural environment.

Q12 to all: **How did you plan what content should be included in the presentation?**

C: We followed what you told us to do by including the five main parts stated in the WebQuest page in our presentation.

Q13 to all: **How did you organize the content into a logical order?**

A: We thought the order of the five main parts stated in the WebQuest page was pretty good. So, we just followed that order.

Q14 to all: **Did you revise the presentation content, as well as its order, and the ways for presenting information based on your on-going discussion?**

A & D: Yes, a little. It's about the information and the content to be presented on

	the slides about our new idea and conclusion.
Q to A, B, C:	**In the middle of the lesson, why did you three often do something that's not related to the WebQuest activity, like visiting an instant messaging website, visiting a Web discussion forum, or surfing freely on the net?**
A:	After we have finished our discussion, we had our division of work. To make it simple, we agreed that the PowerPoint document was opened and edited by only person and the others would help to find pictures and other information.
D:	Yes, I was responsible for making all the slides in the PowerPoint document. I also summarized the main points of our discussion and typed them on the slides.
C:	Yes, in fact, I worked together with her (D) for summarizing the main points of our discussion and making the PowerPoint slides.
A & B:	We helped searching relevant pictures and information about recycle bags.

Target Group in G_d (*WQ2* Lesson 3)

Q15 to all:	**How did your group use the 15 minutes given by the teacher to prepare for the presentation?**
B:	Just like the previous WebQuest activity, we were well-prepared for the presentation before the lesson.
A:	We typed the speech for each of us and the order of speaking on the paper. All of us had the paper. Each of us had practice on his/her part before the lesson.
C:	Therefore, we just needed to go through the PowerPoint slides again. That would be okay.
Q to all:	**That's why all of you visited discussion forum and Xanga or surfed freely on the Web for the rest of the preparation time.**
A, B, C, D:	Yes, exactly.
Q to D:	**Why did you never prepare for the presentation during the preparation time but just visiting a Web discussion forum or surfing on the Web?**
D:	As they said, we were prepared before the lesson. So, I just took some free time.
Q16 to all:	**What do you say about the performance of your group for the presentation?**
C & D:	We were okay.
A & B:	Yes, it's okay. We could also answer the questions given by the classmates.

Q17 to all:	**What do you say about the feedback given by the teacher right after your presentation?**
C:	It's useful. You always pointed out what we should pay attention to and how we could be better.
A, B, D:	Yes, agree with C.

Target Group in G_e (*WQ2* Lesson 1)

Q to D:	**Why did you sometimes visit a Web discussion forum during the lesson?**
D:	Sorry, just for fun. As I took the easy role, I thought I could complete my report with no problem before the end of the lesson.
Q to A:	**Why did you read Yahoo News during the lesson?**
A:	My role was the most difficult one among the four. So, I just wanted to take a break, and then went ahead with my work.
Q to D:	**Why didn't you open the WebQuest page to have a look but just opened the research report for your role?**
D:	You had told us everything about the activity. Also, according to the past experience, the Word document contained everything we needed for that role. So, in order to save the time, I opened the Word document and worked on it directly.
Q to D:	**Why did you search for information about which bag, paper or plastic, was more environmentally friendly at Yahoo Knowledge?**
D:	I guessed there might be similar questions posted there. So, I wanted to have a look. I didn't use any information found there. I used the Websites given in the report to find information for the questions.
Q to D:	**Did you think about the accuracy or correctness of information/responses posted at Yahoo Knowledge?**
D:	They sounded accurate and correct. Some responses were quoted from newspapers or other Websites.
Q1 to all:	**What did you say about the Web materials provided by the WebQuest page?**
B:	In this activity, the links for my role were so clear. It's easy for me to know which links I should check for answering which questions.
D:	Yes, agree with B. Although all the given Websites were still in English, the links for my role looked clear. I could know which ones were useful for which questions. Also, the questions for my role were not very difficult for answering.
C:	There was still so much English text for reading. I needed to check the meaning of a number of English words from time to time. It would be so good if the Websites contained more pictures.
A:	It's not case for my role. I didn't agree with them (B, C & D). As I said, my role was the most difficult one among the four. The questions were difficult to answer. It was also difficult to find the required information from the given Websites. I needed to ask the teacher for help several

	times, or else I might not be able to complete the report.
Q2 to all:	**When you found any useful information for a guiding question, how would you record the information?**
A:	It was difficult to find information at the given Websites for my questions. So, once I found the relevant information at a Webpage, I copied the information and kept it in my report at once.
B, C, D:	The questions and the Websites for us were not so difficult. So, we tried to read the information and answered the questions by ourselves. For a few questions, if the information found for the questions was long, we just copied the information and pasted it in the reports.
Q3 to all:	**Did you think about recording the source of the information?**
A, B, C, D:	No.
Q4 to all:	**Did you find the information that you acquired in the WebQuest activity useful? Especially in helping you study other subjects?**
A, B, C, D:	Yes, useful.
Q5 to all:	**If so, what subjects or topics? How could the information help you?**
A:	Geography about environmental protection. After looking for the information for my questions, I just found that those international big companies should act as models in reducing the use of non-renewable fossil fuels and making use of renewable resources so as to protect our environment.
B:	Integrated Science. It helped me to learn more about how to recycle plastic bottles and plastic bags.
C:	Yes, similar to B.
D:	Also Geography. Through finding information for the questions, I knew the exact figures about how the use of paper would affect our environment and the figures about how paper recycling could help saving our environment.
Q6 to all:	**Were you informed that people from different background would hold different attitudes and viewpoints towards a real-world issue?**
A, B, C, D:	Yes.
Q7 to all:	**Why should we collect information from people with different viewpoints for considering such issue?**
B:	Usually, such issue will affect many people. In such case, we need to collect information from many people. When we collect information from many people, there will be different kinds of people or people with

different viewpoints or thoughts.

A: Yes, agree with B.

D: I think the point is that the issue is not our own matter. It's the matter of many people. So, in order to make a good decision, we need to collect information from different people. They may give us their opinions according to their needs.

C: Yes, agree with C.

Q8 to all: **Would you make use of such way of handling a real issue to deal with other real-world issues with similar nature? If so, what real-world issues could you think about?**

B: Yes, I would use it to consider whether the government should require poultry retailers to surrender their license or permission to sell live poultry. In such case, we may collect information from poultry retailers, government officials, citizens who often buy live poultry, and those who seldom buy live poultry.

A: Yes, similar to A.

D: I would use this way to consider whether the government should prohibit smoking in all public areas. So, we may ask different kinds of people, like those who smoke, those who don't smoke, those who usually have activities in public areas, those who seldom go to public areas, etc.

C: Yes, agree with C.

Target Group in G_e (*WQ2* Lesson 2)

Q9 to all: **How did your group reach a consensus on the answer to the question "Paper of Plastic"?**

B: I was the Plastic Advocate. So, at the beginning, I tried to convince C and D to accept that paper bags should be used.

D: I was the Paper Advocate. I opposed what she (B) said and argued with her at the beginning.

C: I was the Recycling Pessimist. I opposed both B and D. So, I disagreed with what she (B) said and I also disagreed with what he (D) said.

B: After discussing for a while, we found that C was correct. We found that both paper bags and plastic bags had their problems. Most importantly, both of them were not good for our environment. Therefore, we needed to think of an alternative instead of getting stuck in paper or plastic bags. Since then, we shifted our discussion to figuring out a good alternative. The teacher also helped us to think about the alternative.

D: Yes, we can say that we reached a consensus after we found that both paper and plastic bags were not good and we agreed that we needed to think of an alternative. After that, we just worked together on thinking of

	the alternative and focused on its details. The teacher also reminded us some practical issues that we had to pay attention.
Q10 to all:	**In the process of reaching a consensus, as the four of you varied in your viewpoints on the topic, how did you integrate both agreement and disagreement, which came from different information sources supporting different viewpoints, for the topic?**
B:	Yes, at the beginning, we (B, C & D) argued with each other and had no conclusion until we agreed that both paper and plastic bags were not good. Since then, as I could remember, we had no argument and no disagreement. We thought of the alternative together and, then, we thought of the practical details of the alternative together.
C & D:	Yes, that's right.
Q11 to all:	**How did your group make an informed decision for the issue?**
B:	We followed the direction given by the teacher that was to include the advantages of paper bags and plastic bags and to avoid the disadvantages of them. So, we thought our choice could satisfy this requirement and we thought we had made a good decision.
Q12 to all:	**How did you plan what content should be included in the presentation?**
B:	We followed the requirement stated in the WebQuest page by making five slides in our presentation. The first four were about the advantages and disadvantages of using paper bags and plastic bags. The last slide was about our choice.
Q13 to all:	**How did you organize the content into a logical order?**
B:	As mentioned, we followed the requirement given in the WebQuest page. The first four slides were about the pros and cons of paper and plastic bags and the last one was about our choice.
Q14 to all:	**Did you revise the presentation content, as well as its order, and the ways for presenting information based on your on-going discussion?**
A, B, C:	Yes, we worked together for making the PowerPoint slides. We selected the key points from two research reports and discussed together which of them should be put on the first four slides. We also discussed together about what should be presented on the last slide. We revised the content of the last slide for a few times.
Q to all:	**In the middle of the lesson, why did you three visited a Web discussion forum for about 10 minutes instead of working on your presentation?**

D:	Just for relaxing. We did work hard on preparing the presentation. After the end of the lesson, we kept working in the computer room for about 30 minutes until we completed the PowerPoint document.

Target Group in G_e (*WQ2* Lesson 3)

Q15 to all:	**How did your group use the 15 minutes given by the teacher to prepare for the presentation?**
A & B:	We had a rehearsal of our presentation by reading the content on each slide once. Besides, we revised the PowerPoint document in order to make it looked better.
C & D:	Yes.
Q16 to all:	**What do you say about the performance of your group for the presentation?**
B:	It's still not good. I think we may need more practice.
D:	As I said, we were so nervous to present in English in front of our classmates.
C:	It was not good.
Q17 to all:	**What do you say about the feedback given by the teacher right after your presentation?**
B:	Your feedback was useful to us. You pointed out our problems but I think the point is that we don't have enough practice. If we can have more practice, we may do better on the problems you pointed out.
D:	Yes, strongly agree with B.

Appendix 30c: Interview Transcripts with Five Case Groups Concerning *WQ3*

Target Group in G_a (*WQ3*)

Q1 to all:	**Upon completion of the WebQuest (i.e. after comparing several aspects of life in four different countries), can you determine whether living in another country is better?**
C:	Yes, living in Canada is better. The area of Canada is bigger than that of China and the number of people in Canada is much less than that of China. Her average life expectancy is also high than that of China.
A & B:	Yes, totally agree with C. In our report, we also compared China with Canada. We also think living in Canada is better.
Q2 to all:	**Did you find the online resources provided in the WebQuest useful?**
A, B, D:	Yes, useful.
C:	Very useful.
Q3 to all:	**Could you acquire some basic knowledge or some basic understandings about other countries through exploring in the CIA database?**
A & B:	Yes.
C & D:	Yes. Although we could not understand most of the data items shown on the page for a country, it's so interesting to explore in the CIA database by selecting different countries and looking at their information.
Q4 to all:	**So, do you think you could apply such knowledge or online resources to the study of other subjects?**
A, B, C, D:	Yes.
Q5 to all:	**If so, what subjects or topics?**
A & B:	Geography.
D:	Geography and Integrated Humanities.
C:	I think not only the two subjects, Geography and Integrated Humanities, but also we could gain more general knowledge by knowing about more different countries in the world.
Q6 to all:	**Through the WebQuest activity, you experienced the use of tables and graphs for facilitating data comparison. Would you apply such way to perform similar tasks for data analysis?**
A & B:	Yes.
C & D:	Yes, we will. It's easier to compare numbers or data by putting them into a table or making a graph.

Q7 to all:	**You also experienced the use of graphs for demonstrating points or supporting explanation. Would you apply such way to perform similar tasks for data explanation?**
A & B:	Yes.
C & D:	Yes. Like those graphs for this WebQuest, we just thought the graphs were really clear enough to display the comparison of the four countries. So, there was no need to describe them in text.
Q8 to all:	**In creating the graphs, did you find that some graphs demonstrate a better visual aid then others?**
A, B, C:	Yes.
D:	Yes, such as bar chart is more suitable than line chart for showing the comparison of the four countries.
Q9 to all:	**Did you gain a new understanding in which ways graphs can demonstrate a point better than words?**
C & D:	Yes, like what we said, we just though the graphs were already clear enough to show the comparison of the four countries. Why should we still need to describe them using text?
Q10 to all:	**Would you pay attention to these when you make use of graphs to deal with problems with similar nature in the future?**
A & B:	Yes.
C & D:	Yes, it's better to use bar charts for showing comparison and, sometimes, graphs can show an idea better than words.
Q11 to all:	**The crowdedness of a country could not be found from the CIA database. So, how could you make an approximation of such item using the existing data items in the data table?**
C & D:	The teacher gave us the hints already, divide population by area. So, if the country is crowded, it means less area but more people. The result would be a bigger number. However, if the country is not crowded, it means more area but less people. The result would be a smaller number.
Q12 to all:	**How did you answer the first two questions for discussion? In other words, how did you find the correlation between the data items mentioned in the questions?**
C & D:	Just looked at the two columns in the table. If the numbers are high in one column and the corresponding values are also high in another column, or the numbers are low in one column and the corresponding values are also low in another column, they have correlation.
A & B:	Yes, same as C and D.
Q13 to all:	**How did you answer the last two questions for discussion as the two items of information required were not provided in the**

activity?

A & B: We didn't know how to answer these two questions. So, we just answered them by common sense.

C: We (C and D) couldn't complete these two questions in the lesson. So, I completed them at home. It's not so difficult. We could infer average income from literacy rate for Q3 since I thought average income and literacy rate were related. Then, we could make use of the answer of Q3 to infer the answer of Q4.

Target Group in G_b (*WQ3*)

Q1 to all:	**Upon completion of the WebQuest (i.e. after comparing several aspects of life in four different countries), can you determine whether living in another country is better?**
B:	Yes, it seems that living in New Zealand and Canada is so comfortable since their crowdedness is very low and also their average life expectancy is above 80.
C & D:	Yes, similarly, we also think living in the United States is better.
Q2 to all:	**Did you find the online resources provided in the WebQuest useful?**
A, B, C, D:	Yes, useful.
Q3 to all:	**Could you acquire some basic knowledge or some basic understandings about other countries through exploring in the CIA database?**
B:	Yes, we liked exploring in the CIA database by looking at different countries, so that we could learn more about different countries.
C:	Yes, I enjoyed checking the information of different countries at the CIA database. I could find lots of information about a country there. It's very useful. I will use this Website in the future if I need to do any projects that require gathering information about different countries.
Q4 to all:	**So, do you think you could apply such knowledge or online resources to the study of other subjects?**
A, B, C, D:	Yes.
Q5 to all:	**If so, what subjects or topics?**
A & B:	Geography.
D:	Yes, also Geography.
C:	I think not only Geography but also Integrated Humanities. Besides, as I said, these resources are useful for any other projects that require gathering information of different countries.
Q6 to all:	**Through the WebQuest activity, you experienced the use of tables and graphs for facilitating data comparison. Would you apply such way to perform similar tasks for data analysis?**
A & B:	Yes.
C & D:	Yes, we will. It is a good way to use tables and graphs to compare data. It's so clear and people can see the result easily.
Q7 to all:	**You also experienced the use of graphs for demonstrating points or supporting explanation. Would you apply such way to perform similar tasks for data explanation?**
A & B:	Yes.

C & D:	Yes, sometimes, using a graph is easier than using words to explain or show the ideas.
Q8 to all:	**In creating the graphs, did you find that some graphs demonstrate a better visual aid then others?**
A, B, C, D:	Yes.
Q9 to all:	**Did you gain a new understanding in which ways graphs can demonstrate a point better than words?**
C & D:	Yes, as we said, using graphs are easier than using words to show the ideas. It's also clear and people can see the result easily.
Q10 to all:	**Would you pay attention to these when you make use of graphs to deal with problems with similar nature in the future?**
A, B, C, D:	Yes, of course, we will.
Q11 to all:	**The crowdedness of a country could not be found from the CIA database. So, how could you make an approximation of such item using the existing data items in the data table?**
B:	We can calculate crowdedness by dividing population by area.
Q12 to all:	**How did you answer the first two questions for discussion? In other words, how did you find the correlation between the data items mentioned in the questions?**
A & B:	We used our common knowledge to determine the correlation between the two data items and also checked the numbers in the two corresponding columns of the data table.
C & D:	Yes, same as A and B.
Q13 to all:	**How did you answer the last two questions for discussion as the two items of information required were not provided in the activity?**
A & B:	We attempted to infer the required information based on the knowledge we had about those countries.
C & D:	Yes, same as A and B.

Target Group in G_c (*WQ3*)

Q1 to all:	**Upon completion of the WebQuest (i.e. after comparing several aspects of life in four different countries), can you determine whether living in another country is better?**
A:	As we could see from our data, living in another country was nothing special. For example, according to our data, it seemed that France was only a little bit better than China.
D:	Yes, agree with A. According to our data, both Germany and Japan were crowded. So, we didn't think living there was better.
Q2 to all:	**Did you find the online resources provided in the WebQuest useful?**
C & D:	Yes, useful.
A & B:	So useful.
Q3 to all:	**Could you acquire some basic knowledge or some basic understandings about other countries through exploring in the CIA database?**
A & B:	Yes. It's so interesting to select different countries and check their pages at the CIA database. However, we could not understand most of the data items shown on a page but, at least, we could know the names of many counties. We just found that there were so many countries in the world and we just knew too little about other countries. We even hadn't heard about their names.
D:	Yes, strongly agree with A and B.
Q4 to all:	**So, do you think you could apply such knowledge or online resources to the study of other subjects?**
A, B, C, D:	Yes.
Q5 to all:	**If so, what subjects or topics?**
C & D:	Geography.
A & B:	We think those online resources are not only useful for studying Geography but also useful for Integrated Humanities.
Q6 to all:	**Through the WebQuest activity, you experienced the use of tables and graphs for facilitating data comparison. Would you apply such way to perform similar tasks for data analysis?**
A & B:	Yes, of course, we will. It's really a good idea to use tables and graphs to show comparison. It's so clear. It can let people see the comparison clearly, such as which one is the highest and which is the lowest.
C & D:	Yes, agree with A and B, and same as A and B.
Q7 to all:	**You also experienced the use of graphs for demonstrating points or supporting explanation. Would you apply such way**

to perform similar tasks for data explanation?

A & B: Yes. Using graphs for displaying or explaining ideas is also a good idea. I think, sometimes, it's even better than using words to explain or illustrate. People can get the idea in one second by reading the graphs but no need to read and understand many words.

C & D: Yes, agree with A and B, and same as A and B.

Q8 to all: **In creating the graphs, did you find that some graphs demonstrate a better visual aid then others?**

A: Yes, we (A and B) found that bar charts were the most suitable for displaying the comparison of the four countries. So, we used bar charts for all the graphs in our report.

D: Yes, we (C and D) also found that bar charts were more suitable than other charts in this activity. So, we also used bar charts for all the graphs in our report.

Q9 to all: **Did you gain a new understanding in which ways graphs can demonstrate a point better than words?**

A: Yes, we mentioned about this already. Using graphs to explain some points is even more effective than using words to explain or illustrate. People can get or understand the point in one second by looking at the graphs.

Q10 to all: **Would you pay attention to these when you make use of graphs to deal with problems with similar nature in the future?**

A & B: Yes, we will try to use more graphs to demonstrate a point or an idea in other projects.

C & D: Yes, we will do this as well.

Q11 to all: **The crowdedness of a country could not be found from the CIA database. So, how could you make an approximation of such item using the existing data items in the data table?**

A: It's easy. We can calculate crowdedness using population and area.

D: Yes, same as A.

Q12 to all: **How did you answer the first two questions for discussion? In other words, how did you find the correlation between the data items mentioned in the questions?**

B: We could find the correlation by looking at the values of the two columns in the data table. If a country had both high values in the two columns or it had both low values in the two columns, the two items should have correlation.

D: We (C and D) couldn't find the correlation using the data we had collected. So, we just used common sense to determine the correlation of

the two items.

Q13 to all: **How did you answer the last two questions for discussion as the two items of information required were not provided in the activity?**

A: Among the items in the data table, average income should have relation with literacy rate. So, we could look at this item to infer average income. Also, we could make use of the conclusion of Q3 to infer the required item for Q4.

C & D: We used the same method as A for answering these two questions.

Target Group in G_d (*WQ3*)

Q1 to all:	**Upon completion of the WebQuest (i.e. after comparing several aspects of life in four different countries), can you determine whether living in another country is better?**
A & B:	No, it seems that living in another country may not be better as Japan and Korea are so crowded, although their literacy rate and average life expectancy are all higher than those of China.
C & D:	Yes, agree with A and B. England and Japan are also so crowded.
Q2 to all:	**Did you find the online resources provided in the WebQuest useful?**
A, B, C, D:	Yes, useful.
Q3 to all:	**Could you acquire some basic knowledge or some basic understandings about other countries through exploring in the CIA database?**
B:	Yes, at least we knew more about the four countries we chose in the activity.
D:	Yes, although all the information was in English and we could not understand many items on a page, we liked checking the pages for different countries.
Q4 to all:	**So, do you think you could apply such knowledge or online resources to the study of other subjects?**
A, B, C, D:	Yes.
Q5 to all:	**If so, what subjects or topics?**
A & B:	Geography.
D:	Yes, also Geography.
Q6 to all:	**Through the WebQuest activity, you experienced the use of tables and graphs for facilitating data comparison. Would you apply such way to perform similar tasks for data analysis?**
A & B:	Yes.
D:	Yes, I will. I think using tables and graphs is a good way to compare data.
Q7 to all:	**You also experienced the use of graphs for demonstrating points or supporting explanation. Would you apply such way to perform similar tasks for data explanation?**
A & B:	Yes.
D:	Yes, I will. I also think using graphs is a good way to show a point or explain a point. People can read the graphs and then understand the point easily. So, there is no need to describe or explain using a lot of words.
Q8 to all:	**In creating the graphs, did you find that some graphs demonstrate a better visual aid then others?**

C & D: Yes. For example, pie charts are not suitable for comparing the four countries.

A & B: Yes, we think bar charts are more suitable for comparing the four countries. Therefore, we used only bar charts in our report.

Q9 to all: **Did you gain a new understanding in which ways graphs can demonstrate a point better than words?**

D: Yes, I think it's easier to understand a point by looking at graphs than reading words.

Q10 to all: **Would you pay attention to these when you make use of graphs to deal with problems with similar nature in the future?**

C & D: Yes, we will.

A & B: Yes, especially pay attention to using suitable graphs for suitable tasks.

Q11 to all: **The crowdedness of a country could not be found from the CIA database. So, how could you make an approximation of such item using the existing data items in the data table?**

B: It could be found by dividing population by area.

D: Yes, you gave us the hint in the lesson.

Q12 to all: **How did you answer the first two questions for discussion? In other words, how did you find the correlation between the data items mentioned in the questions?**

D: Just looked at the values of the two columns. If a country had a high value in one column and she also had a high value in another column, the two columns should have correlation. However, it's interesting that, for the second question, Japan and England had high values for both crowdedness and average life expectancy. It's not normal. If crowdedness is high, average life expectancy should be low. So, we may just say they may have some correlation. Besides, we should not just use crowdedness to determine average life expectancy. We should also consider other factors, like the development of a country.

A: Yes, similar to D for the first question. We encountered the same problem for the second question. Japan and Korea had both high values in the two columns. So, we could only say there might be some correlation between the two columns. I agree with what D said. We should also consider other factors for average life expectancy but not just looking at crowdedness.

Q13 to all: **How did you answer the last two questions for discussion as the two items of information required were not provided in the activity?**

B: We thought average income should be related to literacy rate. So, we could use literacy rate to infer average income.

A: Yes, similar reason for the last question.

C: Yes, similar to A and B. We also thought that literacy rate should be related to average income and average income should be related to number of people owning computers.

Target Group in G_e (*WQ3*)

Q1 to all:	**Upon completion of the WebQuest (i.e. after comparing several aspects of life in four different countries), can you determine whether living in another country is better?**
B:	Yes, living in Canada is better. Canada is big. It's bigger than China but it has much less people than China. So, it should be so comfortable to live in Canada.
D:	Yes, agree B. We (C and D) found that living in the United States was better. The United States is also bigger than China and has much less people than China. So, we also thought that it should comfortable to live there.
Q2 to all:	**Did you find the online resources provided in the WebQuest useful?**
A, C, D:	Yes, useful.
B:	Very useful, we could find almost any information about a country at the CIA Website.
Q3 to all:	**Could you acquire some basic knowledge or some basic understandings about other countries through exploring in the CIA database?**
B:	Yes. After the activity, I found that I knew so little about other countries in the world. I even hadn't heard about many of the countries listed in the CIA database.
D:	Yes, agree with B. At least, I could learn the names of many countries and their locations, and know a little about those countries.
Q4 to all:	**So, do you think you could apply such knowledge or online resources to the study of other subjects?**
A, B, C, D:	Yes.
Q5 to all:	**If so, what subjects or topics?**
A & B:	We think mainly Geography.
D:	Yes, also Geography but I think not only for that subject but also gaining more general knowledge about different countries.
Q6 to all:	**Through the WebQuest activity, you experienced the use of tables and graphs for facilitating data comparison. Would you apply such way to perform similar tasks for data analysis?**
B:	Yes, it's so clear to compare data using tables and graphs.
D:	Yes, I will. It's easy to check those high values and those low values in a graph.
Q7 to all:	**You also experienced the use of graphs for demonstrating points or supporting explanation. Would you apply such way**

to perform similar tasks for data explanation?

A & B: Yes.

D: Yes, I will. Sometimes, it's difficult to explain a point using words but it would be effective to show the point using a graph. It can allow people to get the idea easily.

Q8 to all: **In creating the graphs, did you find that some graphs demonstrate a better visual aid then others?**

B: Yes, some graphs are not suitable for certain tasks.

D: Yes. We (C and D) thought bar chart was the most suitable one for comparing the countries. That's why we used bar charts for all the graphs in our report.

Q9 to all: **Did you gain a new understanding in which ways graphs can demonstrate a point better than words?**

B: Yes, just like comparing the four countries. It's easier to show the comparison using a graph than describing it using words.

Q10 to all: **Would you pay attention to these when you make use of graphs to deal with problems with similar nature in the future?**

C & D: Yes, we will.

A & B: Yes, graph is a useful tool to demonstrate comparison. We will make good use of graphs in other projects.

Q11 to all: **The crowdedness of a country could not be found from the CIA database. So, how could you make an approximation of such item using the existing data items in the data table?**

B: It's not a problem. You gave us hint on using population and area to calculate crowdedness.

D: Yes, divide population by area to get a number. A larger number means more crowded.

Q12 to all: **How did you answer the first two questions for discussion? In other words, how did you find the correlation between the data items mentioned in the questions?**

A: I used common sense to infer whether the two data items were correlated. Like, high literacy rate should lead to high average life expectancy. On the contrary, high crowdedness should lead to low average life expectancy. Then, I checked the data in my report to support my inference.

C & D: Yes, similar to A for answering the first question but, for the second question, we couldn't find any correlation as the values in the two columns did not show that they were correlated.

Q13 to all: **How did you answer the last two questions for discussion as**

the two items of information required were not provided in the activity?

B: We (A and B) thought the required items for the two questions were all related to literacy rate and we had our reasons and explanation in our report. So, we could use literacy rate to infer the two items.

C & D: Yes, same as B.

Appendix 30d: Interview Transcripts with Five Case Groups Concerning *WQ4*

Target Group in G_a (*WQ4*)

Q1 to all:	**How did you answer the two questions at the beginning of the *Process* section?**
B:	Just found some related information for the questions from the given websites.
C & D:	Yes, similar to B.
Q2 to all:	**When you found any useful information for the two questions, how would you record the information?**
D:	Simply copied the information from the Web page and pasted the words in my report.
B:	Yes, same as D.
C:	I read the information and tried to understand it. After that, I tried to answer the questions by myself.
Q3 to all:	**Did you think about recording the source of the information?**
A, B, C, D:	No.
Q4 to all:	**Did you find the online resources provided in the WebQuest useful?**
A, C, D:	Yes, useful.
Q5 to all:	**Could you acquire some basic knowledge or some basic understandings about healthy fast food?**
A & B:	Yes.
C & D:	Yes. Especially, we could know the exact calories and grams of fat in various food items that we could buy in those fast food restaurants. It's interesting to check the calories and grams of fat of different food items at the given Website.
Q6 to all:	**So, do you think you could apply such knowledge or online resources to looking at other issues with similar nature?**
B, C, D:	Yes.
Q7 to all:	**If so, what issues or problems?**
C:	I think we can use those online resources to calculate how many calories and grams of fat we have taken after having a meal in an American fast food restaurant.
Q8 to all:	**Through the WebQuest activity, you experienced the use of tabular form and chart to represent and analyze data. Would you apply such way to perform similar tasks for data**

	representation and analysis?
A & B:	Yes.
C & D:	Yes, we will. It's so tidy to put a lot of numbers in a table and then show it together with a chart in the report.
Q9 to all:	**How did you answer the first question for discussion? In other words, how did you figure out some common characteristics of American fast food items?**
D:	First, by common sense, we all knew that American fast food was unhealthy. Then, I could find some real data in my report to support this point. I could also find from the given Websites the total calories that we need for one day and then compared the total calories we need for one day with the total calories we will take after having one meal in such restaurants.
A:	Just like what D said, everybody knows that American fast food is unhealthy and our data also showed that such food contained high calories and high grams of fat.
Q10 to all:	**How did you answer the second question for discussion? In other words, how did you find the correlation between the two data items mentioned in the question?**
D:	I looked at the four tables in the Excel file and found that certain food items with high calories but simply no fat and certain food items with high calories but just low grams of fat.
A:	I also looked at the four tables for the four restaurants but found that certain food items with high calories and also high grams of fat.
Q to B:	**While you were looking for the information for the two questions at the beginning of the report, why did you sometimes visited YouTube?**
B:	Just for fun.
Q to B:	**Besides, while your partner was making the graphs and working on the two questions for discussion, why did you just surf freely on the Web instead of working together with him?**
B:	He just told me that he was able to complete the rest of the work. So, I could be free.

Target Group in G_b (*WQ4*)

Q1 to all:	**How did you answer the two questions at the beginning of the *Process* section?**
B:	I just browsed the given Websites and tried to find some useful points for the two questions. However, those websites were all in English with lots of words. So, it's not easy for me to understand the content. I needed to check the meaning of some English words from time to time.
D:	Yes, similar to B by browsing the given Websites for finding the answers. I encountered the same problem as B. The information was all in English. I needed to check the meaning of a number of English words.
Q to D:	**Besides the given Web materials, you visited the Website "london-eating.co.uk", which was found by yourself, for finding information. Why did you browse that Website?**
D:	I used to be in London last year. At that time, I found that Website was so useful. I could also remember that the Website provided some information about healthy eating. That's why I visited that Website.
Q2 to all:	**When you found any useful information for the two questions, how would you record the information?**
B:	I tried hard to understand the content of the given Web materials because I wanted to use my own words to answer the questions. That's why I needed to look up so many English words in the Yahoo Dictionary.
D:	Same as B. After reading the information, I tried to answer the questions in simple words.
Q3 to all:	**Did you think about recording the source of the information?**
B & D:	No.
Q4 to all:	**Did you find the online resources provided in the WebQuest useful?**
A:	The Calorie Counter was interesting and so useful.
C:	Agree with A. Another one, the FastFood.com Calorie Guide, was also useful. It provided even more detailed information for more restaurants, such as Pizza Hut, which could not be found in the Washington Post Fast Food Calorie Counter.
Q5 to all:	**Could you acquire some basic knowledge or some basic understandings about healthy fast food?**
A, B, D:	Yes.
C:	Yes, especially, I liked checking different food items at different restaurants and then seeing their calories and grams of fat. It's so interesting.
Q6 to all:	**So, do you think you could apply such knowledge or online**

	resources to looking at other issues with similar nature?
A, B, C, D:	Yes.
Q7 to all:	**If so, what issues or problems?**
D:	At least, we can make use of those websites to calculate how many calories and grams of fat we take everyday or to check whether our favorite food items contain too many calories or grams of fat.
Q8 to all:	**Through the WebQuest activity, you experienced the use of tabular form and chart to represent and analyze data. Would you apply such way to perform similar tasks for data representation and analysis?**
A & B:	Yes.
C & D:	Yes, we will. It's a good way to show many numbers in different tables. It looks clear and tidy.
Q9 to all:	**How did you answer the first question for discussion? In other words, how did you figure out some common characteristics of American fast food items?**
B:	I just looked at the data in the report again and also tried to find some key points about American fast food from the given Web materials. Later on, after you taught me how to answer the question. I knew that I should only focus on the data collected in the report.
C & D:	Similar to B, we also attempted to find some related information about American fast food from the given Web materials but you told us to focus on the data we had collected. So, we looked at the tables in our report for evidence.
Q10 to all:	**How did you answer the second question for discussion? In other words, how did you find the correlation between the two data items mentioned in the question?**
A:	At the beginning, I looked at the table showing the total calories and the total grams of fat of each restaurant but, later, the teacher told me that I should not look at that table. So, I checked the other four and revised my answer.
C & D:	Yes, similar case for us. The teacher pointed out that we should not look at the table at the bottom. So, we switched to the other four.
Q to D:	**While your partner was working on the second question for discussion, why did you visited Yahoo News instead of working together with her?**
D:	We discussed the question together and we agreed that she was responsible for typing our discussion result in the report.

Target Group in G_c (*WQ4*)

Q1 to all:	**How did you answer the two questions at the beginning of the *Process* section?**
A:	I answered the first question using my own knowledge. For the second question, I looked for useful information from the given websites.
D:	At the beginning, I tried to search for some useful information at Yahoo since all the given websites were in English. I didn't want to read so much information in English. Later on, I found a useful online translator that could translate an entire website into Chinese. It could help me understand the content of the given Web materials. Therefore, I read the given websites and tried to find some points for the questions.
Q2 to all:	**When you found any useful information for the two questions, how would you record the information?**
A:	I answered the first question using my own knowledge. I looked for useful information from the given websites for the second question and then I expressed the answer using my own words based on the information I found.
D:	After reading the given websites in Chinese, I tried to translate those useful points into English for answering the two questions, except the lower half for Question 2. It seemed that I spent too much time on answering Question 1 and searching for information at Yahoo. So, when I was in the middle of answering Question 2, my partner had finished her part. So, I had to be quick. So, for the rest of the answer to Question 2, I just copied and pasted the text from the website to the report.
Q3 to all:	**Did you think about recording the source of the information?**
A & D:	No.
Q4 to all:	**Did you find the online resources provided in the WebQuest useful?**
C:	Useful.
A & B:	Yes, useful.
Q5 to all:	**Could you acquire some basic knowledge or some basic understandings about healthy fast food?**
A & B:	Yes, at least we knew which food items from a fast food restaurant were healthy and which of them were not healthy.
D:	Yes, agree with A and B.
Q6 to all:	**So, do you think you could apply such knowledge or online resources to looking at other issues with similar nature?**
A, B, C, D:	Yes.
Q7 to all:	**If so, what issues or problems?**

A:	I think we can use those online resources to check whether our eating habit is healthy and also help our friends check whether their eating habits are healthy. We can also use them to check whether we take too many calories a day, like whether it exceeds the maximum daily value for our body.
B & D:	Yes, agree with A.
Q8 to all:	**Through the WebQuest activity, you experienced the use of tabular form and chart to represent and analyze data. Would you apply such way to perform similar tasks for data representation and analysis?**
A & B:	Yes, we think it's a good idea to organize those numbers in tables and then compare them using a chart. It looks tidy and it can let people see the data and the comparison clearly.
C & D:	Yes, agree with A and B, and same as A and B.
Q9 to all:	**How did you answer the first question for discussion? In other words, how did you figure out some common characteristics of American fast food items?**
A:	I referred to the table showing the total calories and the total grams of fat of each restaurant and calculated the average calories and average grams of fat of having a meal in the four chosen restaurants. The two numbers were so high. That meant their food was fatty and unhealthy.
C & D:	Yes, similar to A. We also looked at that table and considered the total calories and grams of fat that we would take for a lunch in such restaurant.
Q10 to all:	**How did you answer the second question for discussion? In other words, how did you find the correlation between the two data items mentioned in the question?**
B:	At the beginning, I looked at the two graphs (showing the total calories and the total grams of fat of the four chosen restaurants respectively) and found that the orders of the four restaurants in the two graphs were the same. So, I thought the two data items should have correlation. Later on, you told me that it's not a right way to look at the two graphs. So, I checked the numbers in the four tables for the four restaurants again.
C & D:	We had the same case as B. First, we looked at the two graphs and found the two orders were the same. Later on, you told us that's wrong. Then, we looked at the four tables for the four restaurants one by one.

Target Group in G_d (*WQ4*)

Q1 to all:	**How did you answer the two questions at the beginning of the *Process* section?**
A:	Mostly, used my own knowledge and also used the information found at the given websites to answer the questions.
C:	Mostly, I used the information found from the given Web materials to answer the questions.
Q2 to all:	**When you found any useful information for the two questions, how would you record the information?**
C:	Copied the useful words or paragraphs from the Web page and then pasted them in my report.
A:	I liked understanding the information and then writing the answer in simple words. Besides, mostly, I used my own knowledge to answer the questions. I needed to understand the information and made it as part of my answer.
Q3 to all:	**Did you think about recording the source of the information?**
A & C:	No.
Q4 to all:	**Did you find the online resources provided in the WebQuest useful?**
A, B, C, D:	Yes, useful.
Q5 to all:	**Could you acquire some basic knowledge or some basic understandings about healthy fast food?**
C & D:	Yes, at least we knew which American fast food restaurant provided more healthy food items.
A & B:	Yes, agree with C & D. We were also aware that the ingredient and the cooking method were important as well.
Q6 to all:	**So, do you think you could apply such knowledge or online resources to looking at other issues with similar nature?**
A, B, C, D:	Yes.
Q7 to all:	**If so, what issues or problems?**
C:	I think we can use those online resources to examine the food we take everyday. We can also use them to check the amount of calories and grams of fat we get everyday.
Q8 to all:	**Through the WebQuest activity, you experienced the use of tabular form and chart to represent and analyze data. Would you apply such way to perform similar tasks for data representation and analysis?**
A & B:	Yes.
C:	Yes, I think it's a good way to represent those numbers using tables and to

	analyze them using a chart.
Q9 to all:	**How did you answer the first question for discussion? In other words, how did you figure out some common characteristics of American fast food items?**
B:	It's easy to tell. Just looked at the table showing the total calories and the total grams of fat of the four restaurants. The numbers were all high. That meant we would get many calories and grams of fat by just having one meal.
D:	Yes, same as B.
Q10 to all:	**How did you answer the second question for discussion? In other words, how did you find the correlation between the two data items mentioned in the question?**
C & D:	According to the help given by the teacher, we looked at all the food items in the four tables for the four restaurants and found that, for most of the food items with high calories, they also contained high grams of fat.
A & B:	Yes, we also used similar way to answer the question.

Target Group in G_e (*WQ4*)

Q1 to all:	**How did you answer the two questions at the beginning of the *Process* section?**
A:	At the beginning, I tried to search for information for the two questions. After trying a number of times using different regional portals of Yahoo, I found a detailed report about healthy fast food. The information in the report was well organized. The report seemed useful for answering the questions. I used some information found in the report to answer the two questions.
D:	I used my own knowledge and understandings to answer the questions.
Q to A:	**Why didn't you make use of the pre-selected Web materials for answering the questions but just searching for related information on your own?**
A:	I thought the two questions were just common questions. It would be easy to find the answers on the Web. So, I just tried. Besides, I thought the information found by myself was easier to read and understand.
Q to D:	**Why didn't you make use of the pre-selected Web materials for answering the questions?**
D:	I thought I knew the answers of the two questions. So, there's no need to find information from those websites.
Q2 to all:	**When you found any useful information for the two questions, how would you record the information?**
D:	I used my own knowledge to answer the questions.
A:	I didn't copy information directly from the report that I found on the Web. Instead, I read the report page by page. Then, I attempted to integrate the useful points found in the report into my answer and I wrote the answer by myself.
Q3 to all:	**Did you think about recording the source of the information?**
D:	No.
A:	Yes, I used to think about writing down that the information was from the report but didn't know how to do and how to write.
Q4 to all:	**Did you find the online resources provided in the WebQuest useful?**
B, C, D:	Useful.
Q5 to all:	**Could you acquire some basic knowledge or some basic understandings about healthy fast food?**
A:	Yes, I gained more ideas about healthy fast food through reading the report I found on the Web and answering the two questions.
B:	Yes, I knew the calories and grams of fat of my favorite fast food items.

D:	Yes, at least, I learnt more names of fast food items.
Q6 to all:	**So, do you think you could apply such knowledge or online resources to looking at other issues with similar nature?**
A, B, C, D:	Yes.
Q7 to all:	**If so, what issues or problems?**
B:	Just like, before eating my favorite fast food items, I'd better consider their calories and grams of fat.
A:	I think I could apply the knowledge about healthy fast food to reminding myself to pay attention to the fast food items that I usually eat.
D:	We can also use the online resources to check how many calories and grams of fat we take everyday.
Q8 to all:	**Through the WebQuest activity, you experienced the use of tabular form and chart to represent and analyze data. Would you apply such way to perform similar tasks for data representation and analysis?**
B:	Yes, it's easy to organize those numbers using tables.
D:	Yes, I will. It's easy to check the high values and the low values or to compare the values using a chart.
Q9 to all:	**How did you answer the first question for discussion? In other words, how did you figure out some common characteristics of American fast food items?**
A & B:	We referred to the table showing the total calories and the total grams of fat of each restaurant. With the hints given by the teacher, we calculated the average calories of the four restaurants and the average grams of fat of the four restaurants. We found that both values were high. Therefore, we got our conclusion for the question.
C & D:	Yes, we used similar method to answer the question. From our data, we found that the average calories of the four restaurants for a lunch was nearly equal to the amount that people should take for one day.
Q10 to all:	**How did you answer the second question for discussion? In other words, how did you find the correlation between the two data items mentioned in the question?**
A & B:	With the hints given by the teacher, we referred to the four tables showing the calories and grams of fat of the food items selected from individual fast food restaurants. In each table, we looked at the food items with the highest, or the second highest, calories and checked their grams of fat so as to determine whether there was correlation between them.
C & D:	Yes, similar to A and B.

Appendix 31: Details of Examining the Qualitative Data for Exploration of Possible Reasons for Failure of Two Learning Outcomes

For the learning outcome [C6.1], the following section, Section 31.1, studies 1) whether the students worked according to the learning processes expected by the WebQuest designers, and 2) whether the students achieved the learning outcome, as expected, in each WebQuest. For another learning outcome, [C8.1a], Section 31.2 studies how the students made use of the learning opportunities provided in the WebQuests to practice the relevant skill.

31.1 Students' Practice for Learning Outcome [C6.1]

First, the learning outcome [C6.1] is concerned. It has been stated in Section 3.4.1.5 of Chapter 3 that students were expected to have practice for the learning outcome "[C6.1] make judgments and draw conclusions from research to solve problems" in the four WebQuests. They were provided with the learning opportunities to have practice for the relevant skills and they were expected to achieve the learning outcome concerned through such practice. After that, as illustrated in the figure below, the present study examined whether such learning opportunities yielded significant treatment effect on students' achievement of the learning outcome.

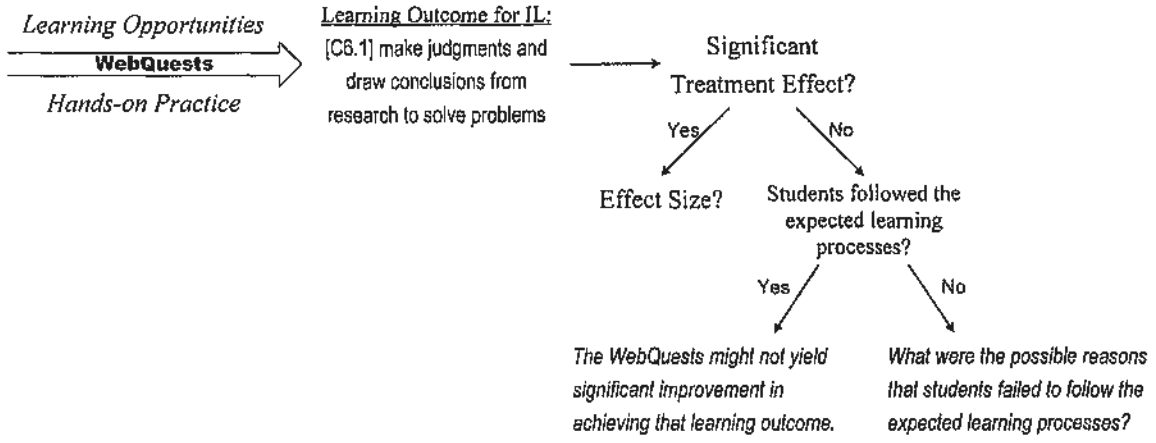


Figure 31.1: Logic Flow for Exploring Possible Reasons for No Significant Treatment Effect on [C6.1]

According to the test result for [C6.1], as there is no significant treatment effect, it is next to study whether the students followed the expected learning process in each WebQuest. If

they are found not working according to the learning process expected by the WebQuest designers, it is to further explore the possible reasons that they failed to follow that. Otherwise, a concluding remark that the WebQuests might not yield significant treatment effect on that learning outcome could possibly be drawn. The following sub-sections contrast the expected learning process with students' actual practice in each WebQuest.

31.1.1 Learning opportunities were not made explicit to students in *WQ1*

In *WQ1*, before joining the group for combining the findings brought by the four different roles, each group member needed to complete individual research on his/her assigned role. As a consultant in a particular area, the member was expected to "*conclude the findings of that area based upon his/her individual research*". So that, when the four members came together to prepare an informational presentation, he/she could "*contribute to the group by bringing an overview of the area to other members*". Here, a learning opportunity was provided to students to have practice for the learning outcome concerned.

Subsequently, using the information brought by the four members, the group was expected to "*determine what were the causes and effects of global warming in the past, and how human behaviors would affect the global conditions in the future*". It came with another learning opportunity for students to have practice.

Based upon the interviews with the five groups of students, the following practice was found as compared with the expected learning process described above. It was found that:

1. almost none of the students concluded the findings of their research areas;
2. almost none of the students gave an overview of the areas that they researched to other group members;
3. most of the groups merely discussed either the causes or the effects of global warming in the past; and
4. most of the groups did not determine how human behaviors would affect the global conditions in the future.

The four points above were supported by students' responses to four interview questions.

Concerning the first point, among the responses given by 20 students to the interview question "*Did each of you try to conclude the findings of your research report before joining the group for preparing the presentation?*", positive responses were given by only two, while negative responses were given by another 18 students (see students' responses to Q9 in Appendix 30a for relevant interview transcripts).

There were similar cases for the second point. Among the responses given by 20 students to the interview question "*Did you try to give an overview of the area that you researched to other group members?*", positive responses were given by two students only, while negative responses were given by the others (see students' responses to Q10 in Appendix 30a for relevant interview transcripts).

The third point was found from students' responses to the interview question "*Did your group determine what were the causes and effects of global warming in the past?*". Among the responses given by the five groups, three of them reported that they discussed either the causes or the effects of global warming. Another two groups reported that they discussed both (see students' responses to Q11 in Appendix 30a for relevant interview transcripts).

Lastly, the fourth point was found from students' responses to the interview question "*Did your group determine how human behaviors will affect the global conditions in the future?*". Among the responses given by the five groups, two groups reported that they had discussion on how human behaviors would affect the global conditions in the future. Another three groups reported that they did not have discussion on that (see students' responses to Q12 in Appendix 30a for relevant interview transcripts).

The table below summarizes and contrasts the expected learning process with students' actual practice, as reported above, in *WQ1*.

Expected Learning Process	Students' Actual Practice
Members of a group concluded the findings of their areas based upon individual research. So	Almost none of the students concluded the findings of their research areas.

that, they could contributed to the group by bringing an overview of their research areas to other members.	Almost none of the students gave an overview of the areas that they researched to other group members.
A group determined what were the causes and effects of global warming in the past, and how human behaviors would affect the global conditions in the future.	Most of the groups merely discussed either the causes or the effects of global warming in the past.
	Most of the groups did not determine how human behaviors would affect the global conditions in the future.

Table 31.1: Comparison of Expected Learning Process and Students' Actual Practice in WQ1

In brief, it was expected by the WebQuest designers that there were two learning opportunities provided in *WQ1* for students to have practice for the learning outcome [C6.1]. Individually, each student was expected to conclude his/her research area followed by providing an overview of the area to other group members. During the group work, each group was expected to determine the causes and effects of global warming in the past and also the future effects of human behaviors on the global conditions. However, it was found that most students failed to practice the relevant skill as expected by the WebQuest designers. In other words, the learning opportunities provided in *WQ1* did not let students have practice for the learning outcome concerned.

While examining the design of *WQ1* again, a possible reason was found. Although the WebQuest provided the learning opportunities, it did not make them explicit to students. In the *Process* section of *WQ1*, students were informed that they were required to work in groups of four (see Appendix 4 for the screenshots of *WQ1*). Each group member was required to 1) take up a role of an expert in a particular area, and 2) carry out individual research in that area. Each role was also prompted by a set of guiding questions helping the student develop expertise in that particular area. However, each role was neither required nor reminded to conclude the findings of his/her research area before joining the group for combining the findings by the four roles. In other words, the WebQuest did not explicitly

require each role to conclude the findings of his/her research area upon completion of individual research.

Subsequently, the group members came together to combine their findings for preparing a presentation. A simple guideline on preparing the presentation was provided to students in the *Process* section, stating the basic elements that should be included in the group presentation, such as at least one slide for the findings of each role, the group's conclusion on global warming, the group's suggestions for improvement, etc. Notwithstanding, specific content of each element was not stated. In other words, it did not explicitly require a group to include the causes and effects of global warming in a group's conclusion on the issue. Again, it did not explicitly require the group to determine how human behaviors would affect the global conditions in the future when making suggestions for improvement.

In summary of the above findings and comments, there were two learning opportunities provided in *WQ1* for students to have practice for the learning outcome [C6.1]. Individually, each student was expected to conclude the findings of his/her research area. For the group work, each group was expected to determine the causes and effects of the given issue in their conclusion and also determine the future effects of human behaviors so as to make suggestions for improvement. However, these learning opportunities were not made explicit to students in the WebQuest that might fail to let students practice the relevant skill.

31.1.2 Students made good decisions but without supportive reasons in WQ2

In *WQ2*, each group member needed to carry out individual research according to an assigned viewpoint. After that, the four members came together to decide what might be the best answer to the question 'Paper or Plastic'. In such case, the members of a group were expected to "*use their findings from the different viewpoints for making an informed decision for the issue*". Here, like *WQ1*, a learning opportunity was provided to students to have practice for the learning outcome concerned.

Based upon the interview data, it was found that, as expected by the WebQuest designers,

students did take the learning opportunity to practice the relevant skill by making an informed decision for the issue given in *WQ2*. This was supported by students' responses to the interview question "*How did your group make an informed decision for the issue?*". All of the five groups reported that they sought to make a decision that included the advantages of paper bags and plastic bags and avoided the disadvantages of them. Two groups also mentioned that they even considered the practical issue of their decisions (see students' responses to Q11 in Appendix 30b for relevant interview transcripts). An excerpt from a group's response is quoted below:

> "*[After discussion,] we found that both paper and plastic bags had their advantages and disadvantages. So, we didn't want either and we thought of recycle bags. Later, when we also considered the practical issue, we decided to use recycle bags together with plastic bags, which were only for wet goods. ..., therefore, we could reduce the use of plastic bags and stop using paper bags.*"

The above finding was also supported by the rubric scores assigned to students' work completed in *WQ2*. The table below presents again the descriptive statistics of the rubric scores assigned to the student work done in *WQ2*. As indicated in the table below, for the criterion "*Appropriateness of Choice*", the majority of the groups (20 out of 25 groups, 80%) were ranked at the accomplished level or above. For the criterion "*Explanation of Choice*", only 60% of the groups (15 out of 25 groups) were ranked at the accomplished level or above.

According to the descriptors of the two criteria, the figures reflected that most students (80%) could make a choice that "*embraces most advantages of using paper and plastic bags and avoids most disadvantages of that*" and the choice "*is considered practical or appropriate in the context of the task*". However, not many of them (60% only) could also provide relevant reasons, "*which take most of the findings of using paper and plastic bags into account*", to support their choices or decisions (see Appendix 20b for descriptors of the

criteria in *RB2*).

Student Work: • 25 presentation documents done in *WQ2*	Criteria in *RB2*	
	Appropriateness of Choice	Explanation of Choice
	To identify the achievement of [C6.1]	
No. of Groups Ranked at Beginning Level:	0 (0%)	1 (4%)
No. of Groups Ranked at Developing Level:	5 (20%)	9 (36%)
No. of Groups Ranked at Accomplished Level:	19 (76%)	11 (44%)
No. of Groups Ranked at Exemplary Level:	1 (4%)	4 (16%)

Table 31.2: Descriptive Statistics of Rubric Scores Given to Students' Work Done in WQ2

In summary of the above findings, there was a learning opportunity provided in *WQ2* for students to have practice for the learning outcome [C6.1]. The interview data showed that all of the five groups did take the learning opportunity, as expected, to practice the relevant skill by making an informed decision for the issue given in the WebQuest. The rubrics scores assigned to students' work done in *WQ2* also indicated that most students could make good decisions for the given problem but not many of them could also provided good reasons to support their decisions.

31.1.3 Students drew conclusions based on analysis of data in *WQ3* and *WQ4*

In *WQ3*, through gathering some real, statistical items about the development and living conditions of their home country and three other countries, the students were expected to "*compare several aspects of life in four different countries*". After that, they were expected to "*apply such information (comparison) to determine whether living in another country would be better*". Similar to *WQ1* and *WQ2*, the WebQuest provided a learning opportunity for students to have practice for the learning outcome [C6.1].

According to the interviews with the five groups of students, it was found that, as expected, students could basically achieve the learning outcome in *WQ3*. Concerning students' answers to the interview question "*Upon completion of the WebQuest (i.e. after*

comparing several aspects of life in four different countries), can you determine whether living in another country is better?", all students in the five groups could determine whether living in another country was better with appropriate reasons. All of them could also name the specific countries that they regarded as better/worse ones and support their conclusions with reasons based upon the data they had gathered (see students' responses to Q1 in Appendix 30c for relevant interview transcripts). An excerpt from a student's answer is quoted below:

> "*Yes, living in Canada is better. The area of Canada is bigger than that of China and the number of people in Canada is much less than that of China. Her average life expectancy is also high than that of China.*"

In another WebQuest, *WQ4*, through gathering the amounts of calories and grams of fat in four sets of fast food items chosen at four fast food restaurants respectively, the students were expected to "*analyze the data and use the results (comparison) to determine which of the four restaurants they selected would have the healthiest fast food meal, so as to determine the healthiest fast food restaurant*". Similarly, the WebQuest provided a learning opportunity for students to have relevant practice.

Students' achievement of the learning outcome [C6.1] in *WQ4* could be found from the rubric scores assigned to their work completed in the WebQuest. The table below presents the descriptive statistics of the rubric scores concerned. As indicated in the table below, concerning the criterion "*Selection of Restaurant*" (for assessing [C6.1]), all groups were ranked at the accomplished level or above, where the majority of them (35 out of 50 groups, 70%) were ranked at the exemplary level. The mean score on that criterion is 3.7.

The figures reflected that students' achievement of the learning outcome [C6.1] in *WQ4* was at the accomplished level, or above. According to the descriptors of the two levels concerned, most students (70%) could "*determine the healthiest fast food restaurant in best accordance with the data gathered and the selection of restaurant was also supported by evidence and reasonable argument concerning healthy fast food*". For the rest (30%), they could still "*determine the healthiest fast food restaurant based upon the data gathered and*

the selection of restaurant was supported by evidence but somewhat improper explanation concerning healthy fast food" (see Appendix 20d for descriptors of the criterion in *RB4*).

Student Work: • 50 reports done in *WQ4*	Criteria in *RB4*	
	Selection of Restaurant	Correlation: Calories & Fat
	To identify the achievement of [C6.1]	To identify the achievement of [C7.1a]
No. of Groups Ranked at Beginning Level:	0 (0%)	0 (0%)
No. of Groups Ranked at Developing Level:	0 (0%)	9 (18%)
No. of Groups Ranked at Accomplished Level:	15 (30%)	9 (18%)
No. of Groups Ranked at Exemplary Level:	35 (70%)	32 (64%)
Mean:	3.70	3.46

Table 31.3: Descriptive Statistics of Rubric Scores Given to Students' Work for WQ4

In summary, students could basically achieve the learning outcome [C6.1], as expected, through the learning opportunities provided in *WQ3* and *WQ4*. The interview data and the rubric scores reflected that students could draw conclusions on the questions posed in the two WebQuests and support their conclusions with reasons based upon the analysis of data gathered.

31.2 Students' Practice for Learning Outcome [C8.1a]

Following the findings and comments on students' practice for [C6.1], this section is concerned with those for another learning outcome, [C8.1a]. As stated in Section 3.4.1.5 in Chapter 3, students were given hands-on opportunities to practice the information skill for the learning outcome "[C8.1a] use multiple keywords or phrases to label information" in the four WebQuests. According to the test results, as there is no significant treatment effect on students' achievement of that learning outcome, the following sub-sections examine primarily how the students made use of the opportunities provided in the four WebQuests to practice the information skill concerned. The figure below presents an overview of the relevant findings, which will be elaborated in the following sub-sections.

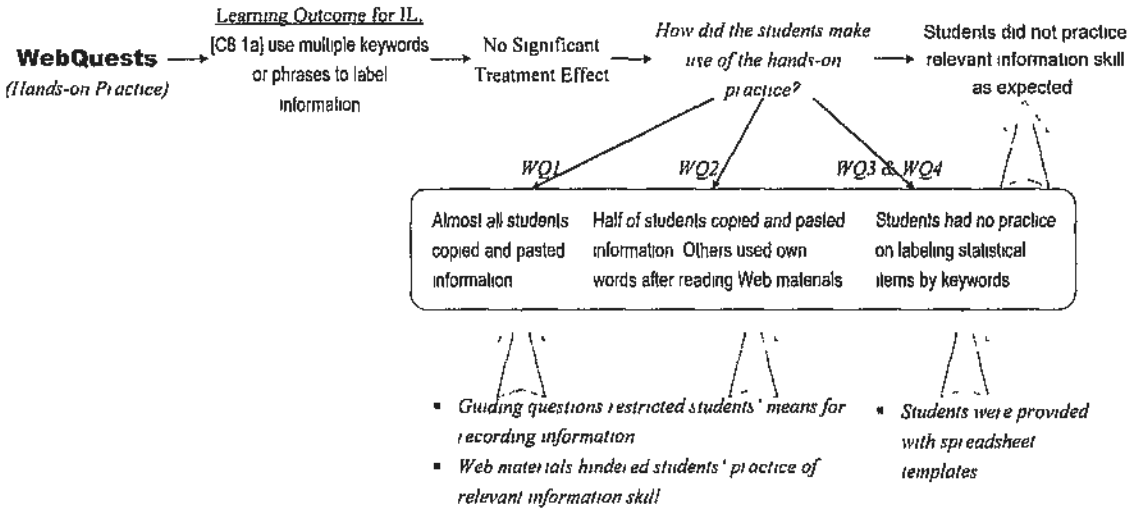


Figure 31 2 Overview of Findings Concerned with Students' Practice for [C8 1a]

31.2.1 Students copied and pasted information found at Websites

In both *WQ1* and *WQ2*, each student needed to carry out individual research according to an assigned role. Each role was prompted by a set of guiding questions helping the student make use of the role-specific Web resources to 1) develop expertise in a particular field, in *WQ1*, or 2) acquire useful information from a particular viewpoint, in *WQ2*. Once any useful information was found from the Web resources, the student would need to "*use certain means to record or mark the information, as well as its source*", so as to "*answer the guiding questions or facilitate further retrieval*".

Based upon the interviews with the five groups, the following student practice with respect to the learning outcome concerned was found.

1. In *WQ1*, almost all students (18 out of 20) copied the relevant text or pictures from the Web pages and pasted them directly in the research reports.
2. In *WQ2*, about half of students (11 out of 20) merely copied useful information, including text, figures, and pictures, found at the Websites and pasted the information directly in their research reports. The others (9 out of 20) used their own words to answer the guiding questions after reading the Web materials. If the information found at the Websites contained much text or pictures, some of them (5 out of 8) still copied the information followed by pasting it in their reports.

The two points above were supported by students' responses to two interview questions and corroborated by the video recording of their computer screens.

Concerning the first point, among the responses given by 20 students to the interview question "*When you found any useful information for a guiding question, how would you record the information?*", 18 of them reported that they simply copied the relevant text and/or pictures from the Websites and then pasted the text and/or pictures directly in their reports (see students' responses to Q2 in Appendix 30a for relevant interview transcripts). The video recording of their computer screens also showed that, during the first lesson for the implementation of *WQ1*, once any useful or related information was found at Websites, all students of the five groups copied the information (relevant text or paragraphs, pictures, or tables) from the Websites and pasted it directly to their reports in the boxes under the corresponding guiding questions (see Sections **WQ1GaS1** – **WQ1GeS1** in Appendix 25a for relevant transcripts of screen recording).

Likewise, the second point was also found from the interview data and corroborated by the screen recording (see students' responses to Q2 in Appendix 30b for relevant interview transcripts; Sections **WQ2GaS1** – **WQ2GaS1** in Appendix 25b for relevant transcripts of screen recording).

In brief, it was expected by the WebQuest designers that students would have hands-on practice for the learning outcome [C8.1a] in *WQ1* and *WQ2*. They were provided with pre-selected Web materials together with guiding questions for inquiry. Once they found any useful information from the given Web materials, they needed to use certain means to record or mark the information for the guiding questions in their reports. According to the findings presented above, the students demonstrated two primary means of recording or marking the information. They either 1) copied and pasted relevant information found at the Websites to their reports, or 2) answered the guiding questions in the reports by their own words after reading the Web materials. The latter would allow students to have hands-on practice for the learning outcome concerned, while the former should basically given no contribution to

students' development of the relevant information skill.

In *WQ1*, almost all the students made use of the former means to record the information required. In *WQ2*, about half of the students used the former means. The others made use of the latter one but some of them switched to the former one if the information contained much text or pictures. The findings indicate that, during the two WebQuests, most students failed to practice labeling information by keywords or phrases as they merely copied and pasted the information. In other words, although students were provided with hands-on practice for the learning outcome concerned, they did not practice the relevant information skill as expected.

In examining again the design of the WebQuests together with students' responses to another two interview questions, two possible reasons were found. It was found that 1) the design of the guiding questions for students' inquiry might restrict the means they used for recording information, and 2) the Web materials given in the WebQuests might also hinder their practice of the relevant information skill.

31.2.1.1 Guiding questions restricted students' means for recording information

First, the design of the guiding questions is concerned. It has been delineated in Chapter 3 that the guiding questions were designed as a sort of scaffolding, which aimed at helping students make use of the Web resources for inquiry (see Section 3.4.1.4 in Chapter 3). For example, the guiding questions in *WQ1* were designed to help each role conduct individual inquiry so as to develop expertise in a particular area. *Figure 31.3* shows the screenshot of the page for a role in *WQ1*. Besides, each role was provided with a Word document, in which the role-specific guiding questions were presented. Under each guiding question, a text box was created for the student to record any useful information for or responses to the question. *Figure 31.4* shows a screenshot of the Word document.

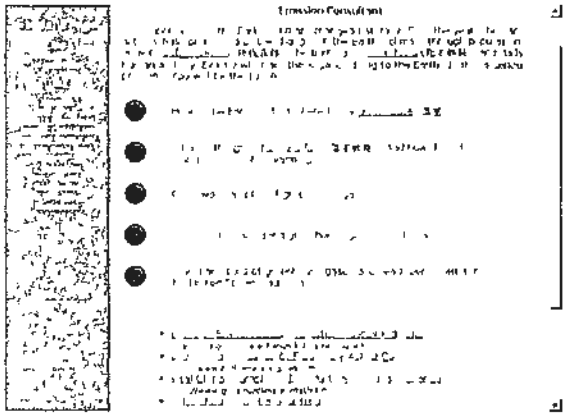


Figure 31 3 Screenshot of WebQuest Page for a Role in WQ1

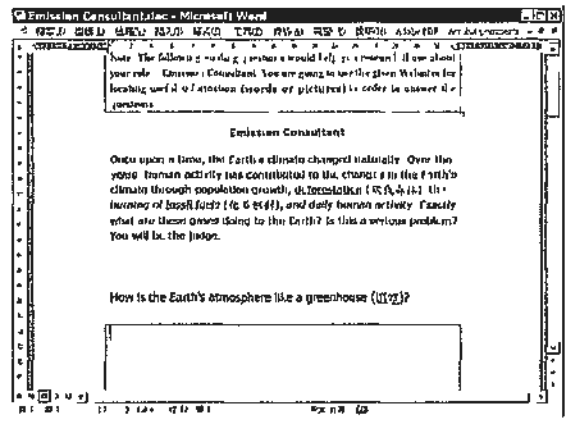


Figure 31 4 Screenshot of Word Document for a Role in WQ1

In both the WebQuest page and the Word document, students were neither told the specific means for recording information nor required to use keywords or phrases to label the information found. They were merely 1) reminded to record the responses to the guiding questions, in the *Process* section of *WQ1* (see Appendix 4 for the screenshots of *WQ1*), and 2) instructed to "*use the given Websites for locating useful information (words or pictures) in order to answer the questions*", in the Word document (see *Figure 31 4*).

As a result, the reminder together with the guiding questions would implicitly lead students to an approach of answering the questions by looking for and recording detailed information for them. The text boxes, under the guiding questions, in the Word document were initially designed to let students practice jotting down the keywords or phrases for useful information found from the given Websites. However, students were not informed about the expected usage of the text boxes. According to the findings presented above, it turned out that they used the boxes for either 1) expressing their answers to the questions or 2) recording detailed information for the questions. Consequently, such design of guiding questions with text boxes restricted the means they used for marking and recording information, and thus influenced their practice for the learning outcome [C8.1a]. Similar cases were found for the design of guiding questions employed in *WQ2*.

31.2.1.2Web materials hindered students' practice of relevant information skill

Besides the design of the guiding questions, it was found that the Web materials given in the WebQuests would be another issue affecting students' practice of the relevant information skill. While looking at students' responses to two interview questions (see Q1 in Appendices 30a and 30b), their comments on the Web materials provided in *WQ1* and *WQ2* are summarized as follows.

Concerning their comments on those provided in *WQ1*, most students (16 out of 20) encountered difficulty in reading the given Web materials, which were mainly in form of English text. A number of students (8 out of 20) needed to use either 1) an online dictionary to check the meaning of quite a number of English words found in the Web materials or 2) an online translator to translate English text into Chinese in order to understand its meaning (see students' responses to Q1 in Appendix 30a for relevant interview transcripts). The table below presents an overview of the major comments given by individual students. Each box in the table presents the main point of a student's comments in short phrase. Those in gray indicate students who found the given Web materials difficult for understanding.

WQ1	Interview Group in G_a	Interview Group in G_b	Interview Group in G_c	Interview Group in G_d	Interview Group in G_e
Student A	*Prefer Chinese*	*Difficult (English Text)*	*Okay*	*Not Easy (English Text)*	*Much English Text*
Student B	*Difficult (Many English Words)*	*Many English Words*	*Okay*	*Prefer Chinese & Figures*	*Much English Text*
Student C	*Difficult (Much English Text)*	*Prefer Chinese & Pictures*	*Quite Difficult (English Text)*	*Not Easy (English Text)*	*Nil*
Student D	*Difficult (Much English Text)*	*Prefer Chinese & Pictures*	*Okay*	*Many English Words*	*Much English Text*
Number of students finding the Web materials given in *WQ1* difficult for understanding: 16					

Table 31.4: Main Points of Students' Comments on the Web Materials given in WQ1

For those about the Web materials provided in *WQ2*, half of students (10 out of 20)

encountered difficulty in reading the given Web materials owing to the amount of English text. The others (another 10 students) considered the given Web materials not difficult for reading and understanding. In each of the five groups, there was one student, who took the role of the Concerned Citizen, considering the given Web materials very difficult for understanding as he/she needed to look for the required information at the official Websites of two international companies (see students' responses to Q1 in Appendix 30b for relevant interview transcripts). The table below presents an overview of the main points of individual students' comments.

WQ2	Interview Group in G_a	Interview Group in G_b	Interview Group in G_c	Interview Group in G_d	Interview Group in G_e
Student A	*Very Difficult*	*Not Very Difficult*	*Very Difficult*	*Very Difficult*	*Very Difficult*
Student B	*Not Difficult*	*Difficult (English Words)*	*Not Too Difficult*	*Not So Difficult*	*Not Difficult*
Student C	*Much English Text*	*Not Difficult*	*Okay*	*Much English Text*	*Much English Text*
Student D	*Okay*	*Very Difficult*	*Not Difficult*	*Much English Text*	*Not Difficult*
Number of students finding the Web materials given in *WQ2* difficult for understanding: 10					

Table 31.5: Main Points of Students' Comments on the Web Materials given in WQ2

Students' comments presented above together with the findings on their means for recording information revealed a possible relation between the given Web materials and the means they used to record or mark information. To facilitate the illustration, the following abbreviation is assumed to represent the numbers of students in different groups.

ND1 and *ND2* are assumed to represent the numbers of students finding the Web materials given in *WQ1* and *WQ2*, respectively, difficult for understanding. According to *Tables 31.4* and *31.5*, *ND1* is 16 and *ND2* is 10. *NCP1* and *NCP2* are assumed to represent the numbers of students using the means of copying and pasting for recording information in *WQ1* and *WQ2* respectively. Referring to the findings presented previously, *NCP1* is 18,

while *NCP2* is 11.

The figures indicate that, *ND1* (16 out of 20) and *NCP1* (18 out of 20) were close to each other, while *ND2* (10 out of 20) and *NCP2* (11 out of 20) were almost equal. Merely from these figures, it was found that the number of students who found the given Web materials difficult for understanding and the number of students who copied and pasted information from the Web materials were close to each other. Such finding initiated an exploration of looking at whether the students, who encountered difficulty in reading the given Web materials, were those who copied and pasted information found at Websites to their reports. In such case, a comparison of the comments given by individual students and their means for recording information in *WQ1* and *WQ2* is required.

To achieve this purpose, the above two tables are enhanced to include and indicate the means used by individual students for recording and marking information in the two WebQuests. The enhanced tables are shown below.

WQ1	Interview Group in G_a	Interview Group in G_b	Interview Group in G_c	Interview Group in G_d	Interview Group in G_e
Student A	*Prefer Chinese*	*Difficult (English Text)*	*Okay*	*Not Easy (English Text)*	*Much English Text*
	Copy and Paste	Copy and Paste	Copy and Paste	Copy and Paste	Copy and Paste
Student B	*Difficult (Many English Words)*	*Many English Words*	*Okay*	*Prefer Chinese & Figures*	*Much English Text*
	Copy and Paste	Copy and Paste	Keep Key Terms	Copy and Paste	Copy and Paste
Student C	*Difficult (Much English Text)*	*Prefer Chinese & Pictures*	*Quite Difficult (English Text)*	*Not Easy (English Text)*	*Nil*
	Copy and Paste	Use Own Words	Copy and Paste	Copy and Paste	Copy and Paste
Student D	*Difficult (Much English Text)*	*Prefer Chinese & Pictures*	*Okay*	*Many English Words*	*Much English Text*
	Copy and Paste	Copy and Paste	Copy and Paste	Copy and Paste	Copy and Paste
Boxes belong to *ND1* (in dark gray): 16		Boxes belong to *NCP1* (in light gray): 18		Boxes overlapped: 15	

Table 31.6: Comparison of Students' Comments on the Web Materials given in WQ1 and Their Means for Recording Information in WQ1

WQ2	Interview Group in G_a	Interview Group in G_b	Interview Group in G_c	Interview Group in G_d	Interview Group in G_e
Student A	*Very Difficult*	*Not Very Difficult*	*Very Difficult*	*Very Difficult*	*Very Difficult*
	Copy and Paste	Copy and Paste	Copy and Paste	Copy and Paste	Copy and Paste
Student B	*Not Difficult*	*Difficult (English Words)*	*Not Too Difficult*	*Not So Difficult*	*Not Difficult*
	Use Own Words	Copy and Paste	Use Own Words	Use Own Words	Use Own Words
Student C	*Much English Text*	*Not Difficult*	*Okay*	*Much English Text*	*Much English Text*
	Copy and Paste	Use Own Words	Copy and Paste	Use Own Words	Use Own Words
Student D	*Okay*	*Very Difficult*	*Not Difficult*	*Much English Text*	*Not Difficult*
	Copy and Paste	Copy and Paste	Copy and Paste	Use Own Words	Use Own Words
Boxes belong to *ND2* (in dark gray): 10		Boxes belong to *NCP2* (in light gray): 11		Boxes overlapped: 7	

Table 31.7: Comparison of Students' Comments on the Web Materials given in WQ2 and Their Means for Recording Information in WQ2

In *Table 31.6*, the boxes marked by dark gray belong to *ND1* (16 boxes), while those in light gray belong to *NCP1* (18 boxes). As indicated, the two sets of boxes get 15 in common. In other words, in *WQ1*, most students (15 out of 16), who encountered difficulty in reading the given Web materials, used the means of copying and pasting for recording information. The response given by such a student (Student C, Interview Group in G_c) is excerpted below:

> "*The English of the given Web materials [in WQ1] was quite difficult. ... It's not easy to understand so much information in English. So, once I found any useful information at a Website, I just copied all the text and put it in my report.*"

Likewise, in *Table 31.7*, boxes belong to *ND2* (10 boxes) and *NCP2* (11 boxes) are showed in dark gray and light gray respectively. The two sets of boxes share 7 in common. Again, the figures indicate that, in *WQ2*, among the students finding the given Web materials difficult for reading, most of them used the means of copying and pasting for recording information. An excerpt from another student's (Student D, Interview Group in G_b) response is quoted below:

"..., the given Websites [in WQ2] were difficult to understand. So, once I found the information I needed, I just copied it directly and put it in my report."

In summary, the above findings reveal a relation between the Web materials, provided in *WQ1* and *WQ2*, and the means used by students for recording or marking information in the two WebQuests. It was found that, in both *WQ1* and *WQ2*, students, who encountered difficulty in reading the given Web materials or found the materials difficult for understanding, tended to copy and paste relevant information found at Websites to their reports. As a result, the given Web materials hindered students from practicing the information skill for the learning outcome [C8.1a].

31.2.2 Students had no practice on labeling statistical items by keywords

Besides *WQ1* and *WQ2*, the other two WebQuests also provided students with hands-on practice for the learning outcome concerned. After gathering 1) the required statistical items from the CIA database (in *WQ3*) or 2) the required numerical data from the online fast food calorie counter (in *WQ4*), the students needed to "*label them in a spreadsheet by relevant keywords*", like size, population, average life expectancy, literacy rate, crowdedness, number of calories, and grams of fat.

However, as reported in Chapter 3 (see Section 3.5.3.3), in order to reduce the time spent on technical operations, the teacher provided students with two spreadsheet templates (see Appendices 12 and 14) during the implementation of *WQ3* and *WQ4*. Each of them was designed to serve as a kind of reception scaffolds (Dodge, 2001) for providing a table structure to students in order to help them 1) organize the input data into a tabular form, and 2) save the class time on creating the data tables. *Figures 31.5* and *31.6* show the screenshots of the two templates.

	A	B	C	D	E	F
1		Area (sq. km)	Population	Average life expectancy (years)	Literacy rate (%)	Crowdedness (pop./area)
2	Country A					
3	Country B					
4	China					
5	Country D					

Figure 31.5: Screenshot of Spreadsheet Template Provided to Students in WQ3

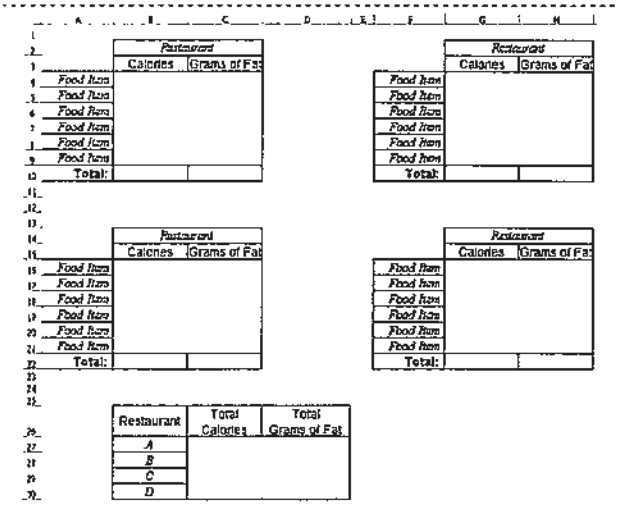


Figure 31.6: Screenshot of Spreadsheet Template Provided to Students in WQ4

As shown above, in the spreadsheet templates, the required data tables were created for students. Each column in a data table was named with a suitable label being related to a required data item. Students could simply fill the tables by entering the required data in the corresponding cells, and then used the tables for further analysis.

According to the video recording of students' computer screens, it was found that, during the implementation of *WQ3* and *WQ4*, all students in the five groups made use of the spreadsheet templates provided by the teacher for data entry. They entered the required data directly into the tables pre-created in the templates (see Appendices 25c and 25d for relevant transcripts of screen recording). In such case, they had no practice on labeling the statistical items or numerical data in a spreadsheet by relevant keywords.