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Using Online Annotations in Collaborative Reading Activities with Elementary-Aged Taiwanese Learners of English

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Dedication

To my grandmother and parents

With love

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Using Online Annotations in Collaborative Reading Activities with Elementary-Aged Taiwanese Learners of English

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Because little was known about second language online collaborative reading, this study explored the application of an online annotation affordance, analyzing the processes and products of how Taiwanese schoolchildren used notetaking and sharing functions to develop their English reading comprehension. Fifth-grade students (N = 83) from three English classes were randomly assigned to three reading conditions: read-only (i.e., individual reading without making any annotation), individual annotation (i.e., making annotations for their own use), and collaborative annotation (i.e., making and sharing annotations on their reading experience with others while reading) for three reading sessions. Data sources included a background survey, reading comprehension tests (free recall and cued recall), reading affect surveys, students' annotations, text-based stimulated recall protocols, and a survey about the frequency of online support consultation.

Results of quantitative and qualitative analyses showed that there was no statistically significant difference among the reading groups in their free recall and cued recall performance, their reading enjoyment and engagement, and their perceptions of the reading activity's helpfulness for reading comprehension. Despite the lack of overall significant difference in reading affect, the collaborative annotation group increased their

affect levels across the reading sessions, and significantly raised enjoyment levels between first and second sessions. Supplementary analyses found that the relationship between the amount of annotation and students' reading comprehension scores was positive but did not reach a statistically significant level. Additionally, the more often the participants consulted online resources, the lower were their cued recall scores.

As for the functions served by students' annotations, nine categories were identified. The most prevalent function for the individual annotation group was "Translations," whereas "Responses to Peers" was the most frequent category for the collaborative annotation group. The amount of interaction with peers was positively associated with cued recall scores and negatively associated with amount of use of translation annotations. Analysis of processes revealed that students were different in how they read online and used annotations. Students provided multifaceted reasons for why they did or did not make annotations and reply to peers while reading, and for why they liked or disliked the online reading activities.

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Chapter 1

Introduction

Background of the Study

Beginning in 2000, the Ministry of Education in Taiwan proactively initiated a series of curricula and instructional reforms to deal with globalization developments, putting much effort into English education and information technology education in order to develop students' core competencies that are essential for their future. For years, English has been considered the most important foreign language in Taiwan (Hsieh, 2011). Thus, the curricular and instructional reform in 2000 mandated that English be a required subject in elementary school. The primary goals of English education at elementary and junior high school stages are to acquire basic communicative competence, develop English learning interests and strategies, and improve understanding of English-speaking cultures (Ministry of Education, 2001).

In addition, to cope with rapid developments in computer technology, the Taiwanese government has devoted much effort to improving the technology information infrastructure in elementary and secondary schools since the early 1980s (Wen & Shih, 2008). Educational authorities have been encouraging teachers to integrate computer technology into their regular courses. The focus of computer-aided instruction has shifted from traditional courseware packages to web-based applications (Liao, 2007). The Ministry of Education in Taiwan explicitly requires that students develop digital skills and knowledge and make use of information computer technologies in their learning (Ministry of Education, 2001).

Rapid developments of digital technologies have a great impact on the ways in which individuals socialize, work, learn, and live. Researchers and educators are highly interested in exploring the efficacy of implementing technology in second/foreign language learning. Researchers have demonstrated that the integration of information and communication technologies could facilitate learners' performance and achievement (e.g., Warschauer & Healey, 1998). More and more language practitioners and scholars are involved in exploring the potential of computer-assisted language learning.

Today, ubiquitous technologies change everyday practices and classroom learning. Prensky (2001) coined the term "digital natives" to describe a new generation of students who have grown up with technology and who use different kinds of digital devices in their daily lives. The way students use technological tools for social practices redefines what literacy means, from traditional literacy, which implied simply encoding and decoding print texts, to the current "new literacies," which broadens this scope by integrating technological elements into meaning comprehension and expression (Leu, Everett-Cacopardo, Zawilinski, Mcverry, & O'Byrne, 2013). A question of great importance is how to effectively and efficiently take advantage of the affordances provided by digital technologies.

At present, reading in digital contexts (such as via iPad, smartphone, or computer) is one of the common literacy activities in students' and others' lives. For example, Lin (2011) surveyed 3,495 Taiwanese elementary school students aged 10 to 12 about their digital reading behaviors. The resultant study showed that it was common for students to have access to computers and that more than 70% of the students started reading online in first grade. One part of the students' major online reading activities was browsing websites to seek information and to read comics or stories as a leisure activity. As suggested by Coiro and Dobler (2007), online reading behaviors included not only some

of the same processes involved in traditional reading (e.g., self-regulation, goal-monitoring, a reliance on prior knowledge) but also the application of knowledge and strategies that reflected web-based affordances (e.g., keeping track of the interconnection between texts). Moreover, Afflerbach and Cho (2010) asserted that readers use similar traditional reading strategies to seek overall meaning, monitoring and evaluating different aspects of texts when reading online. However, they also identified strategies that are unique to hypertext and Internet reading, calling them strategies for "realizing and constructing potential texts to read" (p. 209). Park and Kim (2011) confirmed this finding by qualitatively studying ten English-as-a-second-language (ESL) learners. They showed that two out of seven reading strategies adopted by learners were specifically applied in the online setting: the use of computer accessories and functions (e.g., using the computer mouse to highlight sentences and to point to text they were reading) and the use of hypermedia (e.g., videos and audios). These findings point to the prominence of online reading in literacy development.

Researchers attest that reading plays a crucial role in the development of a second language[1] (Day & Bamford, 1998; Grabe, 2009; Koda, 2005). Second language proficiency is closely related to second language reading comprehension (Alderson, 1984; Lee & Schallert, 1997). To assist students with second language development at the beginning of their learning, early reading instruction has drawn much attention from language teachers, researchers, and educational authorities (National Reading Panel, 2000).

Several scholars have advocated for the great potential of digital contexts in supporting second language learners' reading skills development (Chapelle & Jamieson,

[1] In this study, I adopted Ortega's (2007) definition that *second language* is used to refer to either a second or a foreign language or both.

2008; Dudeney & Hockly, 2007). Language learners can benefit from technological affordances, such as having the support of instant feedback on reading comprehension (Murphy, 2010), vocabulary explanation (Yanguas, 2009), and visual representations of text structure (Liu, Chen, & Chang, 2010). Aiming to support reading activities, language teachers and researchers have developed a variety of computer-aided software programs for improving learners' reading skills by adopting socio-constructivist learning strategies, such as collaborative learning activities and scaffolding, and found promising results (Lan, Sung, & Chang, 2007, 2009, 2013). Glover, Xu, and Hardaker (2007) showed that researchers and teachers can integrate a network annotation system into online learning for boosting collaboration among learners. Learners can have more interactive opportunities within their connected networks and learn from their peers by utilizing the online annotation tools' collaborative functions. Yet, there is little research discussing the efficacy of young language learners' usage of online annotations in second language collaborative reading activities.

Purpose of the Study

Within the literature on the second language reading, little was known about how beginning learners, elementary-aged school students, took notes in their digital reading and what the effect of collaborative reading via note interaction impacted their reading comprehension and affect. Thus, the overarching purpose of the current study was to explore English-as-Foreign-Language (EFL) elementary school students' interactive use of online annotations in the context of digital texts. One of the goals of the study was to examine the effect of different annotation usage on students' reading comprehension as measured by free recall and cued recall tests, comparing the reading comprehension

performance of students assigned to three reading settings: online reading without making annotations, online reading while making one's own annotations, and online reading with opportunities to exchange annotations with a few peers. The second goal was to examine if the students in the different online reading settings would have different affect in responses to their reading setting. This goal required analysis of the three reading groups' responses to surveys of reading enjoyment and engagement. The third goal of the study was to investigate the students' online reading experiences in the three given contexts. The study addressed this goal by gathering learners' perceptions of online reading and their impressions regarding the use of annotations in English reading activity.

The study aimed to observe EFL young learners' processes and products of annotation use in three online reading activities. At the outset, it was hoped that the students' online reading performance and experiences would provide valuable insights into how they approached the emerging technology available in their reading instruction.

Rationale of the Study

As scholars attest, today's learners are living in a world full of technologies, and they need to develop strategies and skills to undertake new literacy activities (Leu, Kinzer, Coiro, & Cammack, 2004). The advancements of the Internet and of information communication technologies have greatly changed literacy practices. Coiro, Knobel, Lankshear, and Leu (2008) asserted that the nature of new literacies is characterized as being integral to participation in a global community, evolves as technologies progress, is multifaceted, and adapts to new technologies. To develop new literacies, learners have to become used to learning with technologies. The International Reading Association (2009)

asserted that, to be considered fully literate, students must become proficient in the digital literacies of twenty-first century technologies. It is crucial for students to have skills and strategies to use technologies in their literacy practices. If learners are not skilled at literacy practices in new technological contexts, then their active participation in literacy activities will be adversely affected.

Furthermore, ubiquitous access to technology equipment and the Internet at home and in school does not necessarily mean that digital equality exists. Khalsa, Maloney-Krichmar, and Peyton (2007) asserted that the "digital gap" involves complex and dynamic factors and is related to three types of access. In addition to *physical access* to technology, *conditional access* implies that learners need to meet certain criteria before they are allowed access to computer applications, software programs, or computer networking resources; this has an impact on the digital divide. Additionally, *skills access* creates more challenges to learners. Van Dijk (2005) asserted that technology-related skills include

- Informational skills: the ability to effectively use information and resources obtained from computer technology;
- Strategic skills: the ability to search, choose, and refine information and resources obtained from computer technology;
- Operational skills: the ability to use information computer technology.

For the purpose of minimizing the digital divide, it is crucial to grant equal access to and construct opportunities for learners to integrate computer technology and skills into their learning.

Another trend in the development of the Internet is that emerging technologies offer new possibilities for human communication, information dissemination, and language usage (Chen, 2013). A culture of participation and sharing is in harmony with

this direction (Jenkins, 2009). As Jenkins (2009) defined:

> A participatory culture is a culture with relatively low barriers to artistic expression and civic engagement, strong support for creating and sharing creations, and some type of informal mentorship whereby experienced participants pass along knowledge to novices. In a participatory culture, members also believe their contributions matter and feel some degree of social connection with one another (at the least, members care about others' opinions of what they have created). (p. xi)

This participatory culture encourages collaboration and provides the benefit of having opportunities for peer-to-peer learning (Jenkins, 2009). As Kessler (2013) addressed, although participatory culture carries potential for new, diverse representations of language and information, which "dramatically enhance and potentially redefine the design of and orientation toward language education" (p. 308), language teachers also have responsibilities to afford opportunities in such environments for language learners to have meaningful and beneficial interaction with their peers.

Therefore, aiming to broaden learners' repertoires of digital reading, the present study introduced an online annotation tool to students in one elementary school in Taiwan, and examined the efficacy of their electronic notetaking on their reading comprehension and on their reading affect for collaborative reading activities. Additionally, the study analyzed the content of the annotations made by the students and investigated their online reading processes.

Significance of the Study

Findings from this research could increase our understanding about the effect of

online annotation usage on EFL elementary school students' second language reading comprehension and affect. Another significance of this study could lie in its exploration of a variety of approaches used by young learners in the process of online reading, providing educators with more information about how to prepare elementary-aged students for online literacy practices.

Research Questions

The present study explored the application of an online annotation affordance, analyzing the processes of how English-as-a-Foreign-Language (EFL) learners use notetaking and sharing functions to develop their English reading comprehension. In this study, *individual annotation* is defined as readers making their own annotations solely for their own use, whereas collaborative annotation refers to readers making and sharing their annotations about their reading experience with others during the reading process. Three research questions guided the study:

1. How did reading comprehension differ for fifth grade students who were engaged in different reading activities: read-only, individual annotation, and collaborative annotation?
2. Were there differences on measures of enjoyment and engagement in the reading tasks for fifth grade students who were engaged in different reading activities: read-only, individual annotation, and collaborative annotation?
3. What did the process of interacting with the text look like for the learners who had been assigned to either the individual or collaborative annotation groups (in terms of the nature of the annotations and text-based recall interviews)?

Overview of the Dissertation

This chapter provides an introduction of the study. In the following chapters of this dissertation, literature review, research methodology, study results, and conclusions are organized and presented in turn. Chapter 2 is allotted to reviewing scholarship dealing with three main themes, including computer-supported second language reading comprehension, collaboration in language learning and teaching, and the application of online annotation for learning. Chapter 3 presents the methodological procedures and concerns in designing the study and analyzing the data. In Chapter 4, research findings are reported in correspondence with the three research questions. Results are further divided into several sub-sections and illustrated with quantitative and qualitative data. Finally, in Chapter 5, I discuss the results and provide implications for teaching and research about the use of online annotation in EFL class settings. Limitations and suggestions for future studies conclude the chapter.

Chapter 2

Literature Review

This chapter presents a review of the theoretical and empirical research relevant to the current study. To frame the study, I drew from literature in three lines of work. First, I address how computer technology supports the development of second language reading comprehension abilities. Second, I describe the work on collaboration in second language learning, specifically focusing on the literacy development. In the third section, I turn to the study's focus: the use of annotation in language learning.

Computer-Supported Second Language Reading

Technologies have been widely applied to second language teaching and learning. In her seminal paper concerning trends and issues of computer-assisted language learning, Garrett (1991) recognized that computer technology is most suited for the development of reading comprehension. To gain more understanding about how individuals develop knowledge, skills, and strategies in literacy practices, scholars either investigate how language learners adopt existing technology tools or develop their own systems to support learners' literacy development. For example, Huang and Lin (2011) examined Taiwanese senior high school students' preferences for reading English texts on mobile phones, paper, or e-mail. Depending on the length of texts, the students displayed different preferences for the reading medium. When reading short texts, they preferred mobile phones, whereas when reading long texts, they favored mobile phones the least due to their small screens. The affordances of technologies allow language learners to have access to more reading practices, linguistic information and examples,

and more exposure to texts (Levy, 2009). As Chun (2006) argued, technologies applied for second language reading include:

> electronic dictionaries, software that provides textual, contextual and/or multimedia annotations, computer-based training programs that aim to accelerate and automatize word recognition, Web-based activities that seek to teach a variety of components (from text structures and discourse organization to reading strategies), and the Internet as a source of materials for extensive reading. (p. 69)

A variety of technology applications could promisingly enhance learners' reading abilities.

When learners read, they consciously or automatically engage with numerous mental activities (Alderson, 2000). Researchers have argued that extreme "bottom-up" processing (e.g., readers constructing texts from decoding letters to words to phrases to sentences) or extreme "top-down" processing (e.g., readers fitting texts into their knowledge schemata and determining if texts bear any new or unexpected information) may not adequately describe the nature of reading comprehension (Bernhardt, 2011; Stanovich, 1980). The current extant model of reading proposes that comprehension involves both "top-down" (conceptually driven) and "bottom-up" (text feature driven) processes (Aebersold & Field, 1997). Readers need to manipulate lower-level lexical skills (e.g., vocabulary knowledge), sentence-level skills (e.g., grammar knowledge), and higher-level skills (e.g., making inferences and checking comprehension) to build their comprehension (Carrell, Devine, & Eskey, 1988). As Grabe (1991) noted, "[r]eading is interactive; the reader makes use of information from his/her background knowledge as well as information from the printed page. Reading is also interactive in the sense that many skills work together simultaneously in the process" (p. 378). Readers synthesize information from their various knowledge sources during the reading process.

Grabe (2009) suggested that second language learners need at least five essential skills for reading comprehension: vocabulary knowledge, grammar knowledge, discourse knowledge, reading strategies, and main-idea comprehension. The following sections illustrate how computer technology supports second language learners' reading comprehension organized by Grabe's five skill areas.

Vocabulary knowledge and computer technology. Research has demonstrated that there is a highly positive, linear relationship between vocabulary knowledge and reading comprehension (Qian, 1999; Schmitt, Jiang, & Grabe, 2011). Successful reading comprehension heavily depends on whether second language learners are capable of automatically recognizing and decoding 95% to 99% words in a text (Laufer, 1997; Nation, 2001). The scholarship of computer assisted language learning (CALL) has shown that learners can acquire vocabulary with the aid of technology. For example, Liou (2000) argued that university students in English-as-a-foreign-language (EFL) contexts benefited from using online bilingual dictionaries in their reading tasks. Word consultation strategies used by university students varied idiosyncratically. However, weaker learners had difficulties choosing the correct definition from polysemous words to match specific text contexts. Liou suggested that weaker learners need more direct help, such as the provision of a glossary.

Moreover, to confirm the function of marginal glossaries in reading, Yanguas (2009) investigated the effects of different types of multimedia glossaries on online reading comprehension and vocabulary learning. He found that Spanish learners who had glossaries noticed significantly more vocabulary words than those who did not. Thus, learners could improve their text comprehension when they received glossaries with text and picture information.

Third, Huang and Liou (2007) conducted a study concerning vocabulary knowledge development via technology. They adopted advanced corpus processing techniques to develop a program for presenting comprehensible English texts with repeated exposure to target vocabulary as extensive reading activities. By comparing the vocabulary pretest and posttest, Huang and Liou found that the participants improved their vocabulary knowledge and appreciated opportunities to encounter target vocabulary repeatedly via the program.

Grammar knowledge and computer technology. Grammar knowledge is needed from the moment readers start reading. Readers undergo complex processes to comprehend the text, such as recognizing words, extracting syntactic information, grouping phrasal and clausal units for semantic proposition construction, and constructing structural information (Grabe, 2009). Van Gelderen, Schoonen, De Glopper, Hulstijn, Simis, Snellings, and Stevenson (2004) demonstrated a high positive correlation (r = .80) between learners' second language grammar knowledge and second language reading comprehension. Research also evidences that learners' reading comprehension might be problematic if they lack certain grammatical knowledge, such as case-marking particles (Koda, 1993) and passive forms (Lee, 2007). Thus, second language grammar knowledge is crucial for reading comprehension.

With the aid of computer technology, language learners can inductively discover the pattern of language use from large corpora data that collect from authentic linguistic materials (Yu, 2011). The consultation of linguistic data from actual language use can be integrated into grammar instruction (Conrad, 2000). Vannestål and Lindquist (2007) introduced college English learners in Sweden to the use of corpora as a complement to grammar textbooks and exercises. The students were required to work in pairs to

formulate their own grammar rules through the consultation of corpora and took turns to present rules. Although some students disliked using corpora for grammar learning due to its time-consuming feature and their weak proficiency level, some students did appreciate this type of grammar learning and recognized it as a fun, useful way to learn grammar.

To support the development of second language syntactic awareness, Sauro (2009) compared the effectiveness of different types of computer-mediated corrective feedback. Twenty three Swedish learners of English at intermediate-above proficiency levels were randomly assigned to one of three feedback groups (metalinguistic, recast, and control) for four weeks. The learners paired up with native English speakers for collaborative writing activities in the context of synchronous text-based computer-mediated communication. The native English speakers corrected the learners' wrong use of the English zero article. Sauro found that both groups receiving metalinguistic and recast feedback improved in the posttest of acceptability judgment. Moreover, the group with metalinguistic feedback significantly performed better than the control group that did not receive feedback.

Discourse knowledge and computer technology. Readers' awareness of how texts are structured is crucial to reading comprehension (Trabasso & Bouchard, 2002). To understand reading texts, readers have to identify the semantic relationships among text elements and grasp information organization (Grabe, 2009; Koda, 2004). Additionally, awareness of text structure affects readers' recall (Cook & Mayer, 1988; Meyer & Poon, 2001). Carrell (1992) reported that ESL students at high-intermediate proficiency levels displayed better text recall if they were more aware of the discourse organization of the reading texts. These results indicated that discourse knowledge works to facilitate second language learners' reading comprehension.

Educators have used graphic organizers to promote learners' discourse-structure awareness (e.g., Jiang & Grabe, 2007, 2009). Noted for its easy correction and easy use, a computerized concept-mapping program was introduced to 194 freshmen English learners in Taiwan in Liu, Chen, and Chang's (2010) study. The researchers further labeled the learners as high-achievers and low-achievers based on the results of a reading test before the experiment, and assigned the learners into experimental (i.e., using the concept-mapping program in the reading activity) and control groups (i.e., without using the concept-mapping program in the reading activity). The findings demonstrated that, in contrast to the high-achievers, the low-achievers benefited more from using the concept-mapping program to improve their reading comprehension than did their counterparts who did not use the program.

Moreover, Yang and Akahori (2000) developed a Japanese computer assisted language learning system that supported learners in better understanding the structure of technical Japanese texts. Using natural language processing techniques, they designed the system to analyze micro and macro levels of text structures, which were cohesive cues and headlines. These results suggested that the system was able to detect discourse structures accurately with a high percentage of success, and present the information to language learners. Furthermore, the system could be used for testing learners' understanding about the discourse cues from the text-analysis result.

Lastly, Lo, Yeh, and Sung (2013) integrated an online annotation tool into a reading class and found that the tool helped Taiwanese university learners better understand English paragraph structures, such as topic sentences, controlling ideas, and supporting ideas. The online annotation group that used the tool to highlight text structure considerably outperformed the non-annotation group in the immediate reading comprehension test and the reading recall test. The students using the online annotation

tool agreed that it was helpful and easy to use. They felt satisfied with the online tool and were willing to use it again.

Reading strategies and computer technology. The use of reading strategies is helpful for second language reading comprehension (Anderson, 1999). As Pulido (2009) pointed out, "[r]eading is a complex cognitive skill, entailing the simultaneous use of various knowledge sources and processing skills. Readers need efficient strategies for acquiring information from texts" (p. 74). It is essential for teachers to help students develop effective reading strategies and support them in becoming strategic readers (Grabe & Stoller, 2011; Horwitz, 2013). Research indicates that reading strategy instruction has positive effects on second language learners' reading comprehension abilities (Carrell, Pharis, & Liberto, 1989; Kern, 1989). Moreover, several researchers demonstrated that computer technology is a useful, facilitative tool to equip learners with reading strategies. For example, Dreyer and Nel (2003) provided English college learners in South Africa with an electronic study guide in Learning Content Management System about (1) how to use the strategy, (2) when and where the strategy should be used, and (3) how to evaluate the use of the strategy. They found that strategic reading instruction in this technology-enhanced learning environment significantly improved the students' reading comprehension achievement.

Next, Tsai and Talley (2013) implemented reading strategy instruction in a course management system for 114 EFL undergraduates in Taiwan. They asserted that "[t]he integration of CMS with strategy instruction is promising, because CMSs support metacognitive self-regulation and a suitable motivational level during the students' learning process" (p. 2). They assigned their learners into an experimental group, which received explicit online reading strategy instruction on problem identification, monitoring

comprehension, inferencing, summarizing, transfer, resourcing, and questioning for clarification, and a control group, which did not receive any strategy instruction. They measured learners' reading comprehension and their strategy use before and after the experiment. The findings indicated that, after instruction, the students in the experimental group showed more progress on the reading comprehension measures and significantly employed more reading strategies than those in the control group.

Additionally, a study conducted by Chang and Lin (2014) gave reflective learning strategies instruction to EFL university learners and implemented e-journal activities across one semester. The students in the experimental group were required to write a reflective summary of reading texts after their reading reflecting on their learning goals and evaluating their learning processes, whereas the students in the control group were not instructed to reflect. Examining both groups' reading comprehension scores showed that the experimental group outperformed the control group. Moreover, most students in the experimental group recognized that they were able to organize ideas in the reading texts, and that they had better reading comprehension by keeping reflective e-journals, according to their responses to the research interview.

Main-idea comprehension and computer technology. Because reading researchers and teachers synonymously use "reading comprehension" and "main-idea comprehension," Grabe and Stoler (2011) viewed reading comprehension as a broader term, containing "understanding and retrieval of details, facts and examples" (p. 141), and considered main-idea comprehension to be the most important aspect of reading comprehension. Grabe (2009) contended that learners need "to identify main ideas in the text, integrate them into a text model of reading, and develop an appropriate situation

model of reader interpretation" (p. 198) in order to comprehend the major ideas of their reading materials.

Aiming to adjust online reading environments to be more supportive of EFL learners' comprehension, Lin and Chen (2007) examined the effects of different types of computer-generated texts (with static or animated graphics) and advance organizers (with descriptive statements or questions) on reading comprehension and retention. They claimed that texts with either static or dynamic graphics were equally effective in supporting learners' reading comprehension. When it came to a combination of visual aids and advance organizers, texts with animated graphics and question-based advance organizers helped learners better in constructing their cognitive understanding of new concepts.

In order to identify and solve EFL learners' reading problems in their reading processes, Yang and Hung (2008) developed a computer program to record how EFL college students constructed mental representation of anaphoric references. The students were divided into proficient, average, and less-proficient readers, based on their scores of a stimulated Testing of English for International Communication (TOEIC). While reading four texts presented by the program, the students were required to indicate the relationships between references on the program. They could receive feedback to study the concept of anaphoric references and verify their answers through the system. All of the students' reading processes were recorded in the system. Yang and Hung discovered that proficient readers better understood the main ideas of texts because they could identify the referenced relationship more correctly, check their comprehension, and reread related sentences to seek contextual cues. In contrast, the average and less proficient readers had difficulties identifying reference cues, and thus did not successfully grasp the main idea of texts. The researchers suggested that reading process data could

provide instructors with valuable information so that they could offer appropriate assistance to their students.

Moreover, Al-Seghayer (2007) presented one well-structured hypertext with explicit organizational devices (e.g., a graphical overview map of text content, headlines, and logical connectives statements) and one less-structured hypertext to 20 ESL proficient students and 20 ESL less proficient students. The students took a reading comprehension test after they read the hypertext. Al-Seghayer observed that the students developed a more coherent mental representation of the hypertext and had a better reading comprehension performance after reading the well-structured hypertext. More importantly, in terms of the proficiency levels, the less proficient learners benefited more from reading the well-structured hypertext than the more proficient learners. These findings implied that the ways hypertext is presented affect learners' reading comprehension.

Finally, Murphy (2010) examined which type of computer-mediated reading feedback could promote EFL learners' comprehension of computerized texts. The results showed that learners who had elaborative feedback (i.e., learners with three chances to get feedback, which became more specific each time) significantly outperformed those who were given immediate correct answers to reading exercises.

Collaboration in Language Learning and Teaching

The second line of the literature review deals with collaborative language learning, which has proved helpful for students' learning (Oxford, 1997). Communicative Language Teaching has become a mainstream style in the field of language learning and teaching since the 1970s, and collaborative work has grown in popularity as a part of

class activities. Pair or group activities involving learner-learner collaboration are common in second language learning and teaching contexts. *Collaborative learning*, one form of social interaction, is grounded in social-constructivist views of learning, which assert that social interactions are essential to meaning and knowledge co-construction through the process of negotiation of multiple perspectives; this process is facilitated by collaboration with others (Vygotsky, 1978). Collaborative learning is also connected to the perspectives and concepts from second language learning and teaching literature. For example, the Interaction Hypothesis, posited by Long (1983), holds that learners' second language acquisition is facilitated through interaction in the form of negotiations for meaning, especially when learners have a goal of making output comprehensible and target-like. This type of interaction may occur both in oral and written modalities (Ortega, 2007). In the Output Hypothesis, Swain (1993) claimed that learners are encouraged to process deeply and reflect on their output and notice gaps in their interlanguage when they need to produce output. Further, she proposed the concepts of *collaborative dialogue* (i.e., a dialogue in which learners engage in joint problem-solving activities) (Swain, 2000) and *languaging* (i.e., a process of using language to make meaning) (Swain, 2006). In collaborative dialogue, languaging allows learners to pool linguistic resources and to promote language performance. These above perspectives corroborate the idea that interaction has a vital and significant role in second language learning.

Language researchers have demonstrated the effectiveness of learners' interactions and collaborations with each other on language development (e.g., Swain, 2001; Swain & Lapkin, 1998). In addition to language gains, collaboration activities empower students to take responsibility for their own learning and play an active role in controlling their learning process (Freeman & Freeman, 1994; Macaro, 1997). This

echoes the philosophy of learner autonomy: Learners should manage their own learning (Benson, 2001). Also, collaboration among students has been attested effectively to reduce second language learners' debilitating anxiety (Tsui, 1996). As Nunan (1992) pointed out, collaboration affords the following advantages to language learners, including

- to learn about learning, to learn better and
- to increase their awareness about language, and about self, and hence about learning;
- to develop, as a result, metacommunicative as well as communicative skills;
- to confront, and come to terms with, the conflicts between individual needs and group needs, both in social, procedural terms as well as linguistic, content terms;
- to realize that content and method are inextricably linked, and
- to recognize the decision-making tasks themselves as genuine communicative activities (p. 3).

Collaborative pair or group activities have been widely used for the development of second language literacy abilities. For example, studies have shown that, in collaborative writing, learners produced more language-related episodes and made less grammatical and lexical errors when they worked in pairs or small groups (Dobao, 2012). Moreover, learners working with others competently produced shorter but more accurate texts (Wigglesworth & Storch, 2009) and held positive attitudes towards collaborative writing because they could share language knowledge and generate ideas together (Storch, 2005; Shehadeh, 2011). In addition to collaborative writing tasks, literature has demonstrated the efficacy of collaborative reading. In the next two sections, I particularly focus on collaborative reading and computer-supported collaborative reading activities.

Collaboration in the development of second language reading comprehension. *Collaborative reading* is a broad term that refers to many types of reading instructional activities, leading to interactions between teacher and students or among students in order to achieve common reading goals. It can be integrated either in text discussion, including book clubs (Raphael & McMahon, 1994) and literature circles (Daniels, 2002), or in multiple-strategy instruction, such as Questioning the Author (Beck, McKeown, Sandora, Kucan, & Worthy, 1996) and Collaborative Strategic Reading (Klingner, Vaughn, & Schumm, 1998).

Reading discussion is a widely used classroom activity. According to Malloy and Gambrell (2010), reading discussion fosters "the exchange and exploration of ideas that occurs in discussions about text involve[ing] cognitive engagements that promote a deeper comprehension and build background knowledge and interpretive skills useful to future interactions with text" (p. 261). A body of literature attests to its second language reading comprehension efficacy. For example, Rodrigo, Krashen, and Gribbons (2004) examined the effect of comprehensible-input approaches on language learning of Spanish learners with intermediate proficiency level. Seventeen students in three classes were assigned to three groups: experimental group 1 with extensive reading of self-selected texts; experimental group 2 with extensive reading of assigned texts plus class discussion; a control group with an emphasis on grammar and vocabulary. The findings showed that both experimental groups outperformed the control group on vocabulary and grammar tests, and supported the hypothesis that comprehensible input-based instruction was more effective than traditional methodology. However, the researchers did not further explore the differences between the two experimental groups. They concluded that learners could benefit from reading discussion because they had more exposure to aural input and

became interested in reading. Furthermore, Scott and Huntington (2007) qualitatively analyzed in-class French literature discussions by novice French learners and confirmed that L1 had a role to play in teacher-moderated discussion. Learners were able to develop cognitive flexibility and affective awareness about cultural differences and make appropriate cultural interpretations of meanings in literature. However, the use of L1 was not successful in student-led discussions due to the occurrence of translation talk and off-task talk.

The next three studies demonstrated that literature circles benefited second language learners. Kim (2004) qualitatively examined how nine adult ESL learners at advanced proficiency levels participated in a literature circle for one month. By analyzing their discussions, Kim found that the learners were engaged in highly dialogic social interactions in English and developed insightful responses to reading texts with critical, reflective judgments. They related reading texts to their own life experiences and shared their perspectives on cultural differences presented in the readings. Kim suggested that second language learners could enjoy reading experiences and boost communicative competence by emotionally and intellectually participating in literature discussions. Moreover, McElvain (2010) implemented literature circles with 75 academically at-risk English language learners for seven months. In comparison to a control group that lacked reading discussion, McElvain reported that reading discussion positively affected the English language learners' reading comprehension and fluency. Through literature circles, they became increasingly engaged and motivated in reading, and developed reading self-efficacy and confidence. Finally, Shelton-Strong (2012) argued that literature circles provide opportunities for collaboration and interaction, giving second language learners more exposure to contextualized language. Second language learners could pleasantly negotiate meaning and interpretations in reading discussions and naturally

develop their interlanguage. His empirical evidence came from one lower-advanced level class and one lower level class, which undertook literature circles for 24 weeks and 18 weeks, respectively. Based on observation and learners' feedback, Shelton-Strong noted that learners improved their reading comprehension, speed, and fluency, and became more engaged in discussion.

Two studies examine the effectiveness of collaborative strategic reading on ESL or EFL learners' reading comprehension. Klingner and Vaughn (2000) investigated how 37 Spanish-English bilingual elementary school students with limited English proficiency levels collaborated together to build reading comprehension. The students were taught how to implement collaborative strategic reading strategies in groups before they actually used them. The researchers analyzed recordings of individual groups' discourse and conducted two vocabulary tests before and after the experiment. The results showed that the students spoke both English and Spanish to discuss English texts. They were able to support their peers to gain vocabulary understanding, identify the main ideas of reading texts, and generate and answer questions about the text. In addition, the students significantly increased more vocabulary knowledge from the pretest to the posttest.

In an attempt to broaden EFL university learners' repertoire of reading comprehension strategies, Zoghi, Mustapha, Maasum, and Mohd (2010) added more reading strategies in their collaborative strategic reading instruction to 42 students in Iran. Over the six-week implementation, the researchers administered a pretest and a posttest of reading comprehension, and gathered the students' perspectives on the instruction. The results showed that the students perceived the collaborative strategic reading instruction positively even though there was no significant improvement in their posttest of reading comprehension. The researchers conceded that the university-level students in the study

might not be accustomed to collaborative learning with peers in their education contexts and might need more familiarity with the technique in order to benefit from it.

Computer-enhanced collaborative second language reading. As technological tools advance and become ubiquitous, educators and researchers have become increasingly interested in implementing computer-mediated collaborative reading activities, such as online discussion about texts (Gambrell, 2004). Coffey (2012) discussed the advantages and disadvantages of integrating technology into reading discussion. On the positive side, readers are not bound by time and place. Virtual reading discussions provide students with opportunities to connect with more readers outside the classroom and offer written transcripts for further reflection and analysis. Further, technology-enhanced discussions have the potential to foster classroom community and social interaction and allow all students to have equal opportunities to participate in discussions. However, technology-integrated reading discussions also bring challenges. For example, readers cannot interpret other readers' tone from written texts. Some readers may have issues with typing and reading speed when participating in synchronous online contexts. Readers may not receive timely feedback when involved in asynchronous discussions. Finally, they may need some time to learn how to use technology tools in order to participate in the reading discussion.

When collaboratively reading online, readers display different collaborative profiles, as demonstrated by Kiili, Laurinen, Marttunen, and Leu (2012). In their study of high school students in Finland, Kiili and her colleagues recorded and analyzed students' conversations used an interaction approach as a means of analyzing verbal protocol data. They found that students adopted diverse strategies while collaboratively reading online (e.g., gathering information; putting forward and developing arguments; inferencing;

using prior knowledge; asking questions; expressing an opinion or disagreement; and proposing solutions). Also, the researchers identified the different collaboration profiles presented by the students: co-constructer, collaborators, blenders, individually oriented readers, and silent readers. Their study contributes a better understanding to the process of online collaborative reading.

In an attempt to afford more opportunities for second language learners to practice reading collaboratively, researchers have adopted existing programs for reading discussion or developed their own system to suit students' needs. Chiang (2007) administered a year-long virtual literature circle activity with 54 EFL college learners in Taiwan in a course management system. She demonstrated that the students improved their English reading comprehension and general English proficiency after the activity. The students appreciated that they had permanent written records of the discussion. However, some students reflected that they encountered technological obstacles during their participation in online discussion. Some students felt discouraged when taking part in discussion due to their limited English proficiency. Another study was conducted by Chen, Chen, and Sung (2010) who developed a tag-based collaborative reading learning system to construct an appropriate online environment for collaborative reading by means of Web 2.0 social tagging features. They found that EFL senior high school students in Taiwan who used the social tagging and discussion forums outperformed those who simply participated in discussion forums on the English reading comprehension measure.

Murphy (2007) examined the effects of manner of study and type of reading feedback on 225 EFL college students with various proficiency levels in Japan. The students were allowed to choose either to study alone or to work in pairs with their peers on an English text. The system assigned the students to receive either elaborative feedback (e.g., provision of additional explanations, prompts, or cues to stimulate

learners' reflection and discussion about appropriate answers to reading questions) or knowledge of correct responses (e.g., provision of correct answers only). The findings showed that there was no significant difference in the reading comprehension performance among the learners. Yet, an interaction effect between the manner of study and the type of feedback occurred. The learners who received elaborative feedback performed better on the reading comprehension test when they worked in pairs, whereas those who obtained knowledge of correct responses were more successful when they worked individually. The researcher's study informed reading teachers of the effect of providing distinct types of feedback to students with different reading manners.

To assess the efficacy of mobile assisted language learning (Hockly, 2013), Lan, Sung, and Chang (2007, 2009) conducted a series of studies regarding the development of computer technology for early EFL learners' reading abilities. They found that students at better proficiency levels either were too busy to take care of slow learners or teased those less proficient students about their poor performance in traditional collaborative reading contexts. Furthermore, slow learners did not receive prompt feedback about their reading performance (Lan et al., 2007). Thus, aiming to address the difficulties faced by young EFL learners in elementary school, Lan and her colleagues (2007) developed a tablet-PC-based peer-assisted learning system (MPAL) with a phonological-skill training module and a peer-assessment module. During the ten-week intervention, the students studied sight words and phonetic words with the system's guides, and practiced reading aloud individually. Once they had passed the test in the training module, they proceeded to the peer-assessment module and invited reading partners to show their ability to read texts. The reading partners could mark the students' mispronunciation while the students were reading, and the system would evaluate the students' reading performance. The results showed that the students were able to enhance

their reading motivation and became more confident in their oral reading. Moreover, Lan and her colleagues (2009) further developed a mobile computer-assisted reciprocal early English reading (CAREER) system and examined whether the EFL elementary school students could sharpen their reading ability when reading together with their peers. Similar to their previous study (2007), the system contained a sight word module, a phonetic word module, and a peer assessment module. The researchers received positive feedback about learning experiences from the young learners and demonstrated that the students could improve their oral reading skills and reading comprehension abilities. Lan and colleagues also reported that the students were engaged in the collaborative reading activities presented by the system.

With the advent of advanced computer technology, more possibilities have been brought into second language reading activities. As previous studies show, second language readers may benefit from receiving different types of reading feedback contingent on different reading approaches; they may reflect better on their reading discussion by having access to discussion transcripts; and they may make use of peers' tagging resources to enhance reading comprehension. Moreover, progress of the Internet and hardware devices offers more potential for collaborative reading activities, such as better individualized learning and easy access to reading partners.

Notetaking and Students' Learning

In this last section, I review the work on learners' reading activities, specifically addressing their information-recording actions, such as taking notes and making annotations; students are highly encouraged to adopt these strategies, both for reading comprehension and the learning of academic subject matters (Shih, 1992; Simpson &

Nist, 1990). Annotation is a typical example of notetaking, and digitized annotations afford collaboration and interaction among readers (Marshall, 2010). A few empirical studies have been conducted on the application of annotation in learning tasks, and these are reviewed in the following paragraphs.

There is an extensive and older literature demonstrating the value of notetaking from texts (e.g., DiVesta & Gray, 1972; Einstein, Morris, & Smith, 1985; Wilson, 1999): Learners can recall more important propositions and better organize information by taking notes; they can transform information they receive in a deeper, meaningful way and consolidate noted information; they can experience better reading comprehension and retention. Bangert-Drowns, Hurley, and Wilkinson (2004) asserted that notetaking can function as a tool for self-reflective monitoring of comprehension and self-evaluation of text comprehension.

Scholarship provides evidence that notetaking facilitates both reading comprehension and listening comprehension for second language learners. Rahmani and Sadeghi (2011) investigated the effectiveness of notetaking strategy training on 108 Iranian EFL undergraduates over two months. The experimental group underwent the notetaking instruction with the graphic organizer skill whereas the control group did not. The researchers found that the experimental group significantly outperformed the control group in terms of their reading comprehension performance and retention of written texts. Also, the experimental group more often recalled important ideas and identified the relationships among ideas in the text.

Two additional studies report on the facilitative impact of notetaking on second language listening comprehension. Hayati and Jalilifar (2009) showed that notetaking instruction could help learners achieve better listening comprehension. They recruited 60 EFL college students in Iran and randomly assigned them to three groups: uninstructed

notetaking group, notetaking group with Cornell notetaking instruction, and no notetaking group. After the six-week treatment, Hayati and Jalilifar administered a simulated Test of English as a Foreign Language (TOEFL) on the students and examined their performance of the listening section. It was demonstrated that the notetaking group with the instruction performed considerably better than the other groups. The non-notetaking group received the lowest scores in their listening comprehension part. Also, Tsai and Wu (2010) demonstrated that EFL university students in Taiwan performed better in short conversations and long lecture listening tests when they took notes, regardless of which languages (English or Chinese) the students used to take their notes. The findings echoed previous literature that supported the benefits of notetaking training for listening comprehension.

As technology develops, texts can be moved from a printed format to a variety of electronic formats. Online notetaking and annotation tools have been developed to support learners taking notes in digital texts. Quade (1996) found that, in computer-delivered instruction, students taking notes on an online computer notepad had better learning outcomes than those using pencil and paper to take notes. Similarly, Bui, Myerson, and Hale (2013) demonstrated that students had better recall on immediate tests when they were advised to type their notes into their computers than when they took notes by hand. In addition, when students reviewed notes that they took in class on computers, their retention was better than that of students taking notes only.

Language learners can be well accustomed to using note-taking software programs in their language learning. For example, Roy, Brine, and Murasawa (2014) observed how ten undergraduate students in a technical university in Japan applied a variety of notetaking software applications to complete a series of English learning activities. Based on the researchers' observations and the students' responses to surveys

and interview questions, the findings showed that the students could successfully complete the learning tasks on the notetaking applications regardless of their novice experience of using the applications. The students also held a relatively positive attitude toward the programs.

The effect of using digitized annotations for collaborative learning. As a form of notetaking, current annotation tools allow learners to make text-based annotations privately or publicly on digital documents by highlighting specific text passages and adding comments with online annotations tools. Wolfe and Neuwirth (2001) identified four functions of technology-supported annotations: to facilitate reading and later writing tasks, to understand other readers' insights, to provide feedback to writers or promote communication with collaborators, and to call attention to important topics and passages. Therefore, the use of collaborative annotations tools can bring learners several advantages in their education (Educause, 2009):

- Learners can become more actively engaged in scholarly discussions by adding and sharing their commentary and reflection;
- Learners can collaboratively share ideas, create knowledge, and search for and evaluate information;
- Learners can accumulate information by reviewing others' annotations and build a connected group;
- Learners can have more opportunities to receive valuable feedback from experts in academic fields because their annotations can be spread throughout the Internet;
- Learners can learn how to collaborate with others via annotation-sharing learning activities.

However, research about the use of online annotation in educational settings is still in its infancy (Novak, Razzouk, & Johnson, 2012). In recent studies, researchers have integrated online annotations into collaborative activities in various academic subject matters, such as educational technology, evaluation and measurement, liberal studies, and language learning. Research demonstrates that learners at different educational levels can benefit from the use of online annotations in several ways.

Both interaction and collaboration are central to the application of online annotations. Nokelainen, Miettinen, Kurhila, Floréen, and Tirri (2005) demonstrated that there was a positive relationship between learners' participation in the web-based shared annotation activity and their final course grades. The learners agreed that the system for shared annotations was useful and peers' comments boosted their learning. Yet, they described a possible distracting effect of shared annotations: They found peers' highlighting in the system annoying. Nokelainen and colleagues claimed that the shared annotation system seemed promising as a way to enhance student-centered learning.

Mendenhall and Johnson (2010) demonstrated that university participants using online, social annotations were more engaged in first language reading tasks and had a higher level of interaction with texts. Thus, online annotations promoted not only interaction with other readers but also deepened their thinking in the reading processes. The students possessed positive views of the annotation tool system, and considered it useful for peer critique activity. However, Mendenhall, Kim, and Johnson (2011) did not find a significant difference in the university students' learning motivation and their performance of first language reading comprehension, critical thinking, and thesis writing between the annotation group and non-annotation group, due to the small sample size of the students and students' part-time status. They proposed that teachers and researchers should have reasonable expectations about the efficacy of a new technology tool.

Online collaborative annotation supports learners' development into critical readers who deeply process reading texts. Wolfe (2008) claimed that the type of annotations affected readers' reflections. For example, when annotations with conflicting positions were presented, readers would carefully consider different viewpoints. Lu and Deng (2012, 2013) reported that online annotation helped high school students identify main ideas and supportive evidence for arguments, and become attentive, reflective, and critical readers when reading each other' s annotations.

Several studies demonstrated that learners who share their annotations can enhance their reading performance. As Johnson, Archibald, and Tenenbaum (2010) reported, community college students improved their first language reading comprehension and meta-cognition skills when they compared their annotations with their teacher's notes. Hwang and Hsu (2011) found that the prereading activity and online annotation sharing with peers led to better learning achievement. When Taiwanese sixth graders shared their annotations in the prereading activity, they were able to discuss with peers and had opportunities to prepare themselves to learn the Chinese reading content. Yang and colleagues (2012) addressed that eighth graders in Taiwan understood better Chinese poetry by creating and sharing digitized annotations. They also expressed positive attitudes toward the annotation system.

Also, Razon, Turner, Johnson, Arsal, and Tenenbaum (2012) found that university students who used online annotations to highlight and annotate text and to comment on others' annotations outperformed those who did not use online annotations in the reading comprehension quizzes and a summative assessment. Furthermore, the students using online annotations had more positive learning affect. Yang, Yu, and Sun (2013) demonstrated that the use of collaborative annotation enhanced Chinese young

learners' reading performance and promoted their higher-level cognitive abilities, such as summarizing and analyzing.

Annotation-sharing meets the needs of learners and encourages them to engage actively in reading discussion. Hwang, Wang, and Sharples (2007) asserted that online annotation methodology was suitable for college learners with different cognitive styles (i.e., field dependence and field independence). Also, Su, Hwang, and Zhang (2010) claimed that there was a positive relationship between the number of readers' annotations and their learning achievement.

Finally, Gao (2013) found that pre-service teachers in an educational technology course became more active participants in reading practices through the use of online annotations. They highlighted and discussed important issues in the reading, shared different opinions, and learned from others' perspectives. In addition, online annotations directed their attention to specific information. Chen and Chen (2014) posited that their online collaborative reading annotation system was helpful to foster Taiwanese fifth graders' Chinese reading interest and learning satisfaction. The system also enhanced the interactive discussion among students and reduced off-topic annotation posts. The students who used the collaborative annotation system improved their reading comprehension and used more reading strategies that required higher reading skills.

Most of the studies report that the majority of students have positive attitudes toward learning with online annotations (e.g., Gao, 2013; Hwang et al., 2007). Yet, Wolfe (2008) cautioned that annotations could be viewed as a distraction by some readers. In her study, some readers simply ignored annotations from other readers because they feared that the annotations would greatly influence their perspectives in ways they hoped to avoid.

The effect of using digitized annotations on second language reading development. The concept of using electronic annotations or glosses is not new to the second language reading field. As Chun (2006) stated when she reviewed such tools, "[o]nline glossing is thought to provide fast and easy access to the meaning of unknown words and to compensate for insufficiently automatic lower-level processes and thus allows the reader to attend to higher level processes" (p. 70). In addition to its easy access, electronic glosses can be effortlessly tailored to meet language learners' needs (Taylor, 2006). Online annotating/ glossing draws much attention from second language researchers and educators, and is continuously evolving to include more functions. An abundance of literature explores its effect on how learners approach second language texts, and, in particular, how they deal with unfamiliar vocabulary.

To examine broadly the relevant studies concerning the use of electronic glossing, I classified the focus of the research into six directions: How much glossing was advantageous to second language learners (e.g., Lomicka, 1998); the manner of presenting glosses- computer-based or paper-based glossing (e.g., Taylor, 2006; 2009; 2013), text-typed or multimedia-typed glosses (e.g., Chen & Yen, 2013; Chun & Plass, 1996; Xu, 2010; Yanguas, 2009), glossing in the first language or second language (e.g., Yoshii, 2006); the position of presenting glosses (e.g., AbuSeileek, 2008, 2011; Chen & Yen, 2013); and a meta-analysis about the effect of using electronic glossing (Abraham, 2008). These studies share a common feature among their participants. The participants simply interacted with texts via the annotations/ glosses provided by the researchers. Rarely did they have opportunities to discuss or communicate with peers by means of such tools in their second language reading activities.

There is a dearth of research on the use of online annotations in collaborative reading activities for the development of second language reading abilities. To my

knowledge, only three studies are concerned with this issue. Yang, Zhang, Su, and Tsai (2011) tested their web-based annotation system, PAMS 2.0. These researchers recruited 94 university juniors in Taiwan and divided them into two groups: an experimental group that used the system to share their annotations, and a control group that used e-mails, instant messengers, and paper documents to discuss English reading materials. Both groups had equal reading competencies, as tested prior to the study. The students went through five rounds of reading comprehension tests across the semester. The results showed that the experimental group outperformed the control group on the five reading comprehension tests. Yang and colleagues suggested that web-based annotations applied to collaborative learning promoted knowledge sharing and boosted interaction and collaboration among users.

Chang and Hsu (2011) investigated the effect of collaborative reading via sharing annotations on the comprehension of English reading texts. University juniors (N = 42) in Taiwan first read a text individually and took the reading comprehension test. Based on their performance on the test, the students were assigned to heterogeneous groups of two, and read a new English text. Each pair shared their translated word meaning annotations (from English to Chinese) in the collaborative reading activity and took the reading comprehension test after their reading. Chang and Hus compared the scores of the two reading comprehension tests and found that the students performed significantly better when they had read collaboratively. The researchers suggested that, with the support of technology, students can collaborate and share their translation annotations with their peers, which helped everyone acquire vocabulary and process their knowledge.

Regardless of the positive findings in terms of annotation-sharing on learning achievement from the previous two studies, Hsu, Hwang, and Chang's study (2013) evidenced that peer collaboration did not always work. These researchers found that

students' reading comprehension performance was statistically similar when they made individual annotations or shared annotations with their peers. In their study, they developed a mobile learning system that provided EFL students with personalized recommendations for English reading materials based on students' preferences and proficiency levels. Taiwanese high school students (N = 108) with identical learning backgrounds in three classes were assigned to one control group (receiving no reading recommendations) and two experimental groups (receiving personalized recommendations). All research groups made translation annotations but only the experimental group 2 shared their annotations with peers. After the four-week-long intervention, all students took a reading comprehension test. The results indicated that both experimental groups significantly performed better on the test than did the control group; however, there was no difference between the two experimental groups in terms of the test results. The researchers interviewed several students from the experimental group 2 and discovered negative views regarding sharing annotations. Proficient learners considered annotations made by less proficient learners distracting and unhelpful; and less proficient learners complained that their classmates did not annotate difficult words and most of the annotations made by learners with similar proficiency levels were already known to them. More studies concerning the effect of annotation-sharing in second language collaborative reading activities are needed.

My Study

Among different technology tools, online annotation tools have the potential to enhance readers' collaboration and interaction. However, most studies about the use of electronic annotations in the field of second language learning and teaching have focused

solely on the interaction between readers and texts; few have explored the interaction among readers, a process of giving and taking comments on readers' own annotations. Little has been reported in the literature about the process and product of this type of collaborative reading. In addition, second language reading literature concerning the use of collaborative annotations has not included the effect of collaboration with peers (by means of annotation-sharing) on learners' reading comprehension. From the previous literature, there are three issues worthy of being addressed.

In the beginning, although participants in the previously-mentioned studies shared their annotations with peers, peers could not respond to received annotations for further discussion. Their collaboration mode was quite limited and did not represent full mutual interaction. Further investigation is needed about how bi-directional interaction among learners via collaborative annotations can affect second language reading comprehension.

Second, most studies concerning the use of collaborative annotations in the first language and second language reading research have focused on adult and adolescent learners, but few has extended to elementary school levels. Little is known about young second language learners' use of digitized annotations. To gain more understanding of the effect of online collaborative annotation usage on the development of second language reading abilities, more research was needed to explore whether the implementation of online annotation in reading activities would fit the learning needs of different levels of learners, such as young learners in elementary school. It seemed promising to integrate online annotations into elementary school curricula. As demonstrated by previous research, the use of online annotations enhances learners' reading engagement, reading motivation, reading comprehension, and vocabulary acquisition. Elementary school students may benefit from the adoption of online annotation tools in their second language learning. Additionally, via the use of online annotations, readers can develop

skills to collaborate and interact with others. These skills are crucial for students to be successful in the new global economy (Partnership for 21st Century Skills, 2007). Thus, a study was needed to inform the efficacy of the use of online annotations on elementary school students' language learning.

Finally, researchers had adopted their own annotation-sharing systems in previous research. For teachers who do not have access to such customized systems, it is difficult to implement collaborative reading by means of annotation exchange and to popularize this type of learning activity. Hence, to overcome this hurdle, it seemed important to seek a publicly available resource and test its efficacy.

In this study, I wanted to extend the idea of collaborative learning and online collaborative annotation use in an open, free platform. The focus of the study centered on examining how EFL elementary school students in Taiwan interactively engaged with online reading activities and what effect it had on their reading comprehension performance and reading affect. The study aimed to investigate whether interaction via an online annotation platform during online reading was beneficial for reading comprehension and reading affect for young learners.

Chapter 3

Method

The purpose of the study was to investigate the English reading comprehension performance and reading experiences of young EFL learners in Taiwan when they participated in various online reading activities. The study focused on how these young Taiwanese learners of English dealt with reading tasks. To triangulate the findings, quantitative and qualitative analytic approaches were used to collect data and examine learners' reading processes and products.

This chapter describes the methods and procedures adopted to conduct the current study that addresses the following research questions:

1. How did reading comprehension differ for fifth grade students who were engaged in different reading activities: read-only, individual annotation, and collaborative annotation?
2. Were there differences on measures of enjoyment and engagement in the reading tasks for fifth grade students who were engaged in different reading activities: read-only, individual annotation, and collaborative annotation?
3. What did the process of interacting with the text look like for the learners who had been assigned to either the individual or collaborative annotation groups (in terms of the nature of the annotations and text-based recall interviews)?

In the following sections, I discuss the research context, the participants, the setting, the online annotation tool, research design, the research instrument, data collection procedures, data analysis, and issues of data trustworthiness and credibility.

Research Context

This study took place in a public elementary school in Hsinchu City, Taiwan. At the time of the study, the school was large, with nearly 2000 students in total across grades one to six. On average, each grade had ten classes.

According to National Curriculum Guidelines in Taiwan (Ministry of Education, 2001), information technology education and English education are mandatory courses, beginning from grade 3. For these requirements, teachers are highly encouraged to make use of information technology and to use Internet resources to create rich learning contexts for students. Information technology is assigned to one 40-minute session per week, whereas English has two sessions weekly, adding up to a total of 80 minutes.

Thanks to the local government's emphasis on students' English competency development, elementary schools in Hsinchu City implement English education in grade 1. Moreover, the government recruited native English speakers with qualifying teaching certificates and assigned them to individual schools, aiming to enhance students' opportunities to interact confidently with native speakers of English and to improve their English communication abilities (Yu, 2006). In the 2013-2014 academic year, there was one 40-minute English class session in grades 1 and 2, taught by native English-speaking teachers; two sessions in grades 3 and 4, one taught by local Taiwanese teachers and the other by native English-speaking teachers; and three sessions in grades 5 and 6, two sessions taught by local Taiwanese teachers and the other by native English-speaking teachers.

Participants

For the study, fifth grade students were selected as research participants because they had some basic English proficiency levels and an adequate command of computer technology. At this school, the vast majority of students at the fifth grade level had been learning English for over four years. Two of their three 40-minute English sessions per week, taught by a local Chinese teacher, placed more emphasis on English reading and writing competence development, whereas the third, taught by a native English-speaking qualified teacher from South Africa, solely focused on listening and speaking skills. In addition, students had received one weekly 40-minute computer session since third grade. Thus, the students were equipped with fundamental technology skills.

I purposefully selected three of the 10 classes of fifth grade students (N = 90) in correspondence with the availability of a computer lab. The participants were between 11 and 12 years of age, and so I attained educational authorities' consent to conduct the research. The three classes were taught by the same English teachers and used the same learning materials. The students were accustomed to having technology infused in their English instruction because their local Taiwanese teacher always presented a wide variety of learning materials from the Internet to them via SmartBoard. One student from Class A, two from Class B, and three from Class C were excluded from the study due to their parents' unwillingness to allow them to join the study. Also, one student with learning disabilities from Class C had difficulty even comprehending Chinese texts, and was therefore not included in the study. Therefore, a total of 83 students were involved in the study. When I asked if any participant would like to be interviewed, I received assent and consent (see Appendix A) from 21 students in Class A, 13 students in Class B, and nine students in Class C. The 83 participants' demographic information, English learning

experiences, computer skills and preferences, and reading behaviors and experiences are shown in the following tables.

There was an equal proportion of girls and boys in the three classes. Differences emerged because some participants were excluded from the study. As Table 3.1 shows, all students owned computers at home. The majority of participants also had access to the Internet at home.

Table 3.1
Participants' Information

Category	Characteristic	Class A (n=29)	Class B (n=28)	Class C (n=26)
Gender	Female	15	14	15
	Male	14	14	11
Have computer at home	Yes	29	28	26
	No	0	0	0
Internet Connection at home	Yes	28	27	26
	No	1	1	0

Table 3.2 describes the participants' English learning experience. Around 72% of the participants had started learning English before they entered elementary school. The time the participants had spent on English learning varied. Nearly 42% of the participants disliked English whereas around 34% liked it. Most of the participants recognized that English was important to them. Over 68% of the participants perceived that they had a good level of English proficiency, and 64% thought that they had a good control of English reading. By contrast, 36% of the participants considered developing English reading abilities difficult. Most of the participants agreed that there were benefits to using

computer technology for English learning. Furthermore, the majority of the participants' parents were concerned with the participants' English learning progress.

Table 3.2
English Learning Experiences

Category	Characteristic	Class A (n=29)	Class B (n=28)	Class C (n=26)
When to start learning English	Before grade 1	17	23	20
	Grade 1	9	4	3
	Grade 2	1	1	1
	Grade 3	1	0	1
	Grade 4	1	0	1
How much time studying English after school per week	Less than 1 hr	6	5	2
	B/w 1 & 3 hrs	10	9	8
	B/w 3 & 5 hrs	6	8	5
	B/w 5 & 10 hrs	7	4	11
	More than 10 hrs	0	2	0
English preference	Extremely dislike	6	3	3
	Somewhat dislike	9	9	5
	Neutral	3	9	8
	Somewhat like	9	4	6
	Extremely like	2	3	4
Perception about the importance of English	Not important at all	1	2	0
	Slightly important	2	6	3
	Somewhat important	9	7	5
	Important	4	3	8
	Extremely important	13	10	10
Perception of English proficiency	Poor	4	2	5
	Fair	6	6	3
	Good	6	13	7
	Very good	8	6	6
	Excellent	5	1	5

Table 3.2 (continued)

Category	Characteristic	Class A (n=29)	Class B (n=28)	Class C (n=26)
Perception of reading abilities	Poor	5	5	5
	Fair	6	4	5
	Good	7	12	5
	Very good	7	6	6
	Excellent	4	1	5
Perception of the ease of learning reading abilities	Very difficult	4	5	2
	Difficult	8	4	7
	Neutral	10	11	6
	Easy	6	4	5
	Very easy	1	4	6
Perception of technology helpfulness on English learning	Not helpful at all	0	2	1
	Slightly helpful	2	2	3
	Somewhat helpful	10	9	7
	Very helpful	13	9	11
	Extremely helpful	4	6	4
Parents' attitude toward their English learning	Not care at all	0	1	1
	Slightly care	0	1	0
	Somewhat care	7	7	2
	Care	9	6	8
	Extremely	13	13	15

Table 3.3 describes the participants' computer learning experiences. The time the participants were allowed to use computers, and whether they felt comfortable reading on screen varied among the three classes. Generally speaking, most of the students expressed interest in using computers. They felt more confident typing in Chinese than in English.

Before the study, many participants were new to *Google Docs*, a free, web-based document managing platform where the students participated in reading activities in the current study.

Table 3.3
Computer Skills and Preferences

Category	Characteristic	Class A (n=29)	Class B (n=28)	Class C (n=26)
How much time using computer per week	Less than 1 hr	8	12	13
	B/w 1 & 3 hrs	16	9	5
	B/w 3 & 5 hrs	3	3	5
	B/w 5 & 10 hrs	1	1	2
	More than 10 hrs	1	3	1
Preference for computer use	Extremely dislike	0	1	0
	Somewhat dislike	0	1	1
	Neutral	8	8	6
	Somewhat like	6	6	6
	Extremely like	15	12	13
Comfortable reading on screen	Extremely uncomfortable	0	0	0
	Somewhat uncomfortable	9	4	6
	Neutral	10	12	7
	Somewhat comfortable	6	1	7
	Extremely comfortable	4	11	6
English typing skills	Poor	7	7	6
	Fair	8	8	5
	Good	9	6	8
	Very good	5	2	3
	Excellent	0	5	4

Table 3.3 (continued)

Category	Characteristic	Class A (n=29)	Class B (n=28)	Class C (n=26)
Chinese typing skills	Poor	2	5	2
	Fair	7	7	3
	Good	7	7	7
	Very good	9	2	7
	Excellent	4	7	7
Google Docs experience	Never	27	16	20
	Yes	2	12	6
The experience of using annotation functions on Google Docs	Never	N/A	6	0
	Yes	N/A	6	6

Table 3.4 reports on students' reading behaviors and experiences. Around 64% of the students in Class B and 54% in Class C had a habit of taking notes while studying. All of the students in the three classes had experience with in-class collaborative reading in both their Chinese and English classes.

Table 3.4
Report of Previous Reading Behaviors and Experiences

Category	Characteristic	Class A (n=29)	Class B (n=28)	Class C (n=26)
Notetaking behaviors while reading	Yes	N/A	18	14
	No	N/A	10	12
Collaborative reading experience	Chinese	29	28	26
	English	29	28	26

Computer Lab Set-Up

During the spring semester of 2014, the study was administered as a regular English learning activity in the local English teacher's class and took place in a computer lab. There were four rows in the computer lab, each containing ten desktops. The seating arrangement was based on their class number. Students' numbers 1 to 8 sat in the first row, those from numbers 9 to 16 in the second row, and so on. If a designated computer was broken, students were moved to another computer. A desktop specifically for teachers was located at the front of the lab, from which they easily controlled all students' computer screens. The operating system of all the computers was Windows 7, with a built-in Google Chrome Web browser.

Online Annotation Tool and Reading Materials

I used Google Docs (https://docs.google.com/?hl=zh-TW), a free, publicly available web-based word processing platform, to administer the online English reading activities. Each student was assigned a new Google account, and Google Docs was thus available free of charge. This platform is similar to Microsoft Word, a program familiar to the students as they used it frequently in their computer class. Therefore, students quickly familiarized themselves with the Google Docs interface and seemed to find it easy to make annotations. Figure 3.1 provides a snapshot of an example Google Docs document with comments.

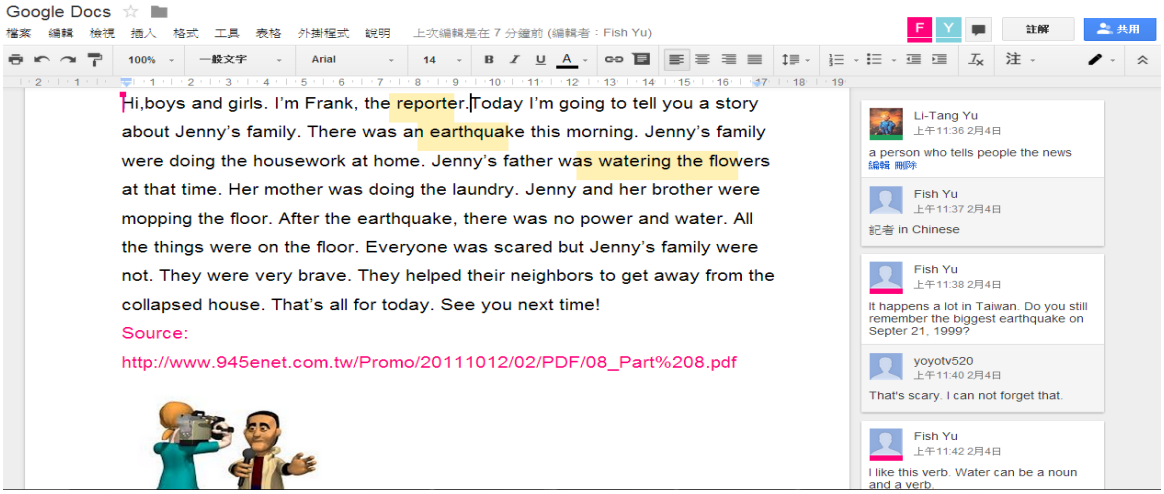

Figure 3.1. A snapshot of Google Docs.

When making annotations to documents on Google Docs, users highlight specific texts and then go to the "Insert" menu or click the right button of their mouse selecting "Comment." An alternative approach to making an annotation is to use the keyboard shortcut "Ctrl + Alt + M" in the Windows operating system. Users can type their comments in a pop-up box. Comment boxes are placed next to highlighted texts. When users point at the highlighted text, Google Docs immediately underscores the annotation box, and vice versa. When responding to others' annotations, users can click that annotation box and type their reply in the column. The reply will be placed under the annotation to which the user responded. All users who have access to the text on Google Docs can see the annotations and replies, and are able to delete the annotations. All annotations and replies, including the deleted ones, are automatically recorded by Google Docs, and become available when users click the "annotation (註解)" button at the right side on the top of the Google Docs interface.

In the current study, students were invited to access English stories on Google Docs. I granted the three reading groups different access levels and use privileges, such

as “View the document only” and “Comment on the document”. Only the users who shared the same document link with the privilege “Comment on the document” could read each other’s annotations and interact with others by commenting on their group members’ annotations

As for the reading materials for the activities, the local English teacher and I together discussed which texts were suitable for her class. We selected three reading texts that had similar themes to the textbook. The three reading texts (see Appendix B) and reading comprehension tests were adapted from two sources. The first text, “Happy Father’s Day,” was provided by a local textbook publisher, Kang-Xuang. The article was designed as a supplementary learning material for high-grade elementary school students with knowledge of 200 English vocabulary terms, which fulfills the Curriculum Guidelines’ requirement for elementary school students (Ministry of Education, 2001). The other two texts, “A Family’s Holiday” and “Jack’s Good Book,” were from *Young Learner English* developed by Cambridge English Language Assessment. “A Family’s Holiday” was in the reading test section of *Young Learners English: Movers*, which fits young learners with knowledge of 700 words. “Jack’s Good Book,” also in the reading test section of *Young Learners English: Flyers*, fits young learners with knowledge of 1100 words (Language Training and Teaching Center, n.d.). In terms of text length, “Jack’s Good Book” was the longest, “A Family’s Holiday” the second-longest, and “Happy Father’s Day” was the shortest. The learners read “Happy Father’s Day” in the first reading session, “A Family’s Holiday” in the second session, and “Jack’s Good Book” in the final session. Reading level became more difficult and the length of the text became longer for each reading session. The rationale for such an arrangement was to better differentiate learners’ English achievement and avoid ceiling effects, and also to

allow these young learners a chance to warm up to the task with a relatively easy first text.

Research Design

In the present study, I adopted a mixed method research design. Recognized by Calfee and Sperling (2010), "mixed methods give complementary and mutually enhancing ways of reaching richer interpretations of observed phenomena than may be possible from a quantitative or qualitative approach alone" (p. 7). Researchers can use mixed methods as a triangulation strategy to gain a better understanding of their focused issues and to strengthen the study validity (Dornyei, 2007). In order to examine the collaborative reading processes and products, five different types of data were collected: (1) the students' English learning and computer learning experiences; (2) the levels of students' comprehension about the reading texts; (3) the students' reading enjoyment of and engagement with the reading activities; (4) stimulated recall about reading processes; and (5) the students' frequency of online support consultation (see section 3.6 for a detailed description).

In an attempt to examine the effect of online annotation usage in collaborative reading activities, three reading conditions were designed. All students went to Google Docs and read an English story as a class activity. A total of three stories were prepared for three reading sessions. Students in the read-only group simply read the online texts, whereas those in the individual annotation group and collaborative annotation group could make annotations while reading. The only difference between the individual annotation group and the collaborative annotation group was that the latter could share the annotations and make comments on group members' annotations. Students in the

individual annotation group only made private annotations for their own reading. Students in the collaborative annotation and individual annotation groups were allowed to use Chinese or English to make annotations, whichever they felt more comfortable with and useful for their comprehension of stories. Table 3.5 provides a brief summary of the reading groups.

Table 3.5
Study Design

Group	Reading setting
Read-only	Individual online reading + No annotation
Individual annotation	Individual online reading + Making annotations
Collaborative annotation	Collaborative online reading + Making annotations + Commenting on other's annotations

Research Instruments

There were five types of instruments used in the study. The first instrument was a background survey (see Appendix C) used for eliciting the participants' information about their English and computer learning experiences. The survey was presented in Chinese. The second instrument was reading comprehension tests (see Appendix D) to measure the students' reading comprehension levels. The tests consisted of two parts, free recall and cued recall. In the free recall part, the students first read the question written in Chinese; this question required them to write down in Chinese everything they could remember about the text. As researchers (Lee, 1986; Wolf, 1993) found, language learners perform better in recall when writing in the first language than in the target language. This part was the same in the three reading comprehendsion tests. As for the cued recall part, questions were from the text resources. There were seven different

questions designed in each test in accordance to the reading texts. They were presented in English. The format of the questions was multiple-choice. The participants had to choose a single correct answer out of four options. When they had finished the free recall test, they proceeded to the second part, the cued recall test. Once the participants began the cued recall test, they could not go back to the free recall test because I wanted to prevent the cued recall part from affecting the students' memory for the text.

The third instrument was a survey for measuring students' reading enjoyment with and engagement in the reading activities. The survey was comprised of two parts: 4-point Likert scale items and open-ended questions (see Appendix E). They were presented in Chinese. The first three Likert scale questions were common to all students, asking how much fun they had, how much engagement they had during the reading activities, and how much helpfulness they perceived about the reading activities for their reading comprehension development. The students in both annotation groups had two additional questions about their perceptions of the usefulness and enjoyability of making annotations while reading the text. The students in the collaborative annotation group had five extra questions about their perceptions of the usefulness and enjoyability of having team members' annotations and comments on their annotations. Furthermore, the students in the individual annotation group had two more questions in the third survey about whether they would like to have peers' annotations and responses. At the end of the survey, there were open-ended questions inviting all students to write down additional thoughts about the reading activities.

The fourth instrument was text-based stimulated recall protocols (Gass & Mackey, 2000) (see Appendix F) in order to understand better the participants' processes of using online annotations in the reading activities. Invited interviewees would reread online reading texts and annotations, and recall what they thought in their mind while

they were reading the texts. This type of verbal report, stimulated recall, has been used widely to assist researchers to explore readers' cognitive processes and reading strategies while reading in digital contexts (e.g., Chun, 2001; Coiro & Dobler, 2007; Zhang & Duke, 2008). The major advantage of using verbal reports is that researchers can gain access to some of what is going through readers' minds as they read texts. Stimulated recall interviews are known for capturing process data without interfering in ongoing processes (Vogler et al., 2013). I administered text-based stimulated recall protocol immediately after the reading activity to volunteer students. I invited six volunteer students with different English reading achievement from the groups. The selection principle was to invite two students with the highest, medium, and lowest previous semester's reading scores out of the participant pool. The protocols were audio-taped and transcribed.

The final instrument was a survey investigating the participants' frequency of online support consultation (see Appendix G). There were four 5-point Likert scale items written in Chinese, ranging from "never use" to "always use." They were designed to ask how often the participants checked the translation of the whole text, a paragraph, a sentence, and a word via online resources.

Data Collection Procedures

During the spring 2014 semester, I contacted the principal of the elementary school, seeking her permission to conduct my research. After the principal agreed to support my study, she introduced me to the Director of Academic Affairs, the Director of General Affairs, and the local Taiwanese English teacher, who was responsible for all fifth grade English instruction and was interested in using computer-aided learning. Both directors confirmed that only one computer lab was available on Monday, Tuesday, and

Wednesday morning from 10AM to noon. Furthermore, I communicated with the English teacher about the idea of online reading activities. The teacher immediately showed enthusiasm for the activities and expressed her willingness to include online reading tasks in her teaching syllabus. In correspondence with the availability of computer lab, she agreed that I could conduct my study in her Class A, B, and C on Monday, Tuesday, and Wednesday morning for one 40-minute session from 11:20 AM to noon each week before the mid-term examination period.

The three fifth grade classes were randomly assigned to one of the three reading groups and underwent the assigned reading approach until the conclusion of the study. Hence, Class A was the read-only group, Class B was the collaborative annotation group, and Class C was the individual annotation group. Students in the collaborative annotation group were further divided into small groups of three to four students. This grouping was set up before the first reading session started with groups determined at random. Once the grouping was decided, the students stayed in the same assigned teams during all reading sessions. Students in both annotation groups were required to make at least four annotations per text, freely addressing their questions and perspectives about the reading. Those in the collaborative annotation group were asked to make two of their four required annotations responses to their team members' annotations.

For each session, the students had a whole class period to read the online text. Once they set themselves up in the computer lab, they logged on to Google Docs and started reading by clicking the file in the menu "Shared with me." Once they completed and felt ready for a reading comprehension test, they turned off the computer and took the test. The final activity had the students fill out a short survey about their enjoyment of and engagement with the reading activity.

My study lasted for six weeks. In the first two weeks, I met with the three classes twice. After that, we met once per week. Each 40-minute online reading task took place in the school's computer lab. Table 3.6 shows an overview of the study timeline for data collection. The following sections present the agenda of each week.

Table 3.6
An Overview of the Study Timeline

Week	Collected data
1	Consent and assent form
2	Learning background survey
3	Reading comprehension test 1; Reading enjoyment and engagement survey 1
4	Reading comprehension test 2; Reading enjoyment and engagement survey 2; Text-based stimulated recall (with six students in the individual annotation group and six in the collaborative annotation group)
5	Reading comprehension test 3; Reading enjoyment and engagement survey 3; Text-based stimulated recall (with six students from the three groups)
6	Frequency of online support consultation survey

First week. I went to the three classes to introduce the study and myself to the students. I explained to students what they were going to do in the following weeks and answered their questions, so that they had sufficient information about the study and felt comfortable with participating in it. After that, I distributed an assent and consent form to the students. The local English teacher was very cooperative and helped me collect both forms from the students and their parents in this week.

After the study introduction, the English teacher led me to the two computer teachers of Class A, B, and C, and helped me arrange for two computer classes for Google Docs orientation. The purpose of the orientation was three-fold. First, all of the

students needed to learn how to access texts on Google Docs. Students in both annotation groups would also learn how to make annotations on Google Docs documents. They were informed that there was no regulation about what they ought to annotate as long as their annotations were helpful for their comprehension of reading texts. The second purpose of the orientation was to familiarize the students with their reading activities, especially the students in the collaborative annotation group, who would interact with their classmates as they read. Three principles were emphasized as I introduced the activity: being collaborative with team peers, learning with them, and using appropriate words in their expressions. Finally, the students needed to understand the kind of reading comprehension tests they would take at the conclusion of reading.

Prior to undertaking the research, I created Google accounts for individual students so that they could log into Google Docs for the online reading activities. When presenting Google Docs to the students, I first informed the students of their accounts and passwords, then demonstrated relevant functions on Google Docs step by step, and told students that they would take a reading test at the end of each reading activity. All students used their designated accounts to log into Google Docs, read assigned documents, and practice performing Google Docs functions. Due to time constraints, the students simply read another handout with two sample questions for the reading comprehension test rather than taking a practice test.

Second week. During the English class, I administered the paper-based background survey. All students and I went through each item together, and I immediately responded to their questions as they arose. The survey took around 35 minutes to finish. While the students who were willing to join the study were filling out

the background survey, those who were not had different supplementary learning materials.

The second Google Docs orientation took place during the students' computer class. The focus of the orientation was to deepen the students' understanding of how to use Google Docs and the format of the reading comprehension test. All students read a new story and took a reading comprehension test at the end of the class. When the students had problems in terms of logging into Google Docs, making annotations, and responding to other students' annotations, I promptly provided support during this orientation. The students became more familiar with Google Docs. Moreover, we talked about the issue of online translation and dictionary functions, and I explicitly advised them not to translate the whole text via online translation because it would be unhelpful for their English reading skill development.

Across the next three weeks, the online reading tasks formally began.

Third week. The students took the first online reading activity. When all of the students were settled down in the computer lab, I briefly reminded them of their Google accounts, passwords, and the activity agenda. I especially repeated that the students in the two annotation groups had to make at least four annotations and that those in the collaborative annotation group needed to produce two replies to their team members.

After the students finished the reading and turned off their computers, they took reading comprehension test 1. Finally, they took the reading enjoyment and engagement survey before they left the computer lab.

Fourth week. The agenda of the second reading activity was the same as the previous week: The students logged into Google Docs for a new reading text and started

reading. Once they had finished the reading, they took reading comprehension test 2 and then a second round of the reading enjoyment and engagement survey.

After the reading activity, six volunteer students with different English reading achievement from each of the two annotation groups were invited to undertake the recall interview. I showed the volunteer students the online reading documents with their annotations in order to stimulate their memory and help them better remember their original thoughts. All of the interviewees reported in Chinese. Each interview took around 10-15 minutes and occurred during the interviewees' break time (recess time or rest time).

Fifth week. The agenda of the final reading activity was the same as for the previous two weeks. After the reading activity, I invited volunteers from the three reading groups for stimulated reading recall. This time, I also invited six students from the read-only group for the purpose of comparison with the two annotation groups; the interviewees from the individual and the collaborative annotation groups remained the same. Each interview took around 10-15 minutes and took place during the interviewees' break time.

Sixth week. By browsing through students' responses to the open-ended questions in the online reading enjoyment and engagement survey, I noticed that the majority of students pointed out that online translation and dictionary tools provided great support to them during their reading. This phenomenon echoed Huang, Chern, and Lin's (2009) report that English learners in Taiwan are inclined to use online dictionary and translation resources as a support strategy in their online reading, regardless of their proficiency levels. This triggered my interest to investigate my participants' frequency of

online dictionary and translation use and to further explore if their use was related to reading comprehension performance. Thus, in the final week, all of the participants took the survey concerning the frequency of online support consultation for the whole text meaning, paragraph meaning, sentence meaning, and word meaning via an online dictionary or translation function. I explained these four questions to all of the participants, and it took them 10 minutes to finish the survey.

Data Analysis

In this section, I describe how I dealt with the five data sources that captured the students' comprehension, online reading processes, and their perceptions of the online reading activities. The data used to answer my research questions are identified. I used mixed methods to analyze the collected data.

Quantitative data analysis. There were two types of quantitative data: the results of the reading comprehension tests and the students' survey responses to the learning background questions, the reading enjoyment and engagement rating, and the frequency of online support consultation.

***Reading comprehension tests*.** I assessed reading comprehension with free recall and cued recall tasks. In order to score students' free recall protocols, I adopted Johnson's (1970) recall scoring system to deconstruct the reading texts into pausal units. I began by asking two native speakers of English to read the texts and mark all of the places in the texts where they paused (e.g., Jack lay on the bed/ in the back of the ambulance/ and read his book). Their level of agreement on pausal segmentation for the three reading texts was 76%, 79%, and 81%. All inconsistent pauses were resolved through discussion.

Thus, the pausal units of the three reading texts were 33, 34, and 42. These pausal units became the basis of my marking scheme (see Appendix H).

Before analyzing the answers of the free recall test, I invited a local, experienced elementary school English teacher who had taught English in the elementary school for over five years to co-evaluate students' answers together. We first discussed scoring guidelines, and then separately marked the presence or absence of each pausal units from a total of 54 different students' protocols (around 21% of all protocols). The inter-rater reliability was very high for this evaluation (r = .98; p < .001). Afterwards, I continued scoring the rest of the free recall protocols. Due to the different number of pausal units in each text, I transformed all students' scores into percentages for the sake of quantifying their recall protocols in a consistent way.

The second part of the reading comprehension tests was the multiple-choice, or cued recall, test. Each question had four alternatives but only one correct answer. When the students answered correctly, they received one point. No points were awarded for wrong answers. The maximum score for each text on the cued recall part was seven points. The students' scores in the cued recall part were turned into percentages for consistency with the free recall part.

I calculated and averaged all students' scores for each reading comprehension test to construct two measures: a free recall average and a cued recall average. To take the students' English proficiency levels into consideration, I adopted their last semester's reading scores as a covariate. Then, I used two-way repeated measure analyses of covariance (ANCOVA) to examine which group means had better reading comprehension performance in terms of free recall and cued recall. The between-subject factor was the reading groups (read-only, individual annotation, and collaborative

annotation) and the within-subject factor was time, as represented by the three online reading sessions. The alpha level for this test was set at .05.

Learning background survey. The survey consisted of three parts: basic information, English learning experiences, and computer learning experiences. The students' responses to the survey were analyzed by descriptive statistics (i.e., means).

Reading enjoyment and engagement surveys. To analyze the first three common questions for all of the groups about their enjoyment of, engagement with, and perceived helpfulness about the reading activities, I first averaged the responses of individual students in each group for the three reading activities. Then, I conducted a repeated measure two-way (groups by time) 3 x 3 analysis of variance (ANOVA) to examine differences among the students in the three reading activities. To investigate how much fun the students in the annotation groups had and how engaged they were when using online annotations, I ran a repeated measure two-way (grouping: individual/ collaborative annotation groups by time) 2 x 3 ANOVA to explore if there were differences between the two groups. The alpha level for these tests was set at .05. Finally, because the students in the collaborative annotation group were exchanging their annotations with others, they received comments from their peers. Five more questions were designed to determine how useful students perceived their own and others' annotations to be and how engaged they were with replying to others' annotations. The students in the individual annotation group particularly had two additional questions concerning their thoughts of having peers' annotations and responses. The results of these questions were presented as descriptive statistics.

Frequency of online support consultation survey. The survey consisted of four items: how often the participants checked out the translation of the whole reading text, a paragraph, a sentence, and a word via online resources, such as translation and dictionary websites. The students' responses to the survey were analyzed by descriptive statistics (i.e., means and standard deviations). Then, I ran one-way ANOVA to examine if their frequency of online support consultation was different.

The findings of students' reading comprehension performance and responses to the enjoyment and engagement surveys in the three reading activities answer my first two research questions. To answer Research Question 3, I performed qualitative data analysis on the students' annotations, their responses to the open-ended questions in the enjoyment and engagement surveys, and stimulated recall protocols.

Qualitative data analysis. There are three sources of data for qualitative analysis: the annotations made by the students in the individual annotation group and the collaborative annotation group; the 30 text-based stimulated recall protocols from 18 students in the three groups; and all of the students' answers to the open-ended questions in the end-of-session surveys. These data sources were used for triangulation.

Students' annotations. As I began analyzing the students' annotations, I was open to the possibility of either adopting an existing coding scheme or developing a new one to reflect the nature of young learners' online annotations. A consultation of previous studies on digitized annotations for collaborative learning revealed only one possibility, Gao's (2013) coding schemes used to describe university students' focus of annotation and type of interactions. However, the codes in Gao's coding schemes were not adequate

for my study because they had not been designed to describe the particularities of young EFL learners' English learning. Therefore, I developed my own coding scheme.

My analytic approach was inductive and interpretive by means of constant comparison and open and axial coding (Corbin & Strauss, 2008). Several steps were taken. The first step was to produce a graph of each reading activity. This graph provides a visual mapping of the connection between the pausal units highlighted by students and their annotations. I further identified annotation exchange among the students in the collaborative annotation group. An example of the graph is in Figure 3.2 with English translations under Chinese expressions.

	Annotation	Response1	Response2	Response3	Response4
A Happy Father's Day	26 一個開心的父親節	23 恩			
	26 A happy Father's Day	23 Yes			
Today is Father's Day.	23 今天是父親節	23 26你在幹嘛	26 打字		
	23 Today is Father's Day.	23 No. 26, what are you doing?	26 I'm typing.		
Emily and her father are going on a trip tonight	23 trip是啥	30 不知	23 26是啥	26 好像是旅行	23 應該
	23 What is the "trip"?	30 I don't know.	23 No 26, what is it?	26 It might be the "trip".	23 Probably.
They will go to Danshui	23 他們會去淡水				
	23 They will go to Danshui.				
to watch the sunset.	23 在日落的時候				
	23 At the sunset time.				

Figure 3.2. Graph for mapping online text and students' annotations.

To derive an appropriate coding scheme, a Taiwanese doctoral graduate specializing in second language writing joined my analysis process. We read three collaborative reading teams' graphs and three students' annotations from the individual annotation group and discussed possible codes. After developing a preliminary coding scheme, we tested the codes by checking more data from three additional collaborative reading teams and ten students' annotations in the individual annotation group, modified

the codes, and then came to a consensus on nine categories of annotation functions, such as "Translate the text," "Identify text structure," and "Moderate discussion." A detailed coding scheme of annotation functions is presented in the Appendix I.

The next step in the data analysis was to reach a satisfactory inter-rater reliability. The co-rater and I independently coded 20 percent of all the annotation data. The Cohen's kappa coefficient was 0.71. Disagreements were resolved through discussion. I then finished coding the rest of annotation data myself.

Text-based stimulated recall protocols. The 30 stimulated recall protocols were first transcribed. Next, through a recursive and dynamic process of protocol analysis, I created a set of tentative categories by inductively identifying instances of how the participants read the texts, how they used online annotations as well as online translation/ dictionary resources, and how they dealt with their peers' comments. A Taiwanese graduate student with a Teaching-English-to-Speakers-of-Other-Languages (TESOL) background assisted me with this data coding. We initially coded three protocols, revised codes, and solved any coding disagreements. After that, we individually coded six protocols (around 20% of the data), held consensus discussions, and rechecked the protocols. Last, a final coding scheme was developed and applied to the rest of the protocols.

Responses to the open-ended questions on the reading enjoyment and engagement surveys. Open-ended questions were asked, such as "What did you like and dislike about the online reading activity?" and "What difficulties did you encounter while reading and how did you solve them?", I listed the participants' responses and used the data to triangulate my interpretations regarding the students' reading processes, their

enjoyment of and engagement with the online reading activities, and factors influencing their reading comprehension. I did peer debriefing with the local English teacher at the research site and received her feedback about my interpretations.

Ensuring Data Trustworthiness and Credibility

I adopted the following techniques to establish trustworthiness and credibility of my data analysis and to ensure the research findings as valid and reliable.

Persistent observation. As an administrator of the study, I conducted all research sessions and wrote observation notes for each session. Moreover, Google Docs not only automatically kept the annotations that the students made, but also instantaneously recorded the order of annotations appearing on screen, allowing for a detailed examination of students' annotations. Also, retrospective stimulated recall provided a venue to explore how the students made use of annotation functions while reading.

Consensus building. Three raters joined with me in the process of qualitative analysis to establish that my coding and data interpretations were clearly explained and reliably undertaken. We achieved satisfactory inter-rater reliability in analyzing the data. Additionally, we adopted a consensus building approach to reporting coding results as well as interpretations (Lincoln & Guba, 1985). In this way, I believe I achieved a more viable interpretation of the collected data.

Triangulation. Triangulation is one of the approaches to establishing trustworthiness. As Mackey and Gass (2005) pointed out, "triangulation involves using multiple research techniques and multiple sources of data in order to explore the issues

from all feasible perspectives" (p. 368). The collected data represented numerous sources elicited by a range of data collection techniques. In addition to different surveys and three reading comprehension tests, my data came from the annotations that the students made and text-based stimulated recall about the students' processes of annotation usage. By means of the triangulation approach, I was able to better understand the students' online reading processes and their reading comprehension from various perspectives.

Peer debriefing. Throughout all of the study's stages, I discussed details of this study with my dissertation supervisor regarding how I was dealing with the collected data from different sources, and how I was interpreting the research findings. Furthermore, I had a debriefing session with the local English teacher at the research site who knew her students well. She provided me with her opinions about my data interpretation.

Chapter 4

Results

This chapter presents the findings of the study, which are organized in four major parts. The first section reports on results of preliminary analyses of the students' English reading scores in the previous semester as a baseline of their reading comprehension abilities. The next sections correspond to my three research questions. Part 2 deals with the reading comprehension performance of the students in the three reading treatments, and addresses relevant issues. The third part reports the results concerning the enjoyment of and engagement with the online reading activities of the students in the three reading groups. Finally, I delineate how the students in the individual and collaborative annotation groups interacted with the online reading texts and used annotation. Emerging themes resulting from an analysis of qualitative data are also presented in the last portion of this chapter.

Preliminary Analysis

For the purpose of comparing reading comprehension performance of the students in the three reading groups, it was important to establish that the groups did not differ in terms of reading comprehension abilities at the beginning of the study. To this end, I obtained the students' reading scores from the previous semester's final reading examination from the local English teacher. Table 4.1 displays the individual group's means and standard deviations of the reading scores.

Table 4.1
Means and Standard Deviations for the Three Groups' Previous Semester's Reading Examination Score

Group	Read-only (n=29)		Individual annotation (n=26)		Collaborative annotation (n=28)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Previous semester's reading scores	83.3	19.0	85.4	16.4	87.1	13.1

The collaborative annotation group had the highest previous semester's reading scores, the read-only group had the lowest mean, and the individual annotation group was in the middle in terms of their reading performance in the semester prior to the study. A one-way ANOVA was conducted to investigate whether the means of the three groups' reading scores were statistically different. The alpha level for this test was set at .05. As shown in Table 4.2, results indicated that there was no significant difference among the three reading groups in their previous semester's reading scores. Thus, the reading comprehension abilities of the three groups could be considered equivalent at the beginning of the study.

Table 4.2
One-Way Analysis of Variance Results for the Three Reading Groups' Previous Semester's Reading Scores

Source	*df*	*SS*	*MS*	*F*	*p*	η^2
Between groups	2	211.66	105.83	0.39	0.68	0.01
Within groups	80	21953.50	274.43			
Total	82	22165.16				

Findings Related to Research Question 1

To answer the first research question, *How did reading comprehension differ for fifth grade students who were engaged in different reading activities: read-only, individual annotation, and collaborative annotation?*, I examined the students' performance on the reading comprehension tests at the end of each online reading activity.

The reading comprehension tests had two components: free recall and cued recall. Scores on both tests were converted to percentages. The findings for the free recall tests are presented first. As Table 4.3 shows, the average performance of the read-only group's free recall test was the highest compared to the other two groups, followed by the individual annotation group and the collaborative annotation group. In addition, for all three groups, their performance rose from the first online reading session to the last. Figure 4.1 demonstrates the groups' progress. For the sake of clarity, the y-axis of the scale in the figures does not start from zero.

Table 4.3
Means and Standard Deviations of the Three Groups' Free Recall Tests

	Free recall test							
	Time 1		Time 2		Time 3		Average	
Group	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Read-only (n= 29)	27.5	25.3	31.2	22.6	36.6	27.7	31. 8	22.5
Ind. Ann. (n= 26)	22.4	15.1	25.6	17.7	27.7	21.2	25.2	14.3
Col. Ann. (n= 28)	13.4	12.5	26.3	19.9	29.3	28.0	22.3	18.4

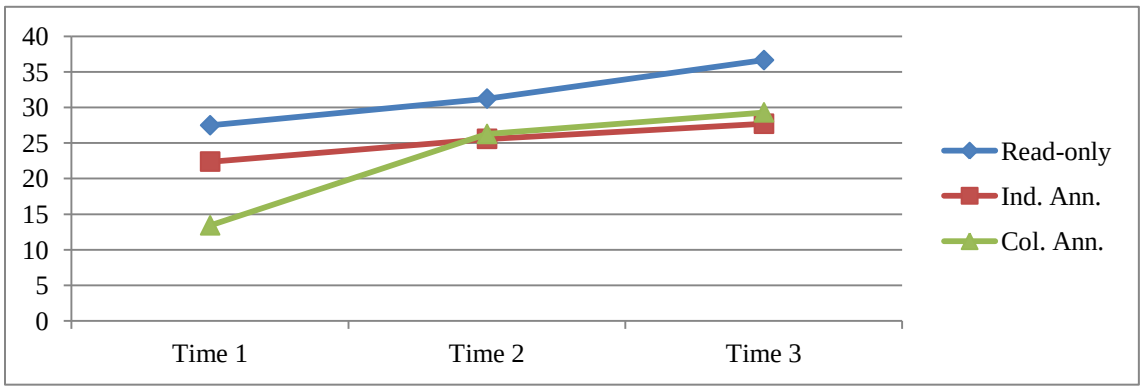

Figure 4.1. Mean scores across time on the free recall measure.

Table 4.4 presents the three groups' performance results on the cued recall tests. The mean performances of both the read-only group and the individual annotation group were similar, and the collaborative annotation group's average scores were the lowest. An examination of the growth of the groups across time (shown in Figure 4.2) demonstrates that the participants in the three groups performed the best in the first reading session. After that, the read-only group's performance in the cued recall tests remained down as the reading activities progressed. However, both annotation groups either remained the same or improved in the third cued recall test, when compared to their scores in the second cued recall test.

Table 4.4
Means and Standard Deviations of the Three Groups' Cued Recall Tests

Group	Cued recall test							
	Time 1		Time 2		Time 3		Overall mean	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Read-only (n= 29)	74.4	32.5	70.9	31.8	62. 6	30.6	69.3	27.3
Ind. Ann. (n= 26)	70.9	28.1	68.7	27.4	68.7	28.3	69.4	23.6
Col. Ann. (n= 28)	72.5	24.3	64.8	28.4	65.8	30.0	67.7	24.1

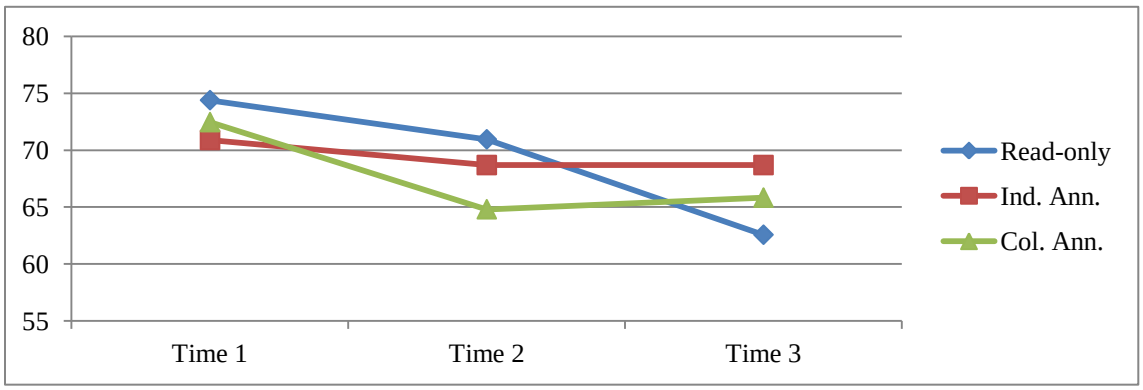

Figure 4.2. Mean scores across time on the cued recall measure.

To examine the effect of the three reading treatments on the participants' reading comprehension performance, I used multiple ANCOVA with mean scores on the free recall and cued recall measures as dependent variables. After eliminating the effect of the covariate (i.e., the participants' previous semester's reading scores), results did not show any significant difference among the three groups, as displayed in Table 4.5. Yet, the covariate was associated with the participants' performance on the cued recall and free recall tests.

Table 4.5

Multiple Analysis of Covariance Results for the Three Reading Groups with Previous Semester's Reading Scores as Covariate

Source	*df*	*SS*	*MS*	*F*	*p*	η^2
Free recall test						
Covariate (previous semester's reading scores)	1	19429.76	19429.76	25.11	0.00	0.25
Groups	2	233.57	116. 78	0.15	0.86	0.00
Error	77	59576.61	773.72			
Cued recall test						
Covariate (previous semester's reading scores)	1	65853.63	65853.63	70.72	0.00	0.48
Groups	2	434.89	217.44	0.23	0.79	0.01
Error	77	71696.98	931.13			

Note. α was set as .05

Supplementary analyses. As the previous literature suggests, factors like the amount of annotation and the use of online translation or dictionary functions could affect learners' reading comprehension while they read online (e.g. Al-Shehri, & Gitsaki, 2010; Su, et al., 2010). Two subsequent analyses were conducted to explore whether these factors affected the participants' reading comprehension performance.

The relationship between reading comprehension and the amount of annotation. The relationship between reading comprehension and the number of shared annotations was reportedly positive in Su et al.'s (2010) study. To confirm this report, I first counted the total amount of annotation made by the participants in the individual and collaborative annotation groups, and averaged the number. According to Table 4.6, each student in the individual annotation group made slightly more than 22 annotations,

whereas individual students in the collaborative annotation group made slightly more than 33 annotations in the three reading sessions. The next step was to investigate the relationship between the amount of the annotation and students' reading comprehension scores using a Pearson Product Correlation analysis. As displayed in Table 4.6, the relationship between the two was not significant. Despite the insignificant findings, the coefficient values were negative in the individual annotation group, while the values were positive in the collaborative annotation group.

Table 4.6
Mean Numbers of Annotations in the Individual Annotation and Collaborative Annotation Groups and the Correlation between Amount of Annotation and Comprehension Scores

Group	Number of annotation		Correlations	
	M	*SD*	Free recall test	Cued recall
Ind. Ann. (n= 26)	22.3	11.6	-.21	-.07
Col. Ann. (n= 28)	33.4	15.7	.18	.29

Note. α was set as .05

The relationship between reading comprehension and the frequency of online support consultation. Second language learners' use of online support resources has been shown to be helpful in their vocabulary learning and retention (Laufer & Hill, 2000; Peters, 2007). Researchers have also suggested that ESL learners could benefit from consulting online dictionaries during reading tasks to increase their reading comprehension (Al-Shehri & Gitsaki, 2010; Chun, 2001; Liou, 2000). Learners' use of online support resources can be viewed as one form of interaction approaches. As Chapelle (2003) proposed, the format of interaction can be interpersonal, intrapersonal, and between a learner and a computer. This type of learner-computer interaction brings

enhanced input, which was operationalized as translations, definitions presented by bilingual dictionaries, and textual annotations (Cárdenas-Claros & Gruba, 2009). Chapelle (2005) advocated that language teachers should encourage learners to use online resources and help them understand their value for language learning. Cárdenas-Claros and Gruba (2009) also emphasized the importance of online support for fostering autonomous learning. Thus, the participants in my study were free to consult online translation websites and dictionaries at will. However, they were discouraged from translating the whole text or too many sentences together at the same time; they were also discouraged from reading L1 translated text only because they would simply focus on Chinese instead of the target language, English.

According to Table 4.7, the overall frequency of online support consultation was between two ("seldom use") and three ("sometimes use") out of five ("use every time"). The collaborative annotation group used the online translation/ dictionary function slightly less often than the other two groups. Despite the fact that the participants were advised not to check the whole text, they still did so. The collaborative annotation group was modestly more frequent in their use of whole text translation, compared to other aspects, like paragraph and sentence translations as well as word meanings. By contrast, the read-only group and the individual annotation group searched for vocabulary meanings most frequently rather than whole text, paragraph, and sentence-level translations.

Table 4.7

Means and Standard Deviations for the Frequency of Online Support Consultation

Group	Whole text		Paragraph		Sentence		Vocabulary		Overall frequency	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Read-only (n= 29)	2.0	1.2	2.0	1.2	2.2	1.1	2.3	1.3	2.1	0.9
Ind. Ann. (n= 26)	2.2	1.2	2.2	1.0	2.6	1.2	2.5	1.4	2.4	0.8
Col. Ann. (n= 28)	2.2	1.3	1.9	1.2	2.1	1.3	2.0	1.1	2.1	0.9

To explore whether the three groups' frequency of online support usage to look up the whole text, paragraph, sentence, or immediate vocabulary items was statistically different, multiple ANOVA was carried out. The alpha level was set at .01 to correct for possible inflated Type I error. As illustrated in Table 4.8, the overall frequency of use and the frequency of looking up whole text, paragraph, sentence, and vocabulary translation did not differ to a statistically significant degree.

Table 4.8

Univariate Analysis of Variance Results for the Three Reading Groups' Frequency of Consulting Online Translations to Check the English Readings

Category	Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Whole text	Between	.34	2	.17	.12	.89	.00
	Within	116.46	80	1.46			
	Total	116.80	82				
Paragraph	Between	1.00	2	.50	.38	.68	.01
	Within	103.90	80	1.30			
	Total	104.89	82				
Sentence	Between	3.75	2	1.88	1.27	.29	.03
	Within	117.72	80	1.47			
	Total	121.47	82				
Vocabulary	Between	3.02	2	1.51	.95	.39	.02
	Within	126.67	80	1.58			
	Total	129.69	82				
Overall frequency	Between	1.26	2	.63	.82	.44	.02
	Within	61.42	80	.77			
	Total	62.69	82				

Note. α was set as .01 for Bonferroni Correction.

Although previous studies have supported the use of online help resources for language learning and promoted the implementation of training for language learners (Hubbard, 2004; O'Bryan, 2008), there is little empirical evidence to show the relationship between the frequency of online support consultation and reading comprehension performance. Thus, a Pearson Correlation analysis was carried out to explore the relationship among the students' free recall as well as cued recall tests' mean scores and the frequency of looking up the whole text, paragraph, sentence, vocabulary, and overall frequency of use. Table 4.9 shows these findings.

The coefficient values of the correlation analyses among each pair were all negative. In particular, the negative correlation between the cued recall average and the

frequency of checking whole text and paragraph translations as well as the overall frequency was statistically significant, implying that the more often the participants consulted online resources, the lower their scores on the cued recall tests. No significant correlation result was found in the free recall test.

Table 4.9
Correlations between the Frequency of Online Support Functions for Whole Text, Paragraph, Sentence, and Vocabulary Translations, and Reading Comprehension Tests

Reading Comprehension test	Whole text	Paragraph	Sentence	Vocabulary	Overall frequency
Cued recall average	-.26*	-.23*	-.10	-.06	-.22*
Free recall average	-.15	-.19	-.05	-.08	-.20

* $p < .05$

Findings Related to Research Question 2

Research Question 2 addressed the following: *Were there differences on measures of enjoyment and engagement in the reading tasks for fifth grade students who were engaged in different reading activities: read-only, individual annotation, and collaborative annotation?* Primary data came from the three reading enjoyment and engagement surveys with four-point Likert scale question items. Descriptive statistics and the inferential statistics analyses for the three groups' reading enjoyment and engagement are reported in the following tables.

Table 4.10 shows descriptive statistics for the three reading groups' reading enjoyment across the three reading sessions. Both the read-only group and the individual annotation group fluctuated across the three sessions, but the collaborative annotation

group expressed having more and more fun each time, choosing a mean of over three on the four-point Likert scale option in the final reading activity; Figure 4.3 displays the three groups' reading enjoyment tendency. Overall, the collaborative annotation group displayed higher online reading enjoyment levels than the other two groups.

Table 4.10
Means and Standard Deviations for the Three Reading Groups' Reading Enjoyment across the Three Sessions

Group	Session 1		Session 2		Session 3		Overall	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Read-only (n= 29)	2.5	.7	2.4	.7	2.6	.9	2.5	.6
Ind. Ann. (n= 26)	2.4	.9	2.8	1.0	2.6	.8	2.6	.8
Col. Ann. (n= 28)	2.6	1.0	3.0	1.0	3.1	1.1	2.9	.9

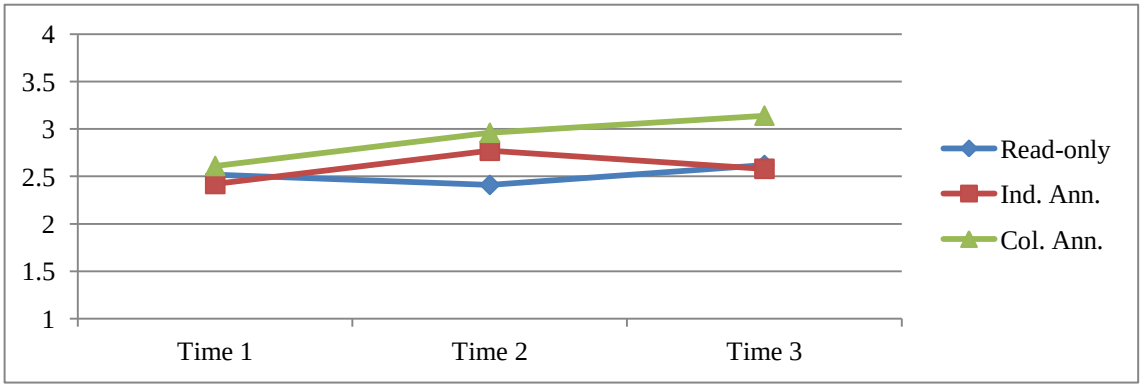

Figure 4.3. The three groups' reading enjoyment levels across the reading sessions.

Table 4.11 presents descriptive statistics of the three reading groups' reading engagement across the three reading sessions. Scores for the read-only group first went down and then went up. The individual annotation group decreased in their reported level of reading engagement in the second activity and maintained a similar level in the final session. In contrast to the read-only group and the individual annotation group, the

collaborative annotation group increased their reading engagement levels across the three sessions. Their overall engagement levels were higher than those of the other two groups in the three sessions. Figure 4.4 shows the three groups' reading engagement development.

Table 4.11
Means and Standard Deviations for the Three Reading Groups' Reading Engagement across the Three Sessions

Group	Session 1		Session 2		Session 3		Overall	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Read-only (n= 29)	2.7	.9	2.3	.8	2.5	.8	2.5	.6
Ind. Ann. (n= 26)	2.6	.8	2.8	.7	2.7	.7	2.7	.6
Col. Ann. (n= 28)	2.6	.9	2.8	1.0	3.0	1.0	2.8	.8

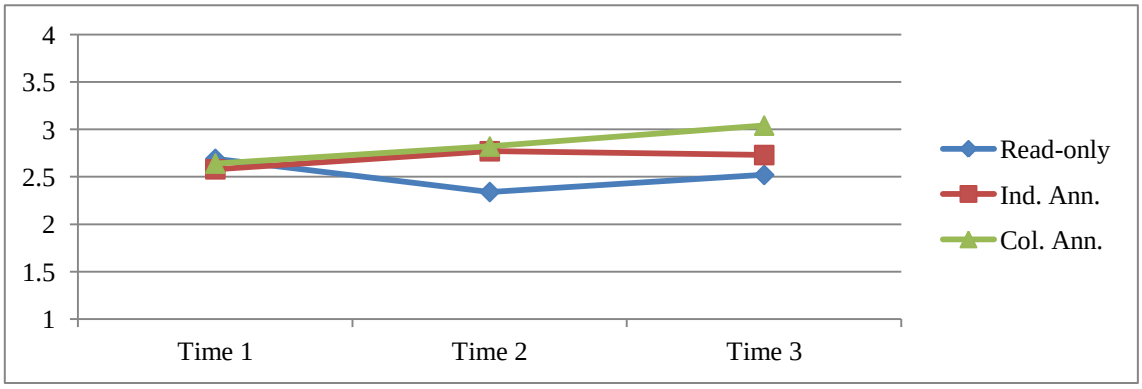

Figure 4.4. The three groups' reading engagement levels across the reading sessions.

Two ANOVAs were conducted to determine whether the three groups' reading enjoyment and engagement levels were statistically different. Displayed in Table 4.12, no significant effects were found, thus supporting a claim that the extent to which the three groups enjoyed and engaged with the reading activities was similar.

Table 4.12

Univariate Analysis of Variance Results for the Effect of the Reading Groups on Overall Reading Enjoyment and Engagement

Source	*df*	*SS*	*MS*	*F*	*p*	η^2
Enjoyment						
Between	2	2.39	1.19	2.13	.13	.05
Within	80	44.83	.56			
Total	82	47.22				
Engagement						
Between	2	1.43	.72	1.53	.22	.04
Within	80	37.34	.47			
Total	82	38.77				

Note. α was set as .025 for Bonferroni Correction.

In addition, one-way repeated measures ANOVAs were conducted to investigate whether there was a statistically significant change in students' reading enjoyment and engagement levels in each session. Results showed that the read-only group (*Fs* = .84 and 1.60, $p > .05$) and the individual annotation group (*Fs* = 1.51 and 1.11, $p > .05$) did not present a statistically significant change across the three reading sessions on either enjoyment or engagement. Although there was no significant change in reading engagement levels across the three reading sessions ($F = 2.53$, $p > .05$), the collaborative annotation group significantly raised their reading enjoyment levels ($F = 4.47$, $p < .05$). Through an examination of Least Significant Differences across the three sessions, I found that the enjoyment levels in the second and third sessions were statistically higher than that in the first session. The levels in the second and third sessions were not statistically different.

Participants' perceptions of the helpfulness of online reading activities for the development of English reading comprehension abilities. In addition to being

asked about reading enjoyment and engagement, the participants were asked how helpful they perceived the reading activities to be for their reading comprehension abilities, using a four-point Likert scale question. Table 4.13 provides mean helpfulness levels of the three groups in the sessions; Figure 4.5 illustrates the trend. The three groups were very similar in terms of their perceptions of helpfulness about the online reading activities. Statistical analysis indicated that there was no significant difference among the three groups in helpfulness levels, as Table 4.14 displays.

Table 4.13

Means and Standard Deviations for the Three Reading Groups' Perceptions about Helpfulness of the Online Reading Activities on Developing Reading Comprehension Abilities

Group	Session 1		Session 2		Session 3		Overall	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Read-only (n= 29)	2.8	.7	2.8	.9	2.8	.9	2.8	.6
Ind. Ann. (n= 26)	2.8	1.0	2.9	.8	2.8	.9	2.8	.8
Col. Ann. (n= 28)	2.5	1.1	2.9	1.1	2.9	1.1	2.8	.9

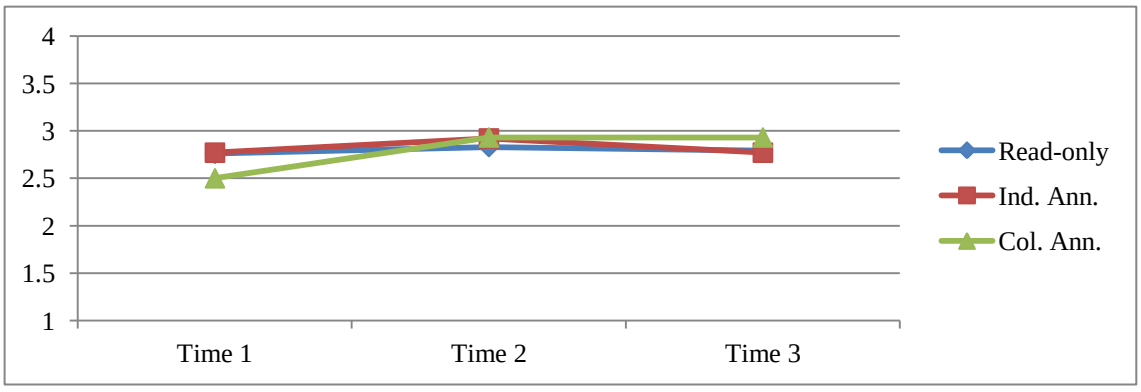

Figure 4.5. Perceptions of helpfulness of the reading activities across the reading sessions.

Table 4.14

Univariate Analysis of Variance Results for the Effect of the Reading Groups on Overall Helpfulness of the Online Reading Activities for Developing Reading Comprehension Abilities

Source	*df*	*SS*	*MS*	*F*	*p*	η^2
Helpfulness						
Between	2	.02	.01	.02	.98	.00
Within	80	45.75	.57			
Total	82	47.77				

Note. α was set as .05.

Additionally, to explore whether there was a statistically significant change in students' perceptions of reading activity helpfulness across the three sessions, a one-way repeated measures ANOVA was adopted. It was found that the read-only group (F = .07, p > .05), the individual annotation group (F = .79, p > .05), and the collaborative annotation group (F = 2.96, p > .05) did not show statistically significant change across the three reading sessions.

The two annotation groups' perceptions about the usefulness of and preferences for making annotations. Two additional four-point Likert scale questions were included in the survey for the two annotation groups. One question asked for perceptions of whether making annotations was useful for enhancing their comprehension of the texts; the other inquired whether they liked making annotations while reading. Descriptive and inferential statistics analyses of the two annotation groups' responses to these items were carried out. As Table 4.15 and Figure 4.6 demonstrate, no significant difference was found between the two groups for the helpfulness of making annotations.

Table 4.15

Means and Standard Deviations of the Two Annotation Groups' Perceptions about the Usefulness of Making Annotations for Reading Comprehension

Group	Session 1		Session 2		Session 3		Overall		*df*	*t*	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*				
Ind. Ann. (n= 26)	2.8	.9	3.0	.9	2.9	.8	2.9	.7	52	.16	.88	.04
Col. Ann. (n= 28)	2.7	1.1	3.0	1.0	3.0	1.0	2.9	.8				

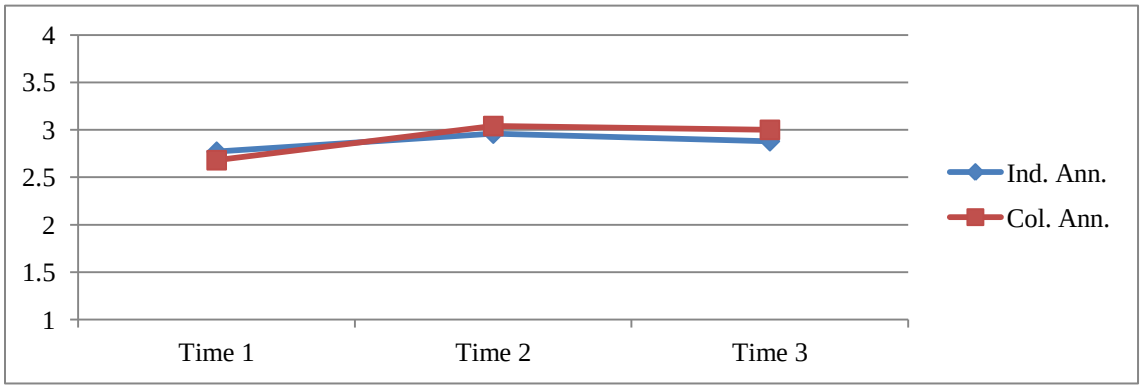

Figure 4.6. The two annotation groups' perceptions about usefulness of making annotations.

In spite of insignificant differences between groups on the usefulness of annotations, the collaborative annotation group appreciated making annotations more than the individual annotation group. Their preference was statistically higher than the individual annotation group, as shown in Table 4.16. Figure 4.7 displays means and shows that the collaborative annotation group increased in their appreciation for making annotations each time, with a particularly sharp rise from the first reading session to the second.

Table 4.16

Means and Standard Deviations of the Two Annotation Groups' Preferences about Making Annotations

Group	Session 1		Session 2		Session 3		Overall		*df*	*t*	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*				
Ind. Ann. (n= 26)	2.3	.9	2.4	.9	2.2	.9	2.3	.8	52	2.72	.01*	.74
Col. Ann. (n= 28)	2.5	1.2	3.0	1.0	3.1	1.0	2.9	.9				

Note. α was set as .05.

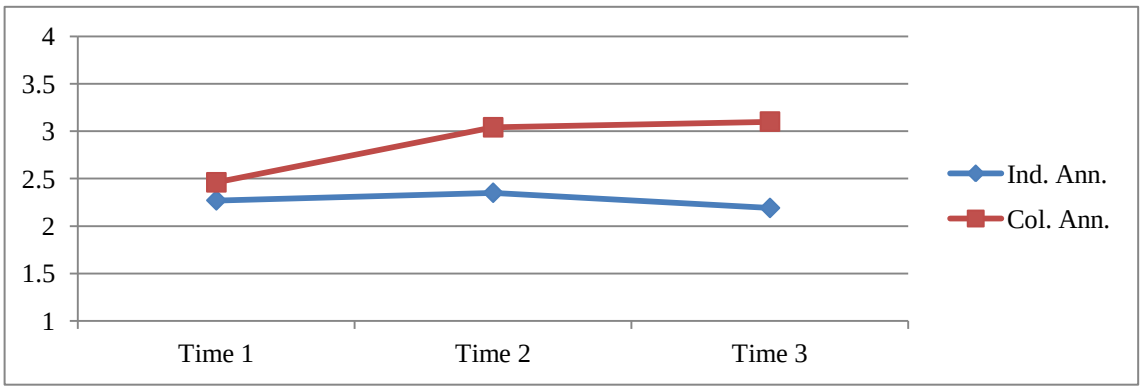

Figure 4.7. The two annotation groups' preferences for making annotations.

The collaborative annotation group's perceptions about exchanging annotations with peers. The collaborative annotation group received additional five four-point Likert-rating scales focusing on perceptions of exchanging their annotations with team members and receiving responses from peers. Among the questions, four inquired about their opinions concerning the helpfulness of their and peers' annotations and responses for reading comprehension; one asked about their willingness to keep discussing reading texts with the same peers in the next session. Table 4.17 displays the means and standard deviations of the students' responses. In a within-subject comparison,

there was no statistically significant difference in their perceptions about the usefulness of their own and peers' annotations and responses for their comprehension.

Table 4.17
Perceptions from the Collaborative Annotation Group about Exchanging Annotations and Responses with Peers

Item	Session 1		Session 2		Session 3		Overall		*df*	*t*	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*				
Helpfulness:												
My ann. for peers	2.8	1.2	2.9	1.0	2.9	1.0	2.8	.9	54	.00	1.00	0
Peers' ann. for me	2.8	1.0	2.9	1.1	2.9	1.0	2.8	.8				
My res. for peers	2.8	1.1	2.8	1.0	3.0	1.1	2.9	.9	54	.37	.72	.11
Peers' res. for me	2.5	1.1	2.6	1.1	3.2	1.0	2.8	.9				
Want to discuss with the same peers again	2.7	1.1	2.6	1.1	2.5	1.2	2.6	.8	N/A			

As Figure 4.8 displays, the students viewed their own and their peers' annotations as similarly useful. However, they considered their responses to peers more helpful in the first two reading sessions. In the final session, although the helpfulness level of their responses to peers or their peers' responses to them increased, the utility level of peers' responses showed a dramatic gain. Noteworthy is the fact that the students consistently lowered their willingness to keep the same peers in the next reading session. Regardless of viewing their responses as most helpful in the final reading session, their motivation to maintain the same peers was the lowest.

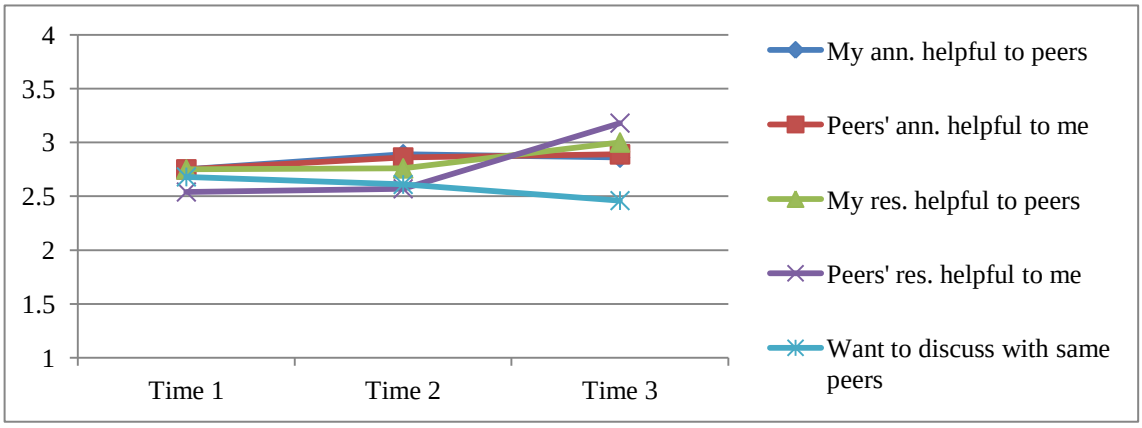

Figure 4.8. The collaborative annotation group's views regarding the helpfulness of their own and peers' annotations and responses.

The individual annotation group's perceptions about peers' annotations. In the final session, the students in the individual annotation group were asked two additional four-point Likert scale questions concerning their views about reading peers' annotations and interacting with peers by annotations. They also were invited to provide their reasons for why they would or would not like to read peers' annotations while they were reading. The students expressed high interests in reading peers' annotations and using annotations to interact with peers, as Table 4.18 illustrates.

Table 4.18
Means and Standard Deviations of the Individual Annotation Group's Perceptions about Reading Peers' Annotations and Exchanging Annotations and Responses with Peers

Item	Overall	
	M	*SD*
Want to read peers' annotations	3.5	1.0
Want to use annotations to interact with peers	3.4	.7

The students provided a variety of reasons for why they did or did not favor being able to access peers' annotations while they were reading. These reasons could generally be classified into two categories: *curiosity* and *collaboration*. For the curiosity category, examples of comments included:

> "我可以看到自己和別人對故事了解的差異。" [I can see the difference in understanding between me and my classmates.] (No. 4)
>
> "我很好奇別人會註解什麼內容。" [I just feel curious about what kind of annotations my classmates would make.] (No. 6)
>
> "我可以知道同學的想法。" [I can understand my classmates' thinking.] (No. 29)

Some students were eager to collaborate with peers in order to gain more comprehension of the texts.

> "大家能一起提供有中文的單字解釋。" [We can provide Chinese definitions of vocabulary together.] (No. 1)
>
> "當我讀到同學的註解，他們能提醒我文章的重點。" [When I read peers' annotations, they can remind me of key points in the text.] (No. 27)
>
> "同學的註解可讓我本來不懂的，印象更深刻。" [Peers' annotations can help me deepen my impression about my unknown vocabulary.] (No. 28)
>
> However, a few students were not interested in having peers' annotations.
>
> "對我來說，同學的註解都太簡單了，沒有什麼幫助。" [Peers' annotations may be too easy for me. They may not be very helpful.] (No. 10)
>
> "我讀愈多的註解，我愈容易忘記。" [The more annotations I read, the more forgetful I am.] (No. 14)
>
> "畢竟還是要靠自己去了解文章，而不是要去依賴別人。" [After all, I have to count on myself to understand the text, not rely on others.] (No. 25)

As for reasons why they were intrigued about exchanging annotations with peers, the students expressed that this type of interaction could be viewed as useful discussion, enhance their memory for the texts, and may be very fun. They indicated that

> "當我回覆我的同學，我能夠弄清楚我不懂的地方，然後得到答案。感覺很興奮。" [When I reply to my peers, I can clarify what I am not clear about and get answers. It makes me feel very excited.] (No. 27)

> "當我打字回覆別人時，順便就能記住打字內容。" [When I type something to reply to my peers, I can automatically memorize what I type.] (No. 24)

> "我會重覆同學的話，再回應一次，可以讓自己的印象更加深。" [I would repeat my peers' words to deepen my understanding.] (No. 28)

> "我們可以一起討論文章內容。" [We can discuss the content of the text together.] (No. 4)

> "回覆別人像聊天一樣。有些同學很爆笑，他們的回應會很好笑。" [It looks like a chat with peers. Some of my classmates are hilarious. Their responses are very funny.] (No. 19)

Yet, opposing opinions about responding to peers by annotations were also expressed.

> "我沒時間回覆同學。" [No time to reply to others.] (No. 10)

> "太麻煩了。" [It's troublesome.] (No. 14)

Findings Related to Research Question 3

Research Question 3 stated: *What did the process of interacting with the text look like for the learners who had been assigned to either the individual or collaborative annotation groups (in terms of the nature of the annotations and text-based recall interviews)?* Results were obtained from various data sources for triangulation, including the annotations the students made at each reading session, the recall protocols that the

invited participants produced immediately after the second and the third reading sessions, and students' answers to the open-ended questions in the reading enjoyment and engagement surveys. They are presented in the following sections.

The first section introduces the online reading processes that the participants exhibited. Emerging themes are reported, such as the use of online support functions and the timing of making annotations and reading peers' annotations. In the second part, the annotations made by the individual annotation group and the collaborative annotation group are examined. In addition, annotation functions are illustrated. The next section explores what motivated the students to make or not to make annotations as well as reply to peers while reading and how the students in the collaborative annotation group reacted to peers' responses. The final part deals with students' impressions of the online reading activities.

The students' online reading processes. This section delineates the students' online reading processes that were derived from 30 recall protocols produced by the interviewees in the read-only group, individual annotation group, and collaborative annotation group, and their responses to the enjoyment and engagement surveys. For this sub-sample of participants, data revealed that the students approached the reading texts in a variety of ways. According to the protocols, some interviewees expressed that they started reading from the top of the text to the bottom of the text.

> "我就一句一句往下讀。" [I just read sentence-by-sentence along the text.] (Student A, Read-Only Group, Session 3)

> "先讀題目，然後再一個一個字，先讀第一段，然後再讀第二段。" [I read the topic first, then read word-by-word in the first paragraph, and went to the second paragraph.] (Student A, Individual Annotation Group, Session 2)

> “依照文章的順序往下看，先看第一張圖片，再看下一段；再看第二張圖片，然後再看第二段文字。” [I read the text based on how it is presented. I looked at the first picture and read the following paragraph; I read the second picture and read the following paragraph.] (Student A, Collaborative Annotation Group, Session 2)

The students either read the text once or reread the text several times. In addition, their levels of processing of the text during their first reading varied. They either quickly browsed over the text or carefully read every word and sentence. Only students in the read-only group and the individual annotation group expressed that they simply read the text online one time only. They remarked,

> “我先看圖、標題，很快看過一遍。” [I looked at the pictures and the topic. Then I took a fleeting glimpse at the text.] (Student B, Individual Annotation Group, Session 2)

> “我看完圖片後，就回來上面讀一次，接下來就一句一句仔細讀，看不懂的字或句子，就算了。” [After looking at the pictures, I returned to the beginning of the text and carefully read individual sentences once. Regardless of having sentences or words I did not understand, I just let them go.] (Student C, Individual Annotation Group, Session 2)

> “我看完兩張大圖片後，然後大概看一下整個故事而已，找一些自己熟悉的單字和不懂的字，用跳的，很快只看一遍而已。” [After looking at two pictures, I just roughly read the whole text, looking for familiar and unknown words. I skipped reading. I very quickly read the text one time.] (Student C, Individual Annotation Group, Session 3)

> “我就馬上一句一句翻譯，翻譯到幾個句點，我就把它串成一串，再把它背起來。每讀完一句心裡面就會先想一下。這樣只讀一遍就能記起來故事。” [I immediately translated every sentence. When I translated several sentences, I would combine my translations together and memorize them. After I read a sentence, I would think about it in my mind.] (Student B, Read-Only Group, Session 2)

Some students adopted the rereading strategy in the reading activities. Similar to students who simply read once, they either quickly scanned the whole text screening for unknown words or dived deeply into the text by mentally translating sentences. When

they read again, they closely digested the text.

> “我會特別留意，先看一下我不會的字，這段看完後，再換到下一段。整個看下來，把我不會的字先找出來。瀏覽過一遍後，回到第一段重新仔細讀。” [I would pay special attention to my unknown words. After searching the words in the first paragraph, I would go to the second paragraph and do the same thing. The first round of reading was to pick up my unknown words. After that, I would return to the first paragraph and read it in detail.] (Student B, Collaborative Annotation Group, Session 2)

> “我讀了三遍，每一遍都很詳細從頭到尾看下去，了解每一句的意思” [I read it three times. Every time I meticulously read the text from the first sentence to the last sentence and understood individual words’ meanings.] (Student D, Individual Annotation Group, Session 2)

> “很快地把整篇看過一次，再去深入了解它的意思，一句一句仔細讀” [I quickly read the whole text once and went back to further understand its meaning by deliberately reading sentence-by-sentence.] (Student C, Read-Only Group, Session 3)

> “一剛開始就一直讀下來，仔細看。第二遍不會整篇再讀一遍，第二遍的時候會特別重讀比較困難的句子。” [At the beginning, I attentively read the whole text from the first sentence to the last one. But I did not reread the whole text. I specifically focused on the more difficult sentences and read those again.] (Student D, Read-Only Group, Session 3)

As the students repeated reading the text, the unit of repetition was different. Some would reread the whole text, like Student C in the read-only group and Student D in the individual annotation group, whereas some students preferred to read the paragraph they had just finished.

> “已經看完第一段，再重讀一遍；然後再讀第二段，每段都會讀兩次。” [When I completed the first paragraph, I would repeat reading it and then proceed to the second paragraph. I read each paragraph twice.] (Student C, Read-Only Group, Session 3)

> “第一段我就會看兩遍，看完之後在繼續換下一段；第二段完之後，再重新看第一段和第二段；看到第三段的時候看完之後再把一二三段重新再背一遍，一直到我看完。” [I read the first paragraph twice. After that, I continued reading

> the next paragraph and reread the first and second paragraph. When I finished the third paragraph, I started from the first paragraph and memorized again the three paragraphs.] (Student E, Individual Annotation Group, Session 3)

In the students' responses to the open-ended questions in the reading enjoyment and engagement surveys, several students talked about their difficulties in the reading activities. One of the major difficulties was that they did not fully remember the story they read in the session. To solve this problem, they recognized that repetitive reading helped them better recall the text. In addition, most students gave credit to online support functions, such as Google Translation and Yahoo Dictionary, for promptly providing them with sentence or phrase translations and word definitions. Thus, an emerging theme was formed to discuss when and how the students used online assistance functions in their online reading processes.

Online support functions usage. Based on my conversation with the local English teacher and my observations at the research site, the students were familiar with seeking online resources for English learning. They either directly typed website addresses on the Internet browser to access online translation tools or dictionaries or searched the keywords "翻譯[translation]" or "英文字典[English dictionary]" via search engines. The students opened translation or dictionary websites when they needed to use them at that moment or immediately after they had logged into Google Docs. Students used online support at different moments. Some students used the online dictionary or translation as soon as they encountered an unknown word or sentence. After grasping the meaning of the unknown word or sentence, they resumed their reading. Others would read the text first and collect words or sentences they did not know. Then, they checked these unknown words or sentences together.

> “我一邊看一邊查，如果碰到不會的字，馬上查Google翻譯” [I read the text and checked what I did not know by means of Google Translation simultaneously. When I met with unfamiliar words, I checked them immediately.] (Student A, Read-Only Group, Session 3)

> “last week我不會，馬上去查，就是看到不確定的，馬上到Google翻譯去查詢” [I did not know the meaning of “last week.” I immediately checked it out. When reading something I felt uncertain with, I definitely went to Google Translation.] (Student A, Collaborative Annotation Group, Session 3)

> “遇到不會的單字，立刻就用Yahoo字典” [When I had unknown words, I went to Yahoo Dictionary.] (Student E, Individual Annotation Group, Session 2)

> “因為我第一遍讀的時候，有特別留意哪些單字我不會，所以在讀第二遍之前，我就先去查這些單字的意思，查完後，再開始讀第二遍。” [In my first reading, I specifically noticed words I did not understand. So before I started reading again, I would make the unknown words clear. After that, I would read again.] (Student B, Collaborative Annotation Group, Session 2)

Although online translation and dictionary functions helped the students understand the text, some students admitted to becoming over-reliant on those functions without trying to comprehend the text on their own. One interviewee pointed out,

> “在讀英文之前，我先全部都用Google翻譯，先翻第一段，然後再翻第二段，用複製、貼上的方式很方便。” [Before I read, I would copy the text and paste it into Google Translation. I only translated one paragraph each time and then did the same thing to the next paragraph. It was very convenient to use ‘copy’ and ‘paste’ functions.] (Student F, Individual Annotation Group, Session 2)

Although some students seemed to depend excessively on Chinese translation provided by online support functions and simply read the text in Chinese, others more skillfully made use of the translation function for English-Chinese comparison and connected the English word with Chinese translation (see an example in Figure 4.9). As one interviewee said,

> “看第一遍的時候，想說有很多單字我都看不懂，會害怕，因為不會的字還蠻多的。我就到Google翻譯，開始查意思。只要點右邊中文翻譯，左邊英文

就會變藍色，就試著對照看看。” [In my first reading, I felt scared because there was a lot of vocabulary I did not know. So many unknown words. I went to Google Translation and checked word meanings. As long as I clicked the Chinese translation at the right column, the English word in the left column became blue. I just tried to make a cross reference.] (Student B, Individual Annotation Group, Session 3)

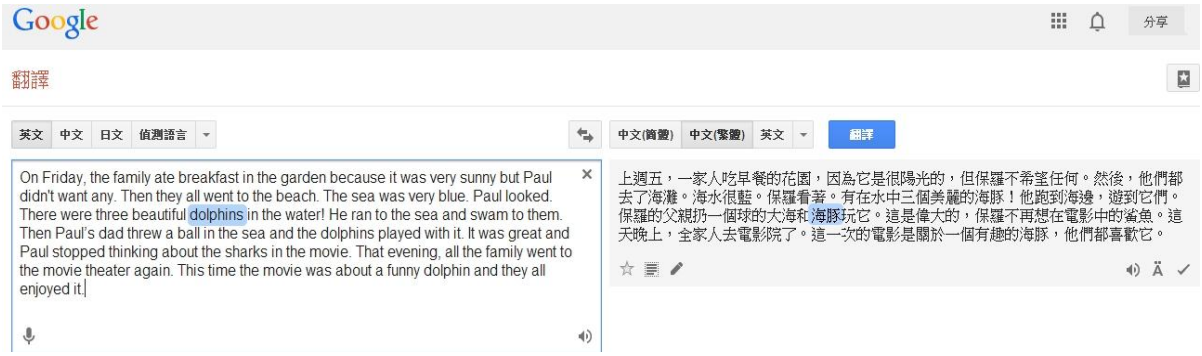

Figure 4.9. An example of making an English-Chinese comparison via Google Translation.

Despite viewing online support as a reference, not all students took for granted the translation results without thinking further. The interviewees noted,

“自己翻不順的話，會先用翻譯，比較看看兩者的不同。Google翻譯的句子有時候不太準，還是要靠自己頭腦去想” [When I could not translate sentences well, I would consult Google Translation and see the difference between my own translations and Google’s. However, sometimes Google’s translations were not very accurate. I still need to count on myself to think about the translation.] (Student C, Read-Only Group, Session 3)

“如果不會的話，可以就是用Google翻譯翻譯一下，可是通常都不太對。因為翻出來的意思好像怪怪的，我要再想想，然後再用我自己的話表達。” [If I don’t know the meaning, I can use Google Translation. But the translation is usually incorrect because the translated meaning sounds odd. I need a second thought and use my own words for expression.] (Student C, Individual Annotation Group, Session 3)

From the interviewees’ points of view, online support indeed offered timely assistance by providing Chinese translation and the meaning of English text. It also

stimulated the students to think about the quality of the translation. Some students even used the translation function to make Chinese-English comparisons. However, when students completely relied on online help without trying to comprehend the English text on their own, this online consultation affordance seemed to hinder students from sharpening their English reading abilities. It was possible for students simply to copy a whole-paragraph/text, obtain a Chinese translation, paste it into an annotation, and read solely in their L1. The next theme is about the timing of making online annotations for students in the individual annotation group and the collaborative annotation group.

Timing of diverse online annotation uses. For students in the individual annotation and the collaborative annotation groups, a large proportion of annotations focused on text translation, including words, sentences, paragraphs, and even the whole text (see more details in the section of "analysis of students' annotations"). There were four time points at which students made annotations. The first time was when they had finished reading individual sentences. Two interviewees disclosed,

> "做註解時，我也是一句一句看，邊看完一句，邊打一個註解。" [When making annotations, I read sentence-by-sentence. When I finished one sentence, I made one annotation.] (Student D, Collaborative Annotation Group, Session 2)

> "我一邊看一邊做註解，一句一句看下去和翻譯下去。" [I read and made annotations. I just read one sentence after another and made one after another annotation about individual sentence translation.] (Student A, Individual Annotation Group, Session 3)

Also, the students would make annotations when they had completed a paragraph. One student mentioned,

> "我先讀第一段，然後第一段哪些不會，我再做註解。" [I read the first paragraph and made annotations about what I did not know in the first paragraph.] (Student A, Individual Annotation Group, Session 2)

Other interviewees preferred to make annotations after they had read the whole text.

> “先看過一遍，如果有碰到不會，我會先記在腦子裏面，全部讀完後，再一起做註解。” [I read the whole text first. If there was anything I did not know, I would keep it in my mind. After reading the text, I dealt with what I did not know by making annotations.] (Student A, Collaborative Annotation Group, Session 2)

> “先看一看整篇故事，試著在心裏翻一翻意思，在第二遍讀故事的時候，才開始做註解。” [I read the whole story at first and then tried to translate the story in my mind. In my second round of reading, I started making annotations.] (Student D, Individual Annotation Group, Session 3)

> “把內容全部讀一次，再開始寫我的註解，到第二遍才開始做註解。” [I read the whole text and then made my annotations. I started making annotations in the second round of reading.] (Student E, Individual Annotation Group, Session 3)

Among the interviewees, only one student mentioned that he began making annotations from the bottom of text and then made another annotation at the top of the text by scrolling up the computer screen. He said,

> “拉到文章的最後一句，先做註解，想知道故事最後在講什麼；然後再拉到最上面，再做註解。” [I scrolled down the screen to the last sentence of the text and made an annotation. It was because I wanted to know the result of the story. Then I scrolled up the screen to the top and made annotations.] (Student F, Individual Annotation Group, Session 2)

Despite the four different times for the students to make annotations, individual students did not stick to one time. They showed flexibility in making annotations. For example, the timing of crafting annotations for Student A in the individual annotation group was different in the second and third reading sessions. Thus, the process of making annotations seemed dynamic.

Timing of reading peers' annotations. The students in the collaborative annotation group not only made their own annotations but also had access to their teammates' annotations during their reading process. There were three patterns of moves for the learners to check peers' annotations. They (1) spontaneously stopped their reading to check peers' new annotations, (2) consistently read certain sections before looking at peers' annotations, or (3) scrolled through the computer screen up and down seeking new annotations when they finished reading one sentence. To explain the first move, these students who prioritized others' annotation over their own reading said,

> "我喜歡看別人的註解在打些什麼，有些同學的註解比較早出現，有的比較晚出現, 我就會先等一下，先看文章，如果有新的註解出現，我就馬上去看。" [I liked reading peers' annotations. Some annotations appeared earlier but some later. I would wait for their annotations and read the text. If the new annotations showed up, I would go for them without hesitation.] (Student E, Collaborative Annotation Group, Session 2)

> "看到別人的註解，會中斷閱讀，然後先看別人的註解。" [When I spotted others' annotations, I stopped my current reading and read their annotations.] (Student B, Collaborative Annotation Group, Session 2)

> "一旦發現上面有別人的註解，會先暫停閱讀，然後移動螢幕到上面看別人註解。會先去看別人的註解，然後再回來。" [Once I noticed new annotations from my teammates on the top of the screen, I would stop reading and move my screen atop to read their annotations. I would read others' annotations and then come back to my own reading.] (Student F, Collaborative Annotation Group, Session 2)

Furthermore, some students favored reading peers' annotations after they read the whole text or one paragraph. These interviewees indicated,

> "看完文章後，我就很專心在看別人的註解了。我比較喜歡就是先看故事內容，因為回答他們的話他們又會有下一個問題，然後我就不能看故事內容，所以我就先看完，然後看別人註解，試著回答他們。" [After reading the whole text, I can concentrate on peers' annotations. I preferred reading the story first. I could not read the story if I responded to my peers and quickly received a

new question from my teammates. So I finished the reading and then checked peers' annotations, trying to respond to them.] (Student A, Collaborative Annotation Group, Session 2)

"段落看到一半，發現有新註解，也是會先把段落看完，再去看別人的註解。" [Even when I just read in the middle of a paragraph and found new annotations, I would still finish reading the paragraph and then check others' annotations.] (Student D, Collaborative Annotation Group, Session 3)

The final type of move involved reading peers' annotations in a non-sequential procession. One student expressed that he would finish one sentence and then scroll his computer screen up and down to read new annotations. He noted

"就我在讀第二句，我就是會先在下面幾句看看有沒有新的註解，然後我大概就在讀第三句第四句的時候，我會看一下第一句的回應" [When I read the second sentence, I would check the following sentences and see if there was any new annotation. When I read the third and fourth sentences, I would check to see if there was any new annotation for the first sentence.] (Student C, Collaborative Annotation Group, Session 3)

The use of pictures in the text for different purposes. The final theme was about how the students used the pictures associated with each text to aid their reading comprehension. Each text had one or two pictures positioned at different points. One picture was placed at the bottom of the first reading text; two pictures were at the top of each paragraph in the second reading text; one picture was located at the top of the third reading text. The pictures were not equally valued by the students. Some reported using the pictures to predict the story before they started reading. Two interviewees remarked,

"一開始先讀標題，還有標題下面通常會有附一個圖片，去大概預測一下它的內容，人事時地物，然後我就開始讀。" [I read the topic first. Usually there was a picture under the topic. I used it to predict the story, like who was in the story, what they did, when they did it, where they did it, etc. Then I began my reading.] (Student C, Collaborative Annotation Group, Session 3)

"先看圖片，先去了解它的內容大概在說什麼，先想一想、猜一下可能的內

> 容，再把內容全部讀一次。” [I looked at the picture first, trying to understand what the story content was. I thought about it and guessed the possible plot. Then I read the whole text.] (Student A, Individual Annotation Group, Session 3)

However, some students would browse the story quickly without further thinking or even skipped the pictures. Two interviewees mentioned,

> “我跟著故事的順序，先看題目、圖，然後很快就跳到文章，不太注意圖片，只是從頭讀到尾而已。” [I followed the text structure by reading the topic, picture, and immediately jumping to the text. I did not pay attention to the picture. I just read from the top to the bottom.] (Student B, Read-Only Group, Session 3)

> “我不太管圖片，就用滑鼠把視窗拉上去或拉下去，趕快看故事。” [I did not care a lot about the picture. I just used my mouse to scroll up or down the screen and read the story.] (Student E, Read-Only Group, Session 3)

Summary. The use of the students’ recall protocols allowed me to examine and analyze the students’ online reading processes. Some students read the online text once whereas others reread it more than one time. The students used online translation or dictionary functions immediately when they encountered problems or later when they had collected all problems. One student further reported making use of online translation affordances by comparing the association between English and Chinese. Moreover, the students made their own annotations when they finished reading a sentence, a paragraph, or the whole text. The students in the collaborative annotation group read their teammates’ annotations at different moments. Finally, the students viewed the pictures in the texts with different amounts of concern. Table 4.19 summarizes the points illustrated by the interviewees.

Table 4.19
Issues of Using Annotations

Theme	Category
Ways to approach reading texts	**<u>One-time reading</u>** ▪ Simply skim the text and search for unknown words. ▪ Carefully read every sentence and understand every word. ▪ Carefully read every sentence, but ignore unknown words/ sentences. **<u>Repetitive reading</u>** ▪ Scan the whole text and search for unknown words and the read again in detail. ▪ Carefully read every sentence and start again several times, understanding every word. ▪ Paragraph by paragraph: • Reread a paragraph before proceeding to the next. • Reread the first paragraph and repeat reading the first and second paragraph after reading the second paragraph; reread the first-third paragraphs after reading the third paragraph. ▪ Read the whole text carefully. The second reading focused on difficult sentences.
Online help resource usage	◆ Use it immediately when encountering unknown/ uncertain words during the reading. ◆ Read the whole text first and target unknown words. Check unknown words together later. ◆ When reading the text, the first thing was to check Google Translation. ◆ Paste the paragraph into Google Translation and check the correspondence between English words and Chinese meanings.

Table 4.19 (continued)

Theme	Category
When to make annotations	◆ After reading a single sentence. ◆ After reading a paragraph. ◆ After reading the whole text. ◆ Annotate the last sentence of the text first, and scroll up the screen to the top and make annotations.
Timing to read peers' annotations	◆ Read classmates' annotations first, and then read the text. ◆ When new annotations appeared, stop reading the text to read others' annotations, and then continue reading. ◆ Read the whole text first and go back to read others' annotations. ◆ Read the first/second paragraph first and read annotations about the first/second paragraph. ◆ Read one sentence and look for annotations about the following two or three sentences.
Use of pictures	◆ Intentionally look at pictures first to predict the text and then read the text. ◆ Not intentionally look at pictures first and read based on text structure.

Analysis of students' annotations. This part first provides an overview of the number of annotations that the students in both annotation groups made during the three reading sessions. Then it illustrates the functions that the students' annotations performed. Translation annotations were the kind of annotations produced the most by the students. Thus, in the next section I particularly address the proportion of students' annotations that were of the translation variety. Finally, I present information about how the students in the collaborative annotation group used annotations.

Number of annotations across the three reading sessions. I begin by discussing the amount of annotation made by the students in the individual annotation group in the

three reading sessions (see Table 4.20). The students made the most annotations in the first session, reduced the amount of the annotation in the second session, but increased again in the third session to a similar level as that of the first reading session. On average, each student made 7.8 annotations in the first session, 6.7 in the second session, and 7.7 annotations in the last session. All students were required to make at least four annotations in each session; yet, two students in the first session and four students in the second session did not comply with the requirement. Among those students, Student 12 and Student 18 made fewer than four annotations in both sessions.

Table 4.20

Number of Annotations across the Three Reading Sessions Made by Each Student in the Individual Annotation Group

Participant	Time 1	Time 2	Time 3	Total
Student 1	5	9	5	19
Student 2	4	4	4	12
Student 3	6	5	4	15
Student 4	4	1	4	9
Student 5	4	4	5	13
Student 6	8	4	8	20
Student 7	11	13	12	36
Student 8	12	24	20	56
Student 9	10	4	5	19
Student 10	12	17	7	36
Student 11	11	4	4	19
Student 12	3	2	4	9
Student 13	5	4	6	15
Student 14	11	1	7	19
Student 15	9	4	5	18
Student 16	9	5	9	23
Student 17	4	6	4	14
Student 18	2	1	4	7
Student 19	4	4	7	15
Student 20	8	6	15	29
Student 21	12	9	9	30
Student 22	12	14	7	33
Student 23	4	4	11	19

Table 4.20 (continued)

Participant	Time 1	Time 2	Time 3	Total
Student 24	8	3	15	26
Student 25	10	8	5	23
Student 26	15	15	15	45
Total	203	175	201	579

To analyze further the development of the amount of annotation across sessions, the following figures display six patterns. In Figure 4.10, the first pattern, looking like an upside-down "U" shape, captures how six students made the most annotations during the second reading session.

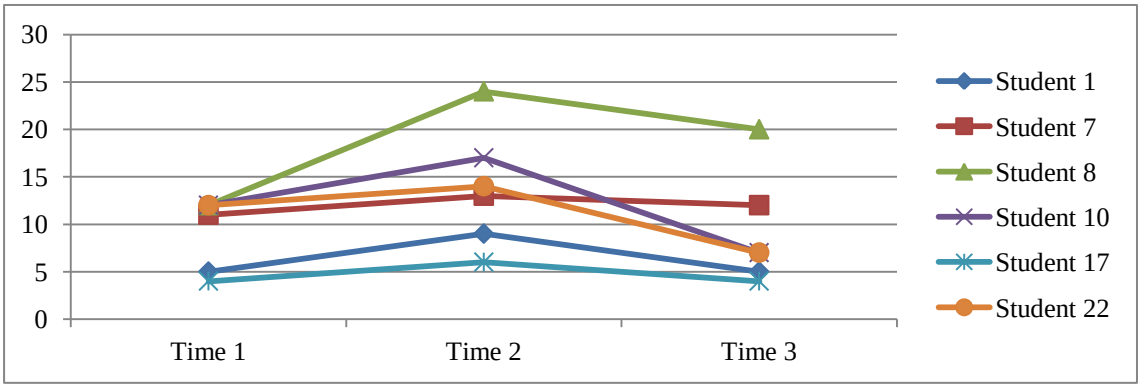

Figure 4.10. The first pattern of the amount of annotation made by six students in the individual annotation group across the three reading sessions.

Only two students experienced the second pattern. They made the same number of annotations across all three reading sessions, as Figure 4.11 displays.

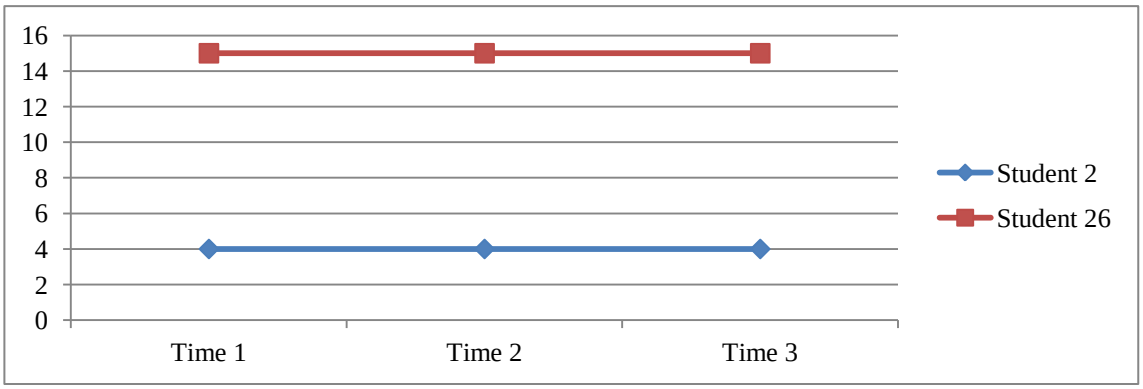

Figure 4.11. The second pattern of the amount of annotation made by two students in the individual annotation group across the three reading sessions.

The third pattern, with two students, reflects a continuous decrease in the amount of annotation across sessions (see Figure 4.12).

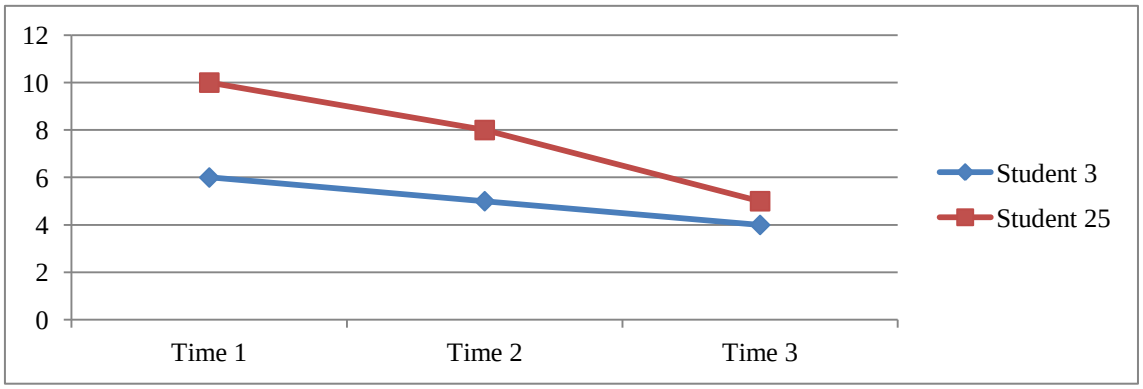

Figure 4.12. The third pattern of the amount of annotation made by two students in the individual annotation group across the three reading sessions.

Most students in the individual annotation group were categorized as displaying the fourth pattern, with the number of annotations being lowest in the second session; thus, the pattern looks like a "U" shape (see Figure 4.13).

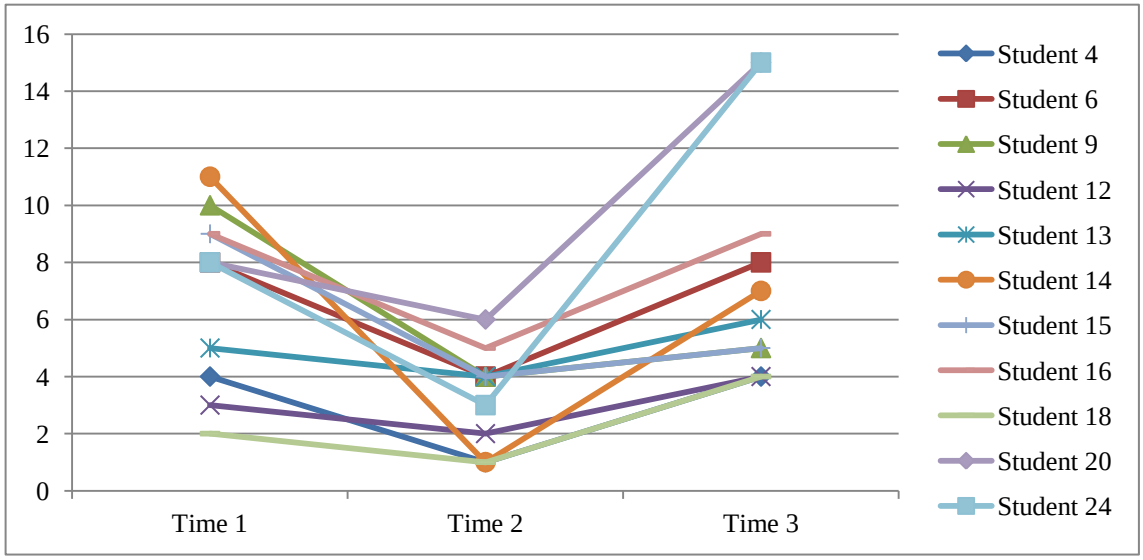

Figure 4.13. The fourth pattern of the amount of annotation made by eleven students in the individual annotation group across the three reading sessions.

The fifth pattern, demonstrated in Figure 4.14, describes two students who made the most annotations in the first session and decreased the number of annotations in the next session. However, they made an equal number of annotations in the last two sessions.

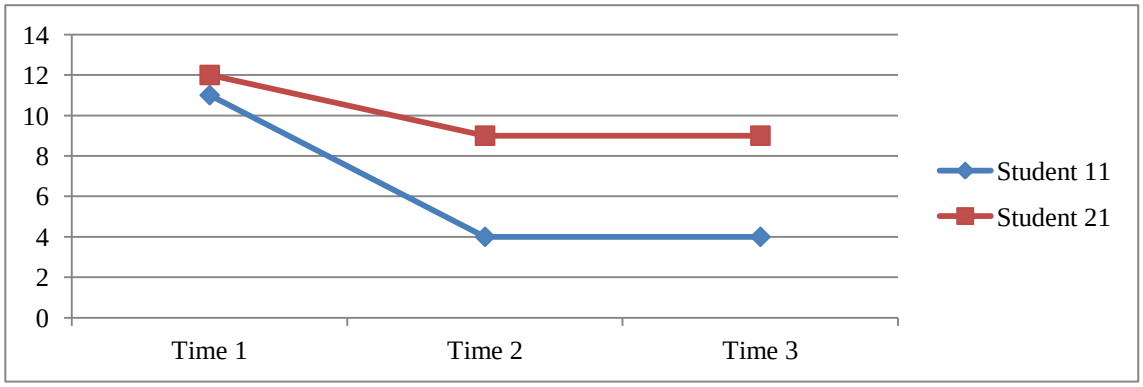

Figure 4.14. The fifth pattern of the amount of annotation made by two students in the individual annotation group across the three reading sessions.

The final pattern stood in contrast to the fifth pattern. The three students in this pattern had same number of annotations in the first two sessions and then increased the number of annotations in the last reading session. Figure 4.15 shows this pattern.

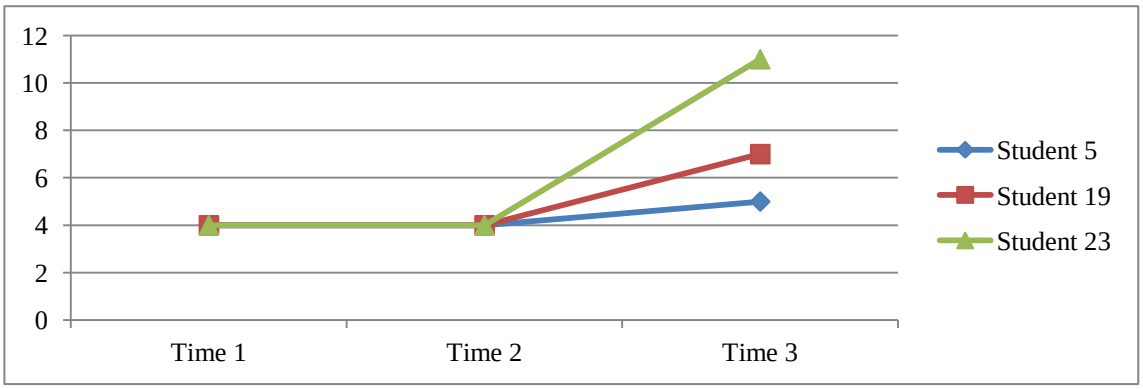

Figure 4.15. The sixth pattern of the amount of annotation made by three students in the individual annotation group across the three reading sessions.

As opposed to the individual annotation group that made the least annotations in the second session, the collaborative annotation group showed a consistent decrease in the amount of annotation in each session and had the fewest annotations in the last session. The students made around a total of 130 annotations in the first session, a total of 97 annotations in the second session, and a total of 83 annotations in the third session. Table 4.21 exhibits individual teams' mean numbers of annotations made in each session. Except for the students in Team 8, who simply made less than the required four annotations in the third session, the rest of the teams fulfilled the requirement.

Table 4.21

The Mean Numbers of Annotations across the Three Reading Sessions Made by Individual Teams in the Collaborative Annotation Group

Team	Time 1	Time 2	Time 3	Total
Team 1	11.0	6.0	6.0	23.0
Team 2	21.7	10.7	10.0	42.3
Team 3	16.7	17.7	14.3	48.7
Team 4	9.0	7.0	10.0	26.0
Team 5	8.7	6.0	7.0	21.7
Team 6	16.7	15.0	14.0	45.7
Team 7	9.7	9.3	5.3	24.3
Team 8	15.8	11.5	3.5	30.8
Team 9	16.0	10.0	11.7	37.7
Total	130.3	97.0	83.0	103.4

In terms of change across sessions, there were four patterns in the mean numbers of annotations made by the individual teams. Figure 4.16 shows Team 1's trend: the number of annotations dropped in the second session and remained the same in the third session.

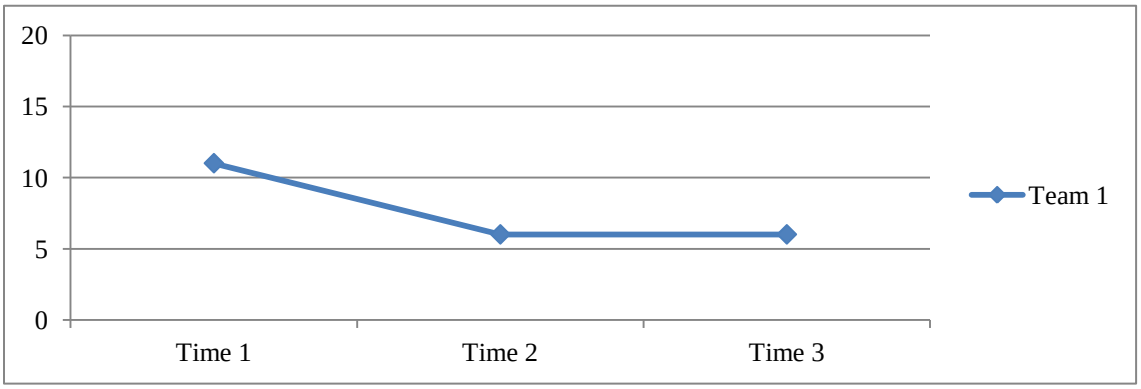

Figure 4.16. The first pattern of the amount of annotation made by Team 1 in the collaborative annotation group across the three reading sessions.

The next four teams, Teams 2, 6, 7, and 8, exemplified the second pattern (see Figure 4.17). Their amount of annotation generally decreased from the first to the third sessions.

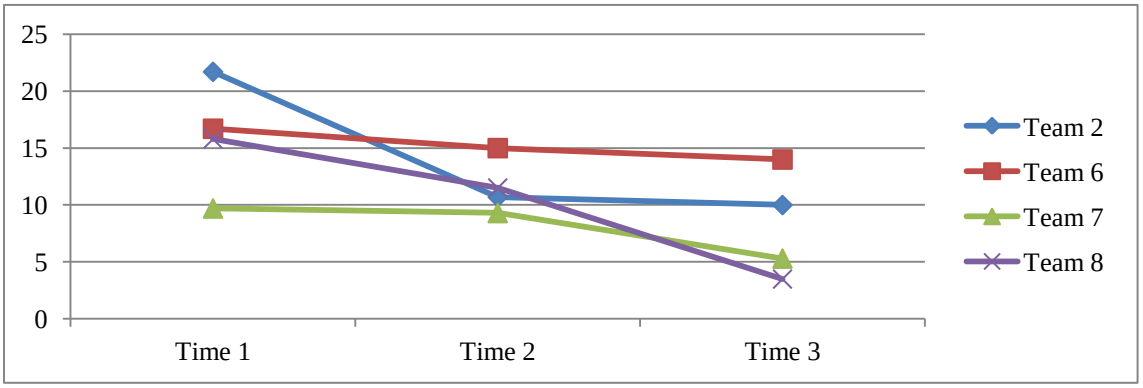

Figure 4.17. The second pattern of the amount of annotation made by Teams 2, 6, 7, and 8 in the collaborative annotation group across the three reading sessions.

The next pattern describes Team 3, which had the most annotations in the second session. Figure 4.18 shows the trend.

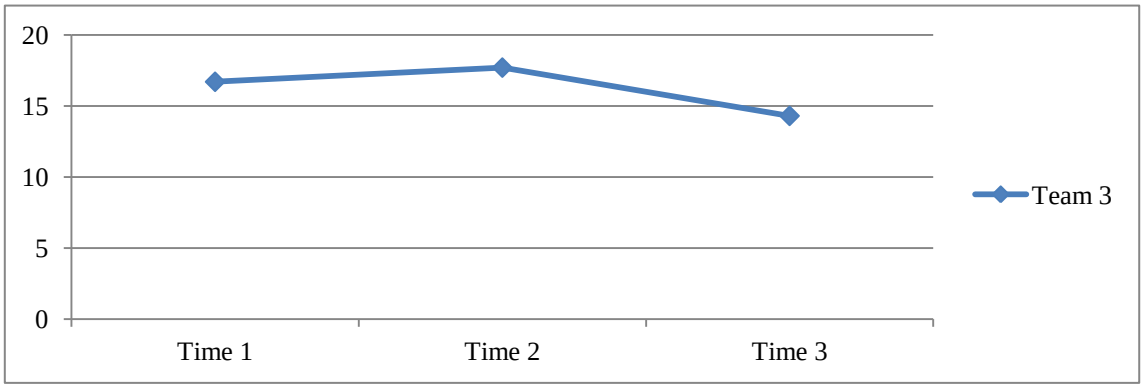

Figure 4.18. The third pattern of the amount of annotation made by Team 3 in the collaborative annotation group across the three reading sessions.

The pattern of participation for Teams 4, 5, and 9 was in a "U" shape, with the least number of annotations made in the second session. Figure 4.19 shows the trend.

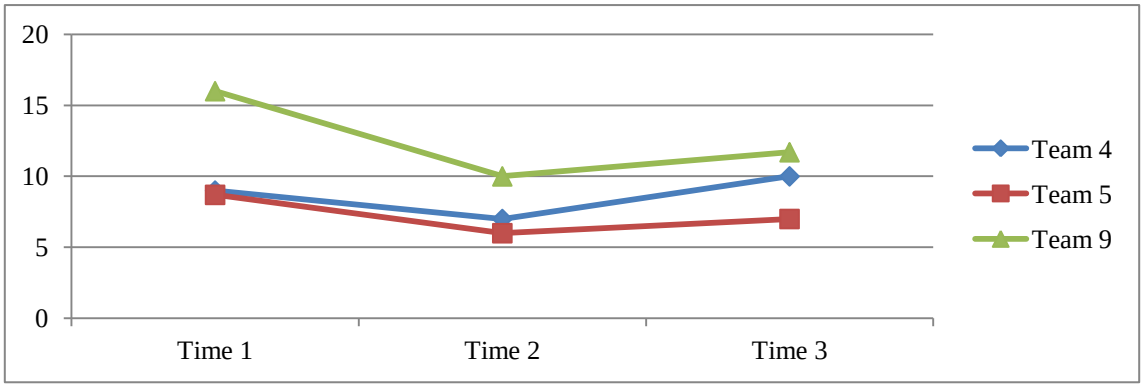

Figure 4.19. The fourth pattern of the amount of annotation made by Teams 4, 5 and 9 in the collaborative annotation group across the three reading sessions.

The students' annotation functions. A coding scheme for annotation functions was developed through qualitative analysis. Nine major categories were defined to deal with a total of 1510 annotations (579 annotations from the individual annotation group and 931 from the collaborative annotation group). The eighth and ninth categories were specifically designed for the interactive nature of collaboration annotations. In this section, I first report the overall frequency of the nine function categories, as Table 4.22 displays. Then, I display the findings of frequency comparison and contrast in individual categories between the individual annotation group and the collaborative annotation group. Finally, I present the results of my analysis of the annotation exchange in the collaborative annotation group.

The first category was "Translate the text" with seven sub-categories: "single word translation (1A)," "single phrase translation (1B)," "single sentence translation (1C)," "more than one sentence translation (1D)," "single paragraph translation (1E)," "more than one paragraph translation (1F)," and "whole text translation (1G)." Each sub-category was further divided into "correct translation (C)" and "incorrect translation (I)." Overall, the proportion of translation annotations in the individual annotation group was

higher than that in the collaborative annotation group. There were no examples of the Code 1EI (incorrect paragraph translation), 1FI (incorrect translation of more than one paragraph), and 1GI (incorrect translation of the whole text) for either group. Moreover, the individual annotation group made more mistakes in their translation annotations than the collaborative annotation group. Below are examples of Code 1 for each the annotation group.

Examples of Code 1A (Translation of a word)

Correct translation:

- Highlight: tonight
- Annotation: 今晚 (Student 1, Individual Annotation Group, Session 1)

- Highlight: movie
- Annotation: 電影 (Student 2, Collaborative Annotation Group, Session 2)

Incorrect translation:

- Highlight: taking
- Annotation: 想 [Thinking] (Student 22, Individual Annotation Group, Session 1)

- Highlight: week
- Annotation: 假日 [Holiday] (Student 6, Collaborative Annotation Group, Session 3)

Examples of Code 1B (Translation of a phrase)

Correct translation:

- Highlight: Last week
- Annotation: 上星期 (Student 10, Individual Annotation Group, Session 2)

- Highlight: after school
- Annotation: 放學 (Student 21, Collaborative Annotation Group, Session 3)

Incorrect translation:

- Highlight: after school
- Annotation: 上學 [Go to school] (Student 17, Individual Annotation Group, Session 3)

- Highlight: last week
- Annotation: 最後 [Finally] (Student 6, Collaborative Annotation Group, Session 2)

Examples of Code 1C (Translation of a sentence)

Correct translation:

- Highlight: Then the doctor told Jack, "Your leg is broken."
- Annotation: 然後醫生告訴傑克，你的腿斷了。(Student 14, Individual Annotation Group, Session 3)

- Highlight: She opened the door.
- Annotation: 她打開了門。(Student 27, Collaborative Annotation Group, Session 1)

Incorrect translation:

- Highlight: Her father loves fruit.
- Annotation: 她的父親愛的果實 [Her father's loving fruit] (Student 11, Individual Annotation Group, Session 1)

- Highlight: the woman from the supermarket phoned the hospital to get an ambulance.
- Annotation: 媽媽打電話叫救護車來 [The mother called to get an ambulance.] (Student 11, Collaborative Annotation Group, Session 3)

Examples of Code 1D (Translation of more than one sentence)

Correct translation:

- Highlight: Last week, they had a holiday by the sea. Sam is ten, Vicky is eight, but Paul is only five.
- Annotation: 上週，他們有一個海邊度假。山姆是10歲，維琪是八歲，但保羅只有五歲。(Student 16, Individual Annotation Group, Session 2)

- Highlight: The sea was very blue. Paul looked. There were three beautiful dolphins in the water!
- Annotation: 海很藍。 保羅看到，在水中有三隻美麗的海豚 (Student 9, Collaborative Annotation Group, Session 2)

Incorrect translation (Some students resorted to using unnatural Chinese expressions):

- Highlight: Vicky lives with her parents and her two brothers, Sam and Paul, in the city. Last week, they had a holiday by the sea. Sam is ten, Vicky is eight but Paul is only five. They went to the movie theater on Wednesday because it rained all day.
- Annotation: 玉萍的生活與她的父母和她的兩個兄弟，Sam和保羅，在這個城市。上週，他們有一個假期在海邊。山姆是10，玉萍是八，但保羅是只有五個，他們去看電影了戲劇週三因為下雨一整天。[Vicky's life and her parents and her two brothers, Sam and Paul, in this city (unnatural Chinese expression). Last week, they had a holiday by the sea. Sam is ten (missing "years old"), Vicky is eight (missing "years old"), but Paul is only five (unnatural Chinese expression). They went to watch a movie theater Wednesday because it rained all day (unnatural Chinese expression).] (Student 4, Individual Annotation Group, Session 2)

- Highlight: At the hospital they had to wait for a long time to see the doctor but Jack didn't mind because he could read his book. Then the doctor told Jack, "Your leg is broken. You have to stay here for three more days."
- Annotation: 傑克在醫院等一下才能繼續看書。醫生告訴傑克，腿壞了三天了。 [Jack waited for a while in the hospital in order to keep reading his book. The doctor told Jack that your leg has been broken for three days.] (Student 23, Collaborative Annotation Group, Session 3)

<u>Examples of Code 1E (Translation of a paragraph)</u>

Correct translation example only:

- Highlight: Today is Father's Day. Emily and her father are going on a trip tonight. They will go to Danshui to watch the sunset. But Emily's father didn't know about it. It's a surprise.
- Annotation: 今天是父親節。艾米莉和她的父親今晚要去旅行。他們會去淡水看日落。但Emily的父親不知道這件事。這是一個驚喜。(Student 4, Individual Annotation Group, Session 1)

- No student in the collaborative annotation group had this code.

Examples of Code 1F (Translation of more than one paragraph)

Correct translation example only:

- Highlight: [First paragraph] Then the doctor told Jack, "Your leg is broken. You have to stay here for three more days." "That's OK," said Jack. [Second paragraph] Jack's parents went to visit him every day and the woman from the supermarket brought him some sweets. They were very surprised that Jack was so happy all the time.
- Annotation: 然後醫生告訴傑克，"你的腿壞了。你要在這裡停留3天。"沒關係，"傑克說。傑克的父母每天都去看望他，超市的那位女人帶給他一些甜食。他們非常驚訝的是，傑克都很開心。(Student 4, Individual Annotation Group, Session 3)

- No student in the collaborative annotation group had this code.

Examples of Code 1G (Translation of a whole text)

Correct translation example only:

- Highlight: the whole text in the third reading session.
- Annotation: 有一天，上週，傑克放學後與他的媽媽去商店。傑克有一本很好的書，他不希望停止閱讀它。於是，傑克讀他的書，跟著他的媽媽到每一家店。但是，當他們走進超市，傑克沒看到在地板上的香蕉，他站在它上面並摔了。他傷了腿非常糟糕。媽媽說:"我要帶他去醫院。"在超市的那個女人打電話給醫院獲得救護車。傑克躺在救護車後面的床上，看他的書。在醫院，他們不得不等待很長的時間去看病，但傑克不介意，因為他能讀他的書。然後醫生告訴傑克，"你的腿壞了。你要在這裡停留3天。傑克說:"沒關係。"傑克的父

母每天都去看望他，超市的那個女人從超市帶給他一些甜食。他們非常驚訝的是，傑克常常都很高興。兩天後，傑克打電話給他的媽媽。他問:“你能來幫我嗎？”媽媽問:“出了什麼事？”傑克說:“我已經看完了我的書，我要回學校去再去拿一本！” (Student 10, Individual Annotation Group, Session 3)

- No student in the collaborative annotation group had this code.

The second category of annotation functions included displays of grammar knowledge. The students made use of annotations to explain words' part of speech and verb tenses. This function was carried out in 13 annotations (2.25%) in the individual annotation group and five annotations in the collaborative annotation group (0.54%). Examples include:

- Highlight: took
- Annotation: take/took/taken (Student 10, Individual Annotation Group, Session 1)

- Highlight: found
- Annotation: 發現(動詞過去式) [Find (the past tense of a verb)](Student 1, Collaborative Annotation Group, Session 1)

The third category of annotation functions concerned displays of students' playfulness, such as humorous statements, emotions, and using Chinese phonetic alphabets or punctuations for funny expressions. The individual annotation groups had more annotations with this code (17 annotations, 2.94%) than the collaborative annotation groups (4 annotations, 0.43%).

- Highlight: What's the matter?
- Annotation: 蝦咪待機 [Student 8 used Min dialect to translate this sentence] (Student 8, Individual Annotation Group, Session 3)

- Highlight: big bird
- Annotation: 大<鳥>!!!!!!!!!!!!!!!!!!!!!!!!!!!!l_l (Student 6, Collaborative Annotation Group, Session 1)

The next category (Code 4) of annotation functions related to the students' reflections about the text. This code was further categorized into two sub-categories. The first included students' reflections based on their personal opinions and experiences (P); the other was based on real-life connections or fact descriptions (R). The proportion difference in the students' personal opinions and experiences code (Code 4P) between the two groups was large. The individual annotation group more frequently disclosed their personal feelings in their annotations (68 annotations, 11.74%) than the collaborative annotation group did (5 annotations, 0.54%). However, the collaborative annotation group had more annotations for real-life connections (Code 4R) with the reading text (6 annotations, 0.64%) than the individual annotation group (1 annotation, 0.17%). Examples are provided for Code 4P and 4R from each annotation group.

- Highlight: Paul didn't like watching them and he closed his eyes.
- Annotation: 和我有同感 [I have the same feeling.] (Student 7, Individual Annotation Group, Session 2)

- Highlight: Paul
- Annotation: 好名 [It's a good name.] (Student 12, Collaborative Annotation Group, Session 2)

- Highlight: the picture in the text
- Annotation: 淡水老街的小公園 [It's a small park at the old street in Danshui.] (Student 6, Individual Annotation Group, Session 1)

- Highlight: Sam

- Annotation: 王大明 (Da-Ming Wang, pseudonym) [The student mentioned his classmate's Chinese name because Sam was his English name.] (Student 12, Collaborative Annotation Group, Session 3)

Structure identification was the fifth category used for coding text. Only the collaborative annotation group performed this function (6 annotations, 0.64%). Examples are provided.

- Highlight: A Happy Father's Day
- Annotation: 題目[The topic of the text] (Student 16, Collaborative Annotation Group, Session 1)

- No students in the individual annotation group had this code.

The sixth category of annotation functions consisted of students' questions about reading, including texts and pictures (Code 6). This code was infrequent in the individual annotation group (4 annotations, less than 1%); yet, it accounted for 6.77% of all annotations in the collaborative annotation group (63 annotations). The students in the collaborative annotation group raised more questions via annotations in the reading sessions. Examples include:

- Highlight: favorite
- Annotation: favorite的意思是 [The meaning of "favorite" is?] (Student 12, Individual Annotation Group, Session 1)

- Highlight: vegetables and rice
- Annotation:這又是啥 [What are they?] (Student 16, Collaborative Annotation Group, Session 1)

For those annotations that proved unable to be interpreted, my coding partner and I categorized them into Code 7 (annotations unable to be interpreted). There were few

annotations labeled as this code in both groups, with two annotations (less than 1%) in the individual annotation group and 10 annotations (around 1%) in the collaborative annotation group. Examples of annotations with undecipherable content include:

- Highlight: I've finished my book.
- Annotation: ji3yji4j06nfvkdsnjbgf (Student 8, Individual Annotation Group, Session 3)

- Highlight: The whole text of the third reading
- Annotation: 犁 [plowing] (Student 5, Collaborative Annotation Group, Session 3)

The following two codes were specifically aimed at the collaborative annotation group to deal with their annotation exchanges in the process of reading. The first such code (Code 8) worked to moderate the discussion. The students used these annotations to set the context and drive the discussion. There were only four annotations with this function (less than 1%). One example is provided.

- Highlight: The first paragraph of the text
- Annotation: 討論課文[The text we need to discuss] (Student 6, Collaborative Annotation Group, Session 2)

The other code reserved for the collaborative annotation group was "Respond to peers" (Code 9). This code accounted for 420 annotations made by the students (around 45% of all annotations). To examine the students' responses to peers, my coding partner and I further classified them into "related to reading text" (Code 9A) and "unrelated to reading text" (Code 9B). Code 9A described annotations that were connected to the reading text; Code 9B described annotations that were off-topic or anything-but-text annotations.

A total of 286 annotations were labeled as Code 9A. The students' responses to their peers about reading texts performed seven functions. Code 9A1 was used when an annotation sought answers or support from peers about text meaning, translation, and their annotation content. Code 9A2 was used for answers to peers' questions. Code 9A3 referred to annotations that connected real-life situations to the reading text. Code 9A4 was for correcting peers' mistakes about their text comprehension. Code 9A5 was for annotations that disclosed the students' feelings, opinions about the reading text or their peers' annotations. Code 9A6 expressed the students' agreement with, understanding about, support to, or appreciation for their peers. The last code in this domain was Code 9A7, which described wrong or unhelpful information and explanations about the reading text provided by the students. Among these codes, the students in the collaborative annotation group used Code 9A6 (to express support, appreciation) the most (91 annotations, 9.77%), followed by Code 9A2 (to answer peers' questions) and Code 9A1 (to ask questions about the reading text) with 66 annotations (7.09%) and 61 annotations (6.55%), respectively. The examples for Code 9A are illustrated.

Examples of Code 9A1 (Responses in order to ask questions)

- Responded annotation: 愛美麗坐高鐵去他爸爸辦公室 [Emily took MRT to her father's office.]
- Annotation: 去做啥？ [What did she do?] (Student 17, Collaborative Annotation Group, Session 1)

Examples of Code 9A2 (Responses to answer peers' questions)

- Responded annotation: 這是什麼 [What is this?]
- Annotation: 慶祝 [to celebrate] (Student 1, Collaborative Annotation Group, Session 1)

Examples of Code 9A3(Real-life connection to reading text)

- Responded annotation: 父親節快樂 [Happy Father's Day]
- Annotation: 現在不是父親節 (Student 7, Collaborative Annotation Group, Session 1)

Examples of Code 9A4 (Responses to correct peers' mistakes)

- Responded annotation:假期 [Holiday] (However, the annotation highlighted "week.")
- Annotation: 是週 [It's "week."] (Student 19, Collaborative Annotation Group, Session 3)

Examples of Code 9A5 (Responses to disclose personal opinions)

- Responded annotation: 愛美麗要給他的父親一個驚喜 [Emily wanted to give her father a surprise.]
- Annotation: 看日落 很好的驚喜 [To watch sunset. It's a very good surprise.] (Student 16, Collaborative Annotation Group, Session 1)

Examples of Code 9A6 (Responses to show appreciation/ agreement)

- Responded annotation: 電影院 [Movie theater] (Student 6 asked the meaning of "movie theater." A following response answered his question.)
- Annotation: $_$ Thank (Student 6, Collaborative Annotation Group, Session 2)

Examples of Code 9A7 (Unhelpful responses to peers' questions)

- Responded annotation: 甚麼？ [What is it?] ("Visit" was highlighted.)
- Annotation: 解決 [to solve] (Student 6, Collaborative Annotation Group, Session 3)

Regarding the second category of Code 9, 134 annotations were identified as Code 9B (responses unrelated to the reading text). This code consisted of six functions. Code 9B1 described annotations in which the students humiliated or mocked at their peers. Code 9B2 was used for annotations with out-of-context responses, which made no sense to viewers. Code 9B3 characterized personal communication or side talk among peers. Code 9B4 expressed students' playfulness when they responded to peers. Code 9B5, moderating the discussion, named those responses that referred to who discussed with whom in the reading session. The final code, Code 9B6, represented situations when students used annotations to advise or question their peers' out-of-context or inappropriate comments. Among these six codes, the students in the collaborative annotation group used Code 9B3 (personal communication) the most (40 annotations, 4.30%), followed by Code 9B2 (nonsense responses) and Code 9B4 (playfulness display), both with 32 annotations (3.44%). Examples for Code 9B are given.

Examples of Code 9B1 (Responses to humiliate peers)

- Responded annotation: 香蕉 [Banana]
- Annotation: 誰不知道啊！ [Who doesn't know that!] (Student 8, Collaborative Annotation Group, Session 3)

Examples of Code 9B2 (Nonsense responses)

- Responded annotation: 驚喜 [Surprise]
- Annotation: wkjkjkdjskjalgjl (Student 13, Collaborative Annotation Group, Session 1)

Examples of Code 9B3 (Responses for side talk)

- Responded annotation: 很好的驚喜 [A wonderful surprise]

- Annotation: 對不起 [I'm sorry.] (Student 17, Collaborative Annotation Group, Session 1)

Examples of Code 9B4 (Responses showing playfulness)

- Responded annotation: 是的 [Yes] (This annotation responded to a previous annotation, which confirmed the meaning of "apple.")
- Annotation: $$ (Student 7, Collaborative Annotation Group, Session 1)

Examples of Code 9B5 (Responses that moderated the discussion)

- Responded annotation: 我們和誰一組 26？ [No. 26, whom do we discuss with?]
- Annotation: 還有30 [Plus No. 30] (Student 26, Collaborative Annotation Group, Session 1)

Examples of Code 9B6 (Responses giving advice about peers' discussion performance)

- Responded annotation: 道~~歉～ [To apologize] (It was a side talk between two students in a group.)
- Annotation: 不要亂打 [Don't type something irrelevant.] (Student 14, Collaborative Annotation Group, Session 1)

Table 4.22

The Frequency and Percentage of Codes Used by the Individual Annotation Group and Collaborative Annotation Group

Code		Ind. Ann.	Percentage	Col. Ann.	Percentage
1A (Translation of a word)	Correct	201	34.72%	246	26.42%
	Incorrect	14	2.42%	13	1.40%
1B (Translation of a phrase)	Correct	76	13.13%	60	6.44%
	Incorrect	3	0.52%	4	0.43%
1C (Translation of a sentence)	Correct	112	19.34%	64	6.87%
	Incorrect	18	3.11%	7	0.75%
1D (Translation of more than one sentences)	Correct	21	3.63%	13	1.40%
	Incorrect	10	1.72%	1	0.11%
1E (Translation of a paragraph)	Correct	16	2.76%	0	0%
	Incorrect	0	0%	0	0%
1F (Translation of more than one paragraph)	Correct	1	0.17%	0	0%
	Incorrect	0	0%	0	0%
1G (Translation of a whole text)	Correct	2	0.35%	0	0%
	Incorrect	0	0%	0	0%
2 (Grammar knowledge display)		13	2.25%	5	0.54%
3 (Playfulness)		17	2.94%	4	0.43%
4 (Reflection)	To reflect the text from personal opinions and experience	68	11.74%	5	0.54%
	To reflect the text from real-life connection	1	0.17%	6	0.64%
5 (Text structure identification)		0	0%	6	0.64%
6 (Reading questions)		4	0.69%	63	6.77%
7 (Nonsense codes)		2	0.35%	10	1.07%
8 (Discussion moderation)		N/A		4	0.43%

Table 4.22 (continued)

Code		Ind. Ann.	Percentage	Col. Ann.	Percentage
9 (Responses to peers) A. Related to text	1 (To seek answers or support about text comprehension)	N/A		66	7.09%
	2 (To answer peers' questions)			61	6.55%
	3 (Real-life connection with text)			3	0.32%
	4 (To correct peers' mistakes about text comprehension)			23	2.47%
	5 (Self-disclosure of personal feelings and opinions)			26	2.79%
	6 (To agree/ support/ appreciate peers)			91	9.77%
	7 (Wrong/ unhelpful responses)			16	1.72%
9 (Responses to peers) B. Unrelated to text	1 (To humiliate peers)	N/A		17	1.83%
	2 (Nonsense responses)			32	3.44%
	3 (Personal communication)			40	4.30%
	4 (To show playfulness)			32	3.44%
	5 (To moderate discussion)			5	0.54%
	6 (To advise peers' discussion performance)			8	0.86%
Total		579	100%	931	100%

The frequency distribution of the students' annotations indicated that both groups invested much effort in translation annotations. Remarkably, nearly 82% of the total number of the annotations (474 out of 579 annotations) in the individual annotation group involved translation from English to Chinese. As Table 4.23 exhibits, the proportion of translation annotations was above 78% in the three sessions, despite a decreasing trend across reading sessions. Among the 26 students in the individual annotation group, 11 only made translation annotations in the three sessions; nine students did so in the two sessions; and three students did so in one session. Only one student (Student 7) did not annotate the reading texts with Chinese translations. His annotations were principally coded as Code 4A (reflection on the text with personal opinions and experiences).

Table 4.23

Proportions of Translation Annotations in the Three Reading Sessions Made by Each Student in the Individual Annotation Group

Participant	Time 1	Time 2	Time 3	Total
1	1.00	1.00	.60	.89
2	1.00	1.00	1.00	1.00
3	.00	.17	.00	.07
4	1.00	1.00	1.00	1.00
5	1.00	1.00	.60	.85
6	.88	1.00	.88	.90
7	.00	.00	.00	.00
8	.92	.46	.50	.57
9	.90	1.00	.40	.79
10	.75	1.00	1.00	.92
11	.91	1.00	1.00	.95
12	.67	1.00	1.00	.89
13	1.00	1.00	1.00	1.00
14	1.00	1.00	1.00	1.00
15	.89	1.00	1.00	.94
16	1.00	1.00	1.00	1.00
17	1.00	1.00	1.00	1.00
18	1.00	1.00	1.00	1.00

Table 4.23 (continued)

Participant	Time 1	Time 2	Time 3	Total
19	1.00	.75	1.00	.93
20	1.00	1.00	1.00	1.00
21	1.00	.89	1.00	1.00
22	1.00	1.00	1.00	1.00
23	.25	1.00	.18	.37
24	1.00	1.00	1.00	1.00
25	1.00	1.00	1.00	1.00
26	.93	1.00	1.00	.98
Average	.85	.82	.79	.82

Note. The proportion came from the number of translation annotations the students made in the individual sessions divided by the amount of all annotation each student composed in each session.

Compared to the individual annotation group that concentrated on making translation annotations, translation for the collaborative annotation group was slightly less frequent in their responses to peers (see Table 4.24). Nearly 44% of their annotations (408 annotations) were used for translation whereas responses to peers represented 46% (420) of annotations. Furthermore, the overall mean of the students' translation annotations increased as the reading activities progressed. Over half of the annotations in the third session were related to text translation.

Table 4.24

Proportions of Translation Annotations in the Three Reading Sessions Made by Each Team in the Collaborative Annotation Group

Team	Time 1	Time 2	Time 3	Total
Team 1	.24	.33	.83	.42
Team 2	.25	.28	.43	.30
Team 3	.28	.47	.51	.42
Team 4	.44	.71	.70	.65
Team 5	.31	.61	.52	.46
Team 6	.34	.58	.45	.45
Team 7	.62	.68	.81	.48
Team 8	.33	.26	.64	.34
Team 9	.29	.50	.46	.40
Average	.29	.48	.56	.44

Note. The proportion came from the number of translation annotations the individual team made in each session divided by the amount of all annotation made by each team in each session.

With regards to examining the nine teams' translation annotations, three patterns emerged. Teams 1, 2, 3, and 7 belong to the first pattern (see Figure 4.20), in which students' translation annotations steadily increased throughout the three sessions.

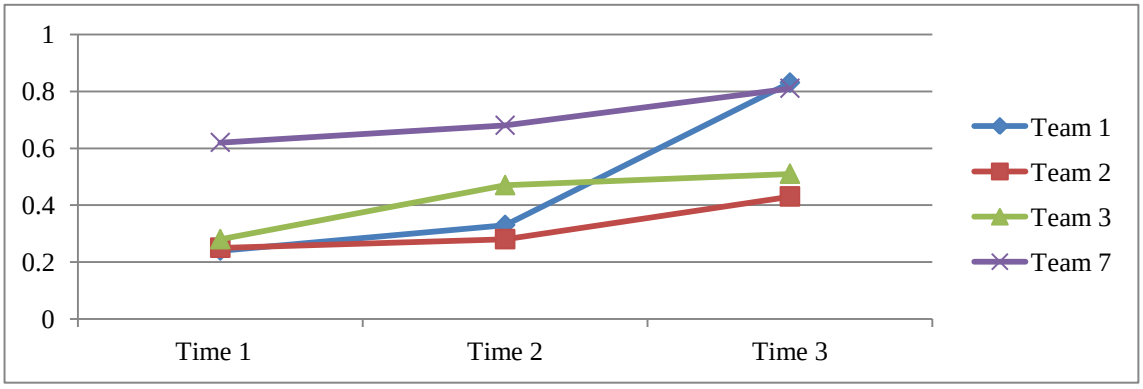

Figure 4.20. The first pattern of proportion of translation annotations made by Teams 1, 2, 3, and 7 in the collaborative annotation group across the three reading sessions.

The second pattern, shown in Figure 4.21, describes a fluctuating trend of translation annotations across the three sessions. Teams 4, 5, 6, and 9 showed an increase

in their proportion of translation annotations in the second session but a drop in the third session.

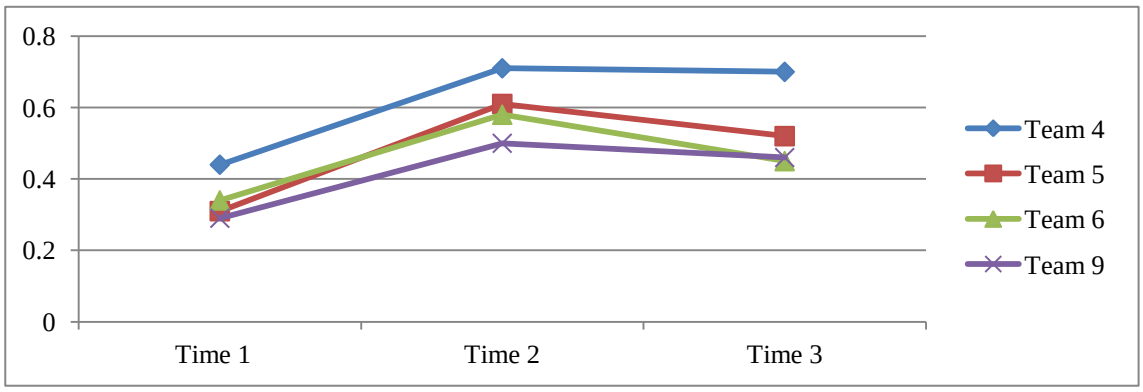

Figure 4.21. The second pattern of proportion of translation annotations made by Teams 4, 5, 6, and 9 in the collaborative annotation group across the three reading sessions.

The last pattern shows that the students in Team 8 made the least proportion of translation annotations in the second session, as Figure 4.22 displays.

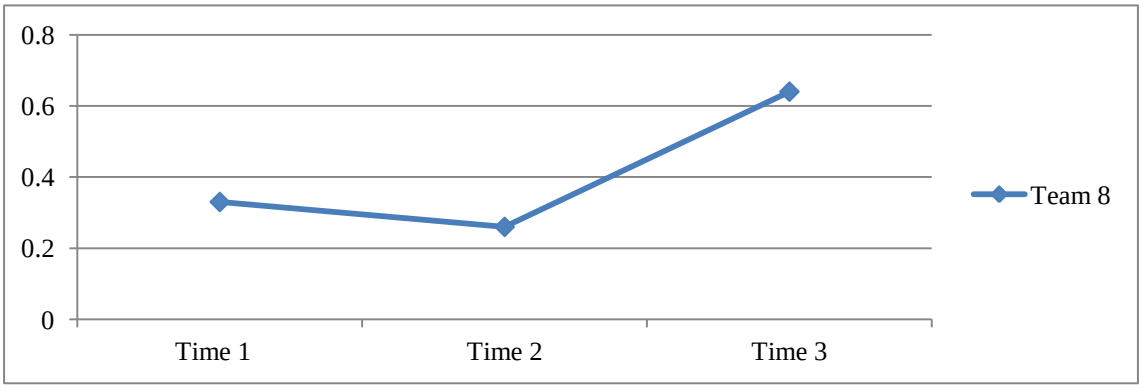

Figure 4.22. The third pattern of proportion of translation annotations made by Team 8 in the collaborative annotation group across the three reading sessions.

In order to explore the interactive nature of annotation exchanges, the proportion of annotations coded as 9A (responses to peers about the reading text) and 9B (responses

to peers not about the reading text) in the three reading sessions was tabulated in Table 4.25. The proportion of 9A codes was generally higher than that of 9B codes across the three reading sessions. Overall, the collaborative annotation group had a lower amount of Code 9A in the second reading session but showed a slight increase in the third session. Yet, the amount of Code 9B annotation decreased steadily as the reading sessions occurred.

Table 4.25

Proportions of Responses Made by Each Team in the Collaborative Annotation Group in the Three Reading Activities

	About the reading text			Not about the reading text			Total	
Team	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3	About the reading text	Not about the reading text
Team 1	.09	.11	.11	.48	.56	.00	.10	.38
Team 2	.37	.34	.43	.31	.22	.07	.38	.23
Team 3	.40	.34	.28	.24	.09	.16	.34	.16
Team 4	.26	.10	.13	.07	.19	.07	.17	.10
Team 5	.54	.33	.43	.00	.00	.00	.45	.00
Team 6	.46	.31	.43	.02	.00	.10	.40	.04
Team 7	.17	.00	.00	.07	.11	.00	.31	.07
Team 8	.33	.33	.00	.24	.24	.21	.29	.24
Team 9	.40	.37	.34	.08	.03	.09	.37	.07
Average	.35	.27	.28	.18	.14	.08	.31	.14

Note. These proportions came from the numbers of responses to peers made by individual teams in each session divided by the total amount of annotation each team made in each session.

Five patterns are portrayed in the students' responses to peers related to the reading texts. The first pattern characterizes Teams 2, 4, 5, and 6. All had the lowest proportion of Code 9A annotations in their second session, with a "U" -shaped trend, as Figure 4.23 illustrates.

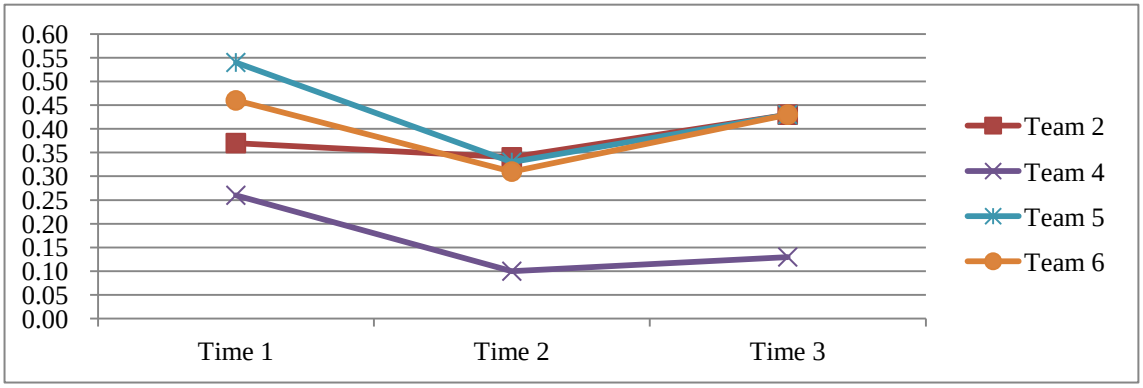

Figure 4.23. The first pattern of proportion of Code 9A annotations made by Teams 2, 4, 5, and 6 in the collaborative annotation group across the three reading sessions.

The second pattern displays a continual decrease in terms of the proportion of Code 9A annotations. Figure 4.24 presents Teams 3 and 9's proportion of Code 9A annotations.

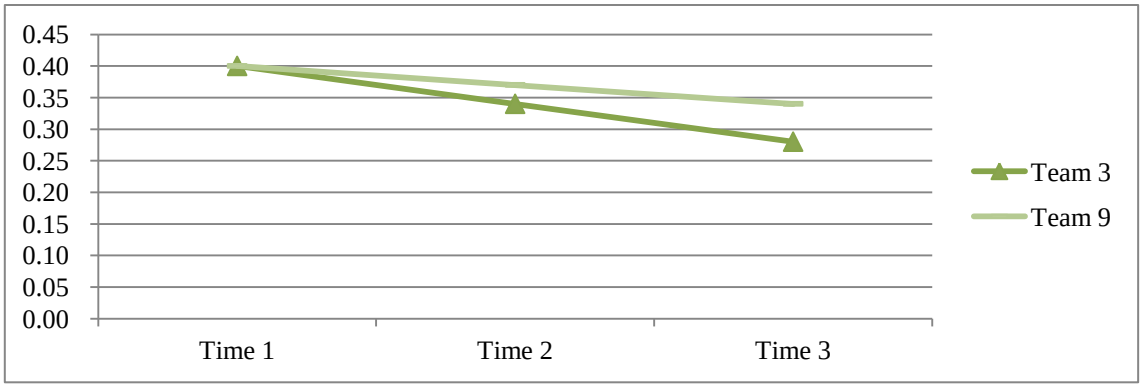

Figure 4.24. The second pattern of proportion of Code 9A annotations made by Teams 3 and 9 in the collaborative annotation group across the three reading sessions.

The third pattern, displayed in Figure 4.25, depicts Team 1. It slightly increased the proportion of Code 9A annotations in the second session and remained flat.

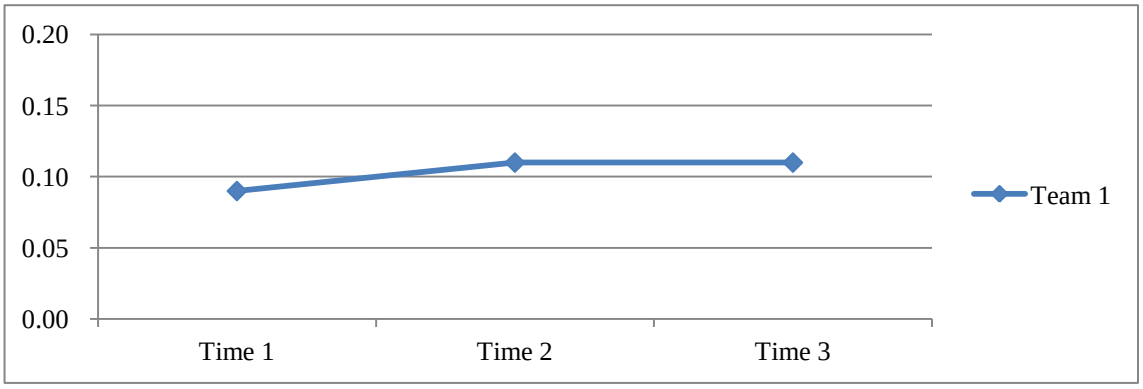

Figure 4.25. The third pattern of proportion of Code 9A annotations made by Team 1 in the collaborative annotation group across the three reading sessions.

The next pattern characterizes Team 7. It reduced the proportion of Code 9A annotations in their second session and remained flat. It is notable that Team 7 had no annotations used for responses to peers about the reading texts in the second and third sessions, as Figure 4.26 presents.

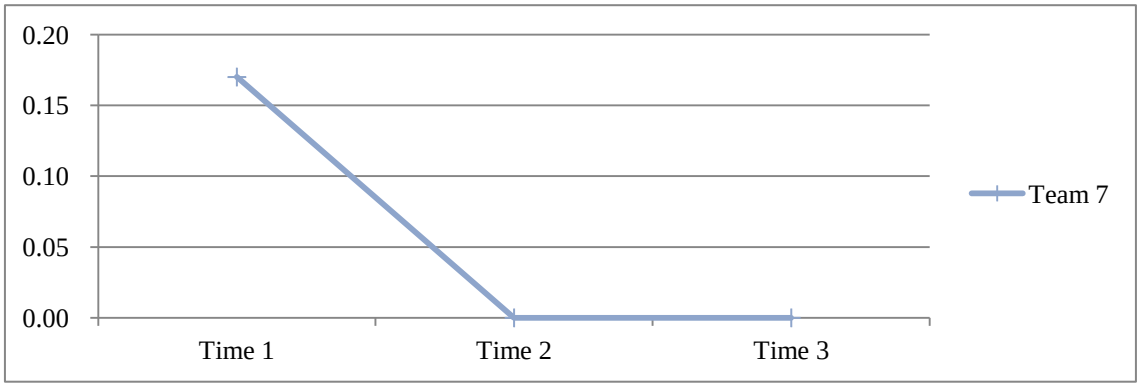

Figure 4.26. The fourth pattern of proportion of Code 9A annotations made by Team 7 in the collaborative annotation group across the three reading sessions.

The final pattern describes Team 8 that held a similar proportion of annotations with Code 9A in the first two sessions but showed a sharp decrease in the third session. Figure 4.27 presents the pattern.

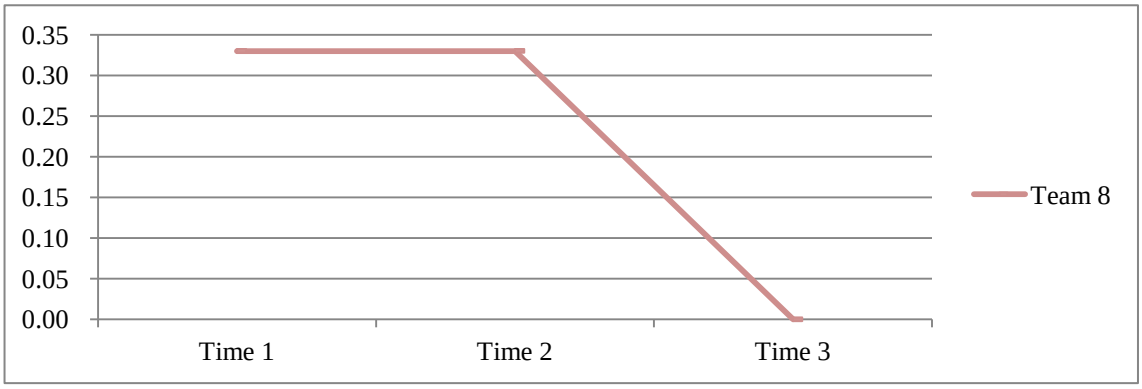

Figure 4.27. The fifth pattern of proportion of Code 9A annotations made by Team 8 in the collaborative annotation group across the three reading sessions.

Regarding the development of responses to peers unrelated to the reading texts, there were five patterns. The first pattern, applicable to Teams 1, 4, and 7 showed a rise in proportion of Code 9B annotations in the second session and a drop in the third session. Figure 4.28 displays the trend.

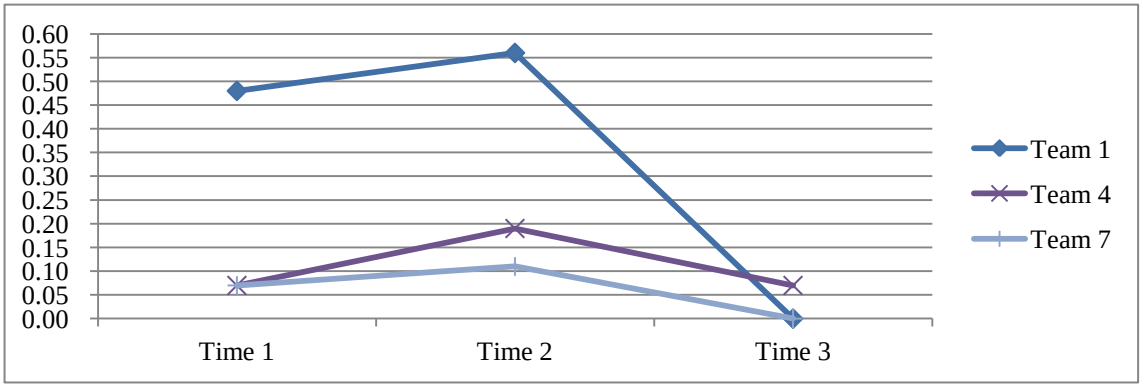

Figure 4.28. The first pattern of proportion of Code 9B annotations made by Teams 1, 4, and 7 in the collaborative annotation group across the three reading sessions.

The second pattern represents Teams 3, 6, and 9. Illustrated in Figure 4.29, these teams' proportion of Code 9B annotations were the lowest in the second session.

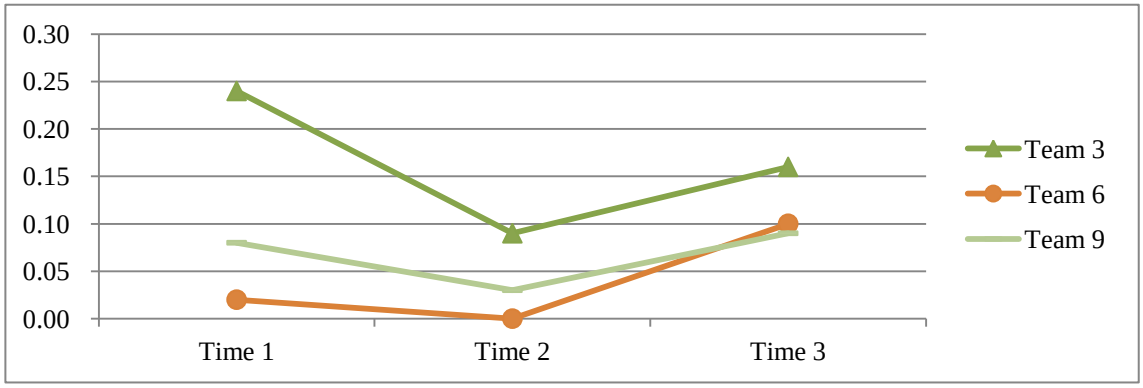

Figure 4.29. The second pattern of proportion of Code 9B annotations made by Teams 3, 6, and 9 in the collaborative annotation group across the three reading sessions.

The next pattern reflects Team 2's progression across sessions with a constant decrease in proportion of Code 9B annotations across the sessions. Figure 4.30 shows the pattern.

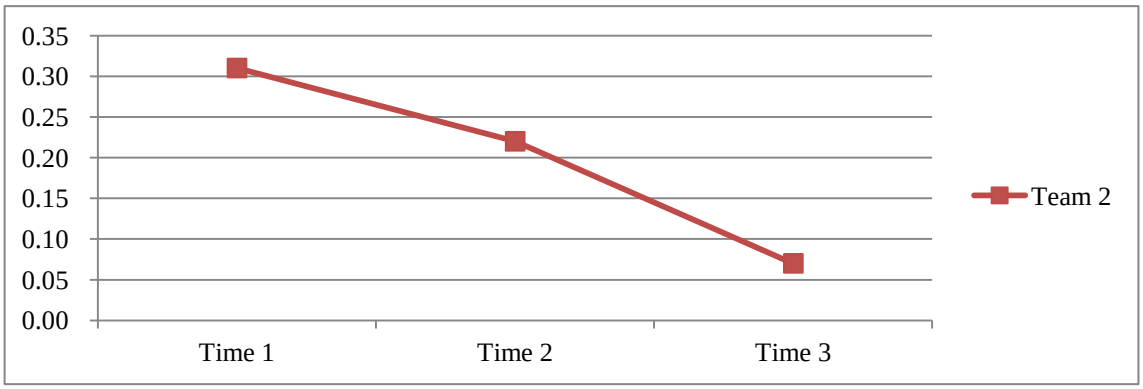

Figure 4.30. The third pattern of proportion of Code 9B annotations made by Team 2 in the collaborative annotation group across the three reading sessions.

The fourth pattern describes how Team 8 remained similar proportion of annotations with Code 9B in the first two sessions. The proportion of their Code 9B annotations was the lowest in the third session, as Figure 4.31 displays.

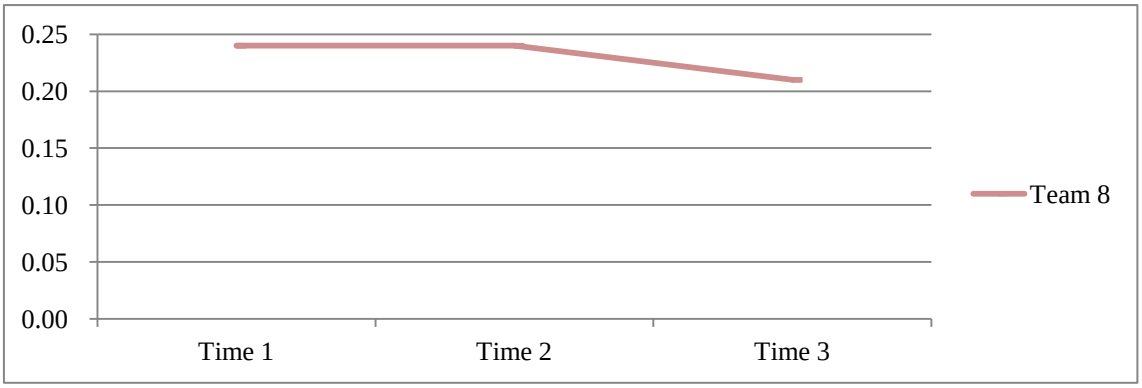

Figure 4.31. The fourth pattern of proportion of Code 9B annotations made by Team 8 in the collaborative annotation group across the three reading sessions.

The fifth pattern describes how Team 5 remained the same in the proportion of annotations with Code 9B throughout the reading sessions. Team 5 did not make any annotation with code 9B. Figure 4.32 displays the last pattern.

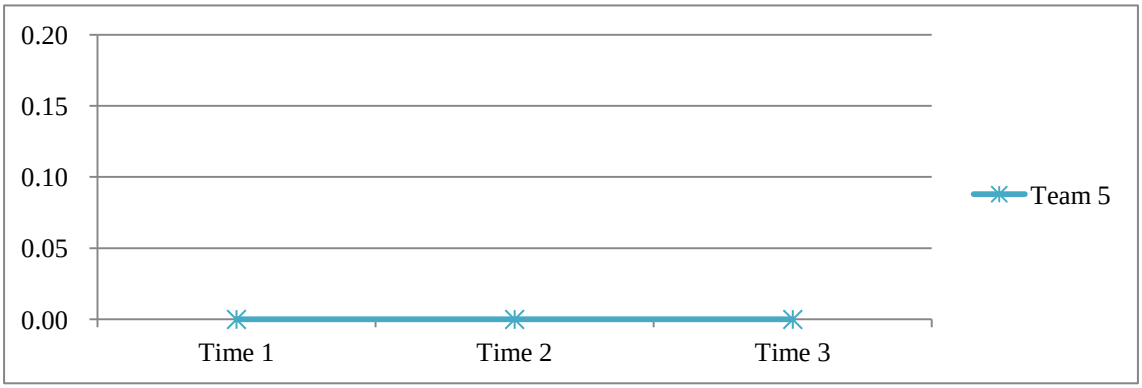

Figure 4.32. The fifth pattern of proportion of Code 9B annotations made by Team 5 in the collaborative annotation group across the three reading sessions.

Three issues were explored to further investigate to what extent the students in the collaborative annotation group gave and received support from their peers during the reading activities. The first involved examining whether the students could provide correct feedback when their team members made mistakes about their reading comprehension and translations. To do so, I reexamined all annotations with Code 1AI

(incorrect translation of a word), 1BI (incorrect translation of a phrase), 1CI (incorrect translation of a sentence), and 1DI (incorrect translation of more than a sentence). Results are presented in Table 4.26.

When students made mistakes, the students in the collaborative annotation group made them by providing wrong translations of a word, followed by wrong translations at a sentence level, a phrase level, and at more than a sentence level. Peers responded to nine annotations with incorrect word translations. The correction rate for wrong word translations was nearly 70%. Regarding wrong translations of a phrase or a sentence, the corrected response rate was below 30%. Team members ignored most of these translations during the reading activities. No one responded to the annotation with a wrong translation of more than one sentence.

Table 4.26
The Percentage of Corrected Annotations

Type of wrong annotations	Number	Corrected number	Percentage
Code 1AI (incorrect translation of a word)	13	9	69.2%
Code 1BI (incorrect translation of a phrase)	4	1	25.0%
Code 1CI (incorrect translation of a sentence)	7	2	28.6%
Code 1DI (incorrect translation of more than a sentence)	1	0	0.0%

The second issue was to delve into how many questions the students asked that were successfully solved by their peers. The number of questions decreased across the three sessions (see Table 4.27). The successful response rate was the highest in the second session when 12 questions received definite, correct answers. However, the response rate dropped considerably to 23.1% in the third session.

Table 4.27
The Percentage of Questions Successfully Responded

Time	Questions raised	Useful response	Percentage
Session 1	34	19	55.9%
Session 2	16	12	75.0%
Session 3	13	3	23.1%
Average	21	11.3	51.9%

The final issue was to consider the relationship of the proportion of student responses (related to text and unrelated to text in Table 4.25) to their reading enjoyment, reading engagement, helpfulness ratings, and reading comprehension performance. Due to the students' frequent use of online support functions to find translations and the meaning of the English texts they were reading, the relationship between the proportion of the students' translation annotations (see Table 4.24) and the proportion of their responses to peers was also investigated. Table 4.28 displays information about the means and standard deviations of each collaborative team's reading enjoyment, engagement, helpfulness, and free recall and cued recall tests.

Table 4.28

Means and Standard Deviations of Each Collaborative Annotation Teams' Reading Enjoyment, Engagement, Helpfulness, and Free Recall and Cued Recall Tests

Session	Team	Enjoyment mean (SD)	Engagement mean (SD)	Helpful mean (SD)	Free recall test mean (SD)	Cued recall test mean (SD)
	Team 1	3.0 (1.0)	2.3 (.6)	2.3 (.6)	12.1 (13.2)	42.9 (24.7)
	Team 2	2.3 (1.5)	3.0 (1.0)	2.7 (1.2)	30.3 (31.5)	76.2 (29.7)
	Team 3	2.7 (.6)	2.7 (.6)	2.3 (.6)	15.2 (8.0)	95.2 (8.3)
	Team 4	2.0 (1.0)	2.0 (1.0)	2.7 (1.5)	14.1 (11.5)	71.4 (37.8)
Session 1	Team 5	1.7 (.6)	2.3 (1.2)	1.7 (.6)	8.1 (1.8)	76.2 (29.7)
	Team 6	3.0 (1.0)	3.3 (.6)	3.7 (.6)	12.1 (8.0)	81.0 (16.5)
	Team 7	2.7 (1.5)	2.3 (1.5)	2.7 (1.5)	10.1 (4.6)	61.9 (16.5)
	Team 8	3.0 (1.2)	3.3 (1.0)	2.8 (1.5)	7.6 (5.3)	78.6 (8.2)
	Team 9	3.0 (0.0)	2.3 (.6)	1.7 (.6)	13.1 (6.3)	66.7 (29.7)
	Team 1	3.3 (1.2)	3 (1.0)	2.7 (1.2)	23.5 (30.7)	57.1 (37.8)
	Team 2	3.3 (.6)	3.7 (.6)	3.3 (1.2)	45.1 (32.3)	76.2(29.7)
	Team 3	2.7 (.6)	2.7 (.6)	2.7 (.6)	41.2 (23.0)	90.5 (16.5)
	Team 4	3.3 (.6)	3.3 (1.2)	3.7 (.6)	29.4 (25.6)	61.9 (41.2)
Session 2	Team 5	1.7 (.6)	1.7 (1.2)	1.7 (.6)	11.8 (3.0)	76.2 (29.7)
	Team 6	3.0 (1.0)	3.0 (1.0)	3.3 (.6)	18.6 (10.3)	42.9 (14.3)
	Team 7	2.7 (1.5)	2.3 (1.5)	2.7 (1.5)	5.9 (0.0)	38.1 (8.3)
	Team 8	3.0 (1.2)	3.0 (1.2)	2.8 (1.5)	22.8 (8.5)	82.1 (18.0)
	Team 9	3.7 (.6)	2.7 (.6)	3.7 (.6)	20.6 (0.0)	52.4 (29.7)
	Team 1	2.3 (1.5)	2.3 (1.5)	2.3 (1.5)	35.0 (40.2)	61.9 (43.6)
	Team 2	3.3 (.6)	3.7 (.6)	3.7 (.6)	71.7 (22.6)	85.7 (14.3)
	Team 3	3.0 (1.0)	2.7 (.6)	3.0 (1.0)	43.3 (24.0)	81.0 (21.8)
	Team 4	4.0 (0.0)	4 .0 (0.0)	3.3 (.6)	35.0 (49.8)	52.4 (45.9)
Session 3	Team 5	2.7 (1.5)	2.3 (1.2)	2.7 (1.5)	31.7 (8.0)	61.9 (54.1)
	Team 6	3.0 (1.7)	3.3 (1.2)	2.7 (1.5)	8.3 (1.4)	57.1 (14.3)
	Team 7	2.7 (1.5)	2.3 (1.5)	2.7 (1.5)	7.5 (2.5)	47.6 (29.7)
	Team 8	3.5 (.6)	3.5 (.6)	2.8 (1.0)	18.8 (10.5)	71.4 (23.3)
	Team 9	3.7 (.6)	3.0 (1.0)	3.3 (.6)	15.8 (12.8)	71.4 (28.6)

Table 4.29 presents the correlations of the proportion of related-to-text responses

and unrelated-to-text responses with reading enjoyment, engagement, helpfulness, and free and cued recall test performance, and the proportion of translation annotations. There was a high positive relationship (r = .510, p < .01) between the number of text-related annotations and cued recall test performance. The positive direction of this relationship suggested that the more students wrote responses related to the reading texts, the better performance they had in cued recall. Nevertheless, a strong inverse (r = -.685 and r = -.520, p < .01) relationship between both types of responses and the proportion of translation annotations was found, suggesting that as students made more translation annotations, the number of their responses to peers decreased to a limited extent.

Table 4.29
Correlations of the Proportion of Peers' Responses with Reading Enjoyment, Engagement, Helpfulness, Free Recall Test Performance, Cued Recall Test Performance, and the Proportion of Translation Annotations

Response	Reading enjoyment	Reading engagement	Reading helpfulness	Free recall test	Cued recall test	Translation annotations
Related to text	-.207	-.002	-.081	.105	.510**	-.685**
Unrelated to text	.241	.209	-.052	.011	.035	-.520**

Note. **. Correlation is significant at the 0.01 level (2-tailed).

The students' views of annotation usage. This part introduces the students' reasons for making and not making annotations while they were reading. The second sub-section reports on the collaborative annotation group's explanations for replying and not replying to peers.

Reasons to make and not to make annotations. During the stimulated recall interview, I showed the interviewees their annotations and garnered a range of responses about what had motivated them to make annotations and why they did not want to make annotations in the reading sessions. There were four major reasons why they made annotations and three reasons for why they chose not to do so. The students' rationales for adding annotations are described first.

One of the reasons for making annotations, expressed by both annotation groups, was perceiving annotations as reminders. Through reading annotations, students can better remember grammar rules, vocabulary meanings, text content, and the connection between the text and real life situations as well as personal experiences. These students explained,

> "我可以提醒自己went單字的過去式，和teeth名詞複數。" [I can remind myself that "went" is a past tense and "teeth" is a plural noun.] (Student B, Collaborative Annotation Group, Session 2)

> "stood是stand的過去式，就想告訴自己這是過去式。" ["Stood" is the past tense of "stand." I just wanted to tell myself that it is a past tense.] (Student B, Collaborative Annotation Group, Session 3)

The students also reported that they used the annotations to highlight a word they did not know or fully understand so that they could check it or think about its meaning and associate the translation annotation with the unknown word. Contrary to the emphasis on unknown words, some students used annotations to highlight which words they already knew. As the interviewees stated about using annotations to deal with unknown and known words,

> "註解幫助我回想起這個單字，雖然之前有學過這個單字，但剛剛看的時候，不太確定，就做個註解。" [Making annotations helped me recall this word. Although I learned it before, I was not certain about it when I read it. So I made an annotation.] (Student E, Individual Annotation Group, Session 2)

“我不會這個單字，所以就做了movie的註解。” [I did not know this word. So I made this annotation about “movie.”] (Student D, Collaborative Annotation Group, Session 2)

“註解就是自己不知道的英文，從Google翻譯查詢，再回到註解。” [I annotated words I did not know. I checked their meanings from Google Translation, and made annotations.] (Student A, Individual Annotation Group, Session 3)

“一開始看的時候，看不太懂，就想了一下，後來才想到"星期五"，就做了一個註解，想讓自己記住。沒想靠線上字典查意思，完全靠自己。” [When I first read it, I did not understand it well. I thought about it for a while and got the meaning “星期五” (Friday). So I made an annotation and wanted to remember it. I did not check an online dictionary. I solely counted on myself.] (Student B, Collaborative Annotation Group, Session 3)

“做了一個「電影」的註解, 因為我知道這個字的意思，我大部份的註解都是做我知道意思的。” [I made an annotation “電影” (movie) because I knew this word’s meaning. Most of my annotations were about the words that I knew.] (Student E, Collaborative Annotation Group, Session 2)

“看到一個字對我來說比較難的，可是我知道的，所以我就順便打一下註解。” [I spotted a word that was a little bit difficult for me. But I knew its meaning. So I conveniently made an annotation for that.] (Student C, Collaborative Annotation Group, Session 3)

The students also used annotations to help themselves better remember the reading texts, so that they could perform better in the reading comprehension test. They prepared by translating the texts in their annotations. The interviewees mentioned,

“在寫閱讀測驗時，我們要盡量把大意寫下來，我會特別寫到我註解內容。” [When taking the reading test, we needed to do our best to write down the story’s main points. I would especially write what I annotated.] (Student B, Collaborative Annotation Group, Session 2)

“我的註解是翻譯，可以讓我更快記住故事。” [My annotations were translations. They helped me remember the story faster.] (Student A, Individual Annotation Group, Session 3)

“我發現只翻譯片段的話 就是記憶沒有很深刻。那我覺得一字一字，一句一

句打下去，就是會在打的時候，會去看一下這個單字在這個句子裡面它的意義，可能它在每一個句子裡面意義不同，那打的時候可能就稍微會有印象，那在寫卷子的時候也比較好回答" [I realized that I could not remember the text very well if I just translated chunks of the text. So I thought that I would check the meaning of a word in a sentence if I typed word-by-word, sentence-by-sentence. Then I could find that a word may have different meanings in individual sentences. Then typing these words in my annotations may make me impressed with them. It was easier for me to answer when I took the test.] (Student C, Collaborative Annotation Group, Session 3)

Some students favored recording their personal reflections or experiences, or making real-life connections with the reading texts in the annotations, aiming for better memorability. They stated,

"我做這個『星期三』註解，因為當時在做註解的時候是星期三" [I made this annotation "星期三" (Wednesday) because it was Wednesday when I annotated this word.] (Student E, Individual Annotation Group, Session 2)

"就一邊讀，然後就一邊回想我的經驗，有相同的就打上去我的感想。" [I read the text and recalled my own experience. If there was any similarity between the text and my experience, I would type what I thought.] (Student F, Individual Annotation Group, Session 2)

"把自己的心得啊感想啊，寫上去，記住閱讀的感覺，把自己融入到故事情境去，比較容易記住故事" [I would annotate what I learned and my reflection and remember my feeling while reading. It was easier to remember the story if I immersed myself in the story.] (Student C, Individual Annotation Group, Session 3)

The second reason why the students made annotations was to fulfill the requirement: each student had to write at least four annotations in their individual reading of the texts. They pointed out,

"我就只是湊註解數目而已" [I just wanted to get the required annotation amount.] (Student E, Individual Annotation Group, Session 2)

"其實我知道sharks，但是因為老師要求我們要做4個註解。我才只好做這個註解，問what is shark。" [In fact, I knew "sharks". But I did not have another

choice and just made this annotation “what is shark.” That was because the teacher required us to make four annotations.] (Student A, Collaborative Annotation Group, Session 2)

The next two reasons for making annotations were specific to the collaborative annotation group. One reason was to draw attention from their teammates. Through exchanging annotations with classmates, they intended to display their playfulness or seek support from their peers in order to overcome reading difficulties. The students stated,

“我打123456，我在想其他同學看到時，應該覺得很好笑。” [I typed 123456. I was thinking that other classmates would laugh when they read it.] (Student F, Collaborative Annotation Group, Session 2)

“看完如果不會的話，會發問。” [I would ask questions if I did not understand the text after reading it.] (Student B, Collaborative Annotation Group, Session 2)

“不知道這個單字意思，所以希望我的同伴能救我。” [I did not know the word’s meaning. So I hoped that my peers could help me.] (Student D, Collaborative Annotation Group, Session 3)

Some students adopted two strategies to capture attention from peers. They would intentionally either raise questions for which they already knew the answer in order to receive replies and to test their peers, or they made nonsense annotations. They said,

“標題就做了一個註解呢，我想問他們，就是看他們有沒有答對，自己知道答案。想捉弄他們一下，就問他們是不是知道一個簡單單字的意思” [I made an annotation about the topic. I wanted to ask my teammates and see whether anyone could correctly answer my question. I knew the answer. I just wanted to make fun of them and ask if they knew the meaning of a simple word.] (Student A, Collaborative Annotation Group, Session 3)

“沒有人理我，我就亂打，看看會不會有人理我。” [I was ignored by my teammates. Then I typed something ridiculous to see if anyone would pay attention to me.] (Student C, Collaborative Annotation Group, Session 2)

The final purpose described by the students was to assist their peers with better

reading comprehension. While reading the text, they would take their teammates' reading abilities into consideration and provide translation annotations to help their teammates. They stated,

> "做shark註解，想要讓12號和15號更知道這個單字的意思" [I made an annotation on "shark." I wanted to let No. 12 and No. 15 know the word meaning better.] (Student E, Collaborative Annotation Group, Session 2)

> "他們應該不知道garden這個字，所以我就翻譯這個字讓他們知道。" [They might not know this word "garden." So I translated the word for them.] (Student B, Collaborative Annotation Group, Session 2)

> "這個註解"在醫院"，怕別人不知道這個意思，想幫助別人" [I made this annotation "在醫院" (in the hospital) because I was afraid that someone else might not understand its meaning. I wanted to help others.] (Student D, Collaborative Annotation Group, Session 3)

Not many interviewees talked about why they stopped making more annotations during the reading processes. Four major reasons can be induced from the responses of both annotation groups. The first reason concerned the students' forgetfulness. One student said,

> "有時候我就忘了做註解了，讀完就結束了" [Sometimes I just forgot to make annotations. When I finished reading, I ended the reading activity.] (Student B, Collaborative Annotation Group, Session 2)

The second reason seemed related to the requirement to make four annotations. Once the student had satisfied the requirement, he or she became reluctant to make more. One student stated,

> "做了四個註解了，那時候在想應該夠了吧。" [I had made four annotations. At that time, I thought that should be enough.] (Student E, Individual Annotation Group, Session 2)

Another reason to explain the students' hesitation to make annotations was the difficulty level of the reading texts. Some students lacked the motivation to make annotations because they saw the text as being too easy. One student expressed,

> "這篇故事對我還算蠻簡單的，不用做太多註解" [This story was quite simple for me. There was no need to make more annotations.] (Student C, Individual Annotation Group, Session 3)

The final reason concerned time constraints. Because students only had 40 minutes, they had to distribute their time to finish reading and accomplish the follow-up reading comprehension test and survey. Therefore, they could not spend too much time solely on the reading. As reported by one student,

> "時間有限，我不能要佔用午餐時間，要在下課前，完成所有事情" [Time was limited. I did not want to use my lunch time. Before the class was over, I wanted to finish everything.] (Student F, Collaborative Annotation Group, Session 3)

Reasons to respond and not to respond to peers. According to the interviewees in the collaborative annotation group, there were four types of explanations for why they gave responses to peers. First, they wanted to understand their teammates' thinking, so they directly asked for elaboration and clarification in their responses. Take these students as an illustration:

> "不知道同學的註解是說誰，就再問問他" [I did not understand whom the classmate was referring to in his annotation. So I asked him again.] (Student A, Collaborative Annotation Group, Session 1)

> "對於同學的註解有疑問，想說為什麼海裡面會有早餐，所以就打「啥」，來表達我的疑問，想知道他到底在想些什麼" [I had a question about my classmate's annotation and wondered why there was a lunch in the sea. So I typed "啥" (What).] (Student C, Collaborative Annotation Group, Session 2)

The second reason touched on the students' characteristics. Two students expressed that they tended to help others when they understood the text. They said,

> "我通常比較喜歡回應別人的問題，如果我知道，我就可以幫助別人。" [I usually preferred to answer others' questions. If I knew answers, I would help others.] (Student A, Collaborative Annotation Group, Session 2)

> "如果知道答案，我幫忙別人，回答他們的問題。" [If I knew answers, I would help others by answering their questions.] (Student F, Collaborative Annotation Group, Session 2)

In addition to answering their peers' questions, some students provided accurate translations by correcting peers' wrong annotations. One student said,

> "看到同學錯誤的註解，就告訴她，希望她能寫正確，這樣下次她就會記得了。" [I saw the classmate's wrong annotation and told her. I hoped that she could make right annotations. Then next time she would remember them.] (Student B, Collaborative Annotation Group, Session 2)

Next, the students responded to annotations to make fun of their classmates via their responses. Two students illustrated examples of their mischievous behaviors.

> "想開個玩笑，25的註解「大牙齒」，就回應她「你有的」。" [I wanted to make a joke. When I saw No. 25's annotation "大牙齒" (big teeth), I replied "你有的" (You got them) to her.] (Student A, Collaborative Annotation Group, Session 2)

> "他的註解是問號，我也用問號來回應他。想看看他會有什麼反應。" [My classmate's annotation was a question mark, and I responded to him with a question mark. I wanted to see how he reacted to it.] (Student B, Collaborative Annotation Group, Session 2)

The fourth explanation was to express agreement with their peers' annotations. This reason can be further divided into two motives. First, the students truly agreed with their peers and recognized their annotations. Two students mentioned,

> "我贊成22號，就回應她" [I agreed with No. 22. So I responded to her.] (Student A, Collaborative Annotation Group, Session 2)

> “同學的註解打對了，和我想的一樣，就給他一個同意的回應。” [When the classmate had correct annotations and s/he had the same thinking as mine, I gave her/him an annotation with my agreement.] (Student E, Collaborative Annotation Group, Session 3)

Alternatively, some students mentioned that they sometimes agreed with their peers in order to hide their lack of low English proficiency. As one student honestly admitted,

> “有時候，不管同學在註解說什麼，我都通通同意，因為如果我不同意的話，他們就會問我，哪裡要不同意、哪裡錯了，而我卻不知道該怎麼回答他們。所以我就通通同意他們的註解。” [Sometimes I did not care about what my classmates had said. I simply agreed with them. It was because I did not know how to answer them if they asked me what points I was against and what mistakes they had made. Therefore, I agreed with all of their annotations.] (Student D, Collaborative Annotation Group, Session 3)

As for reasons not to reply to peers, the students cited a variety of factors, which I categorized into four major reasons. First, students’ low level of English proficiency contributed to low motivation to respond to peers. Either that the teammates’ proficiency levels were low or that the student’s own low level of English hindered providing more responses. As the students stated,

> “比較少回應別人，因為我懂得比較少，而且他們也未必知道故事的內容” [I seldom responded to others because I knew less about the text. In addition, my classmates did not necessarily understand the text.] (Student E, Collaborative Annotation Group, Session 2)

> “我也不會，不知道該怎麼回答別人，就不回覆別人了。” [I did not understand the text and had no idea about how to answer other’s questions. So I just did not respond to them.] (Student D, Collaborative Annotation Group, Session 2)

Second, some students’ high level of English proficiency also contributed to low motivation to respond to peers. Thus, low motivation for responding could be caused by either the teammates’ high proficiency levels or the student’s own high proficiency in English. The students expressed,

> “感覺我的組員都看懂故事，也沒有問太多問題，也不知道該回應他們什麼”

[I felt that my teammates all understood the story. They did not ask many questions. And I did not know what to respond to them.] (Student B, Collaborative Annotation Group, Session 2)

"有時候，同學要問稍微高深一點的問題，他們都問太簡單的，所以我就不想回應他們。" [Sometimes, my classmates had to ask more advanced questions. Their questions were too easy. So I did not want to reply to them.] (Student A, Collaborative Annotation Group, Session 3)

Third, intentional ignorance existed in these interactive reading sessions. Some students took the initiative to ignore their teammates' annotations because they wanted to skip those playful or side-talk annotations and concentrate on text discussion. Personal relationship issues were another reason to neglect some peers purposefully. The students also gave up replying to their teammates because they were always ignored no matter how hard they tried to get a response from their teammates. As these students remarked,

"沒有回應同學的感想，因為這樣就沒完沒了啊，這樣回下去就會變成一個聊天，我就來不及讀完整篇" [I did not respond to my classmates' reflections because it was never ending! If I responded to them, the whole discussion would become a chat. I had no time to read the whole text.] (Student C, Collaborative Annotation Group, Session 2)

"我不想回覆某些同學，因為我不想理他。" [I did not want to reply to some classmates because I just did not want to take notice of them.] (Student A, Collaborative Annotation Group, Session 2)

"因為就算我回應別人的話，他們也不怎麼理我。" [Even though I responded to others, they still ignored me.] (Student F, Collaborative Annotation Group, Session 3)

Finally, a concern for memory span also prevented some students from sending responses to their peers. One student pointed out,

"我看完了文章，就不想去回覆別人的註解，直接就先做閱讀測驗了，這樣我才記得比較清楚文章內容" [When I finished reading the text, I did not want to respond to others' annotations. I directly took the reading comprehension test. By doing so, I was able to have a better memory about the text content.] (Student C, Collaborative Annotation Group, Session 3)

Summary. The previous sections reported on the two annotation groups' reasons for making or not making annotations. Furthermore, the students in the collaborative annotation group provided their explanations about why they did or did not respond to their peers. Table 4.30 provides a summary of the aforementioned factors.

Table 4.30
Issues of Making Annotations and Responding to Peers

Category	Students' answers
Why or why not make annotations	**Reasons to make annotations:** ◆ As a reminder to self ▪ of grammar rules. ▪ of the meaning of unknown words. ▪ of the meaning of known words. ▪ of main ideas and details of the story; to enhance a deeper impression about the story. ▪ of real-life connection with the story. ◆ As fulfillment of the requisite four annotations. ◆ To draw attention from teammates: ▪ To display humor. ▪ To receive a reply from teammates. ▪ To make fun of teammates. ▪ To test teammates. ◆ To support teammates with translation annotations. **Reasons not to make annotations:** ◆ Forgot to do annotations. ◆ Already fulfilled the four annotation requirement. ◆ The story was too easy for me; no need to make annotations. ◆ Time constraints.

Table 4.30 (continued)
Issues of Making Annotations and Responding to Peers

Category	Students' answer
Why or why not respond to peers' annotation	**Reasons to respond to a peer's annotation** ◆ To understand classmates' thinking; to ask for clarification. ◆ A natural tendency to help others. ◆ To make fun of classmates; to want to see the peer's reaction to funny replies. ◆ To agree with classmate's annotation content: ▪ Stay on the same page. ▪ Avoid questions from teammates. **Reasons not to respond to a peer's annotation** ◆ Lower level of English proficiency: ▪ I cannot help my teammates. ▪ My teammates cannot help me. ◆ Higher level of English proficiency: ▪ Their questions were too easy to be worthy of a response. ▪ They understood the story very well; no questions to respond. ◆ Intentional ignorance: ▪ To ignore specific teammates' annotations because they were playful/ chatting about something unrelated to reading texts. ▪ To ignore others due to personal relationship issues. ▪ To be ignored by teammates; no response from them either. ◆ Eager to take the reading comprehension test earlier before memory faded.

Students' impressions of the reading activities. This section reports on how the students in the three reading treatments viewed their experiences in the reading activity, including their likes and dislikes as well as perceived pros and cons of online reading. The read-only group's opinions were viewed as a baseline for comparing and contrasting the two annotation groups. Next, the section reviews how the students in the collaborative

annotation group perceived their peers' annotations and responses. These findings were based on the analysis of the responses to the enjoyment and engagement surveys and recall protocols.

The students' likes and dislikes. All of the students were encouraged to offer their perspectives about the online reading activities in the end-of-session surveys. There was a huge overlap in terms of the three groups' likes and dislikes. The following paragraphs first present what the students favored about online reading.

Several students in the read-only group reiterated that they appreciated the online reading activities because it helped them enhance their English reading abilities and proficiency levels through opportunities to learn new vocabulary and review old words. The students wrote,

> "線上閱讀可以幫我加強英文閱讀的能力。" [The online reading can help me boost my English reading abilities.] (Student 2, Read-Only Group)
>
> "可以學習英文、學習更多單字。" [I can learn English and more vocabulary.] (Student 23, Read-Only Group)
>
> "增加英文知識，除了可以看到已經學過的單字外，還可以學新的單字。" [I can gain more English knowledge. Besides reading the words I learned before, I can learn new words.] (Student 17, Read-Only Group)

The other point acknowledged by the read-only group was the use of computer technology in their reading activities. Online reading was very convenient for them, and they highly valued the chance to use online dictionary or translation functions.

> "可以用電腦讀英文。" [I can use the computer to read English.] (Student 14, Read-Only Group)
>
> "可以馬上查線上字典，方便又快速，看不懂的字，也不用買字典了。" [I can immediately check out the online dictionary. It was convenient and fast. I do not need to buy a dictionary anymore.] (Student 16, Read-Only Group)

> “用電腦讀很方便，就不用買書。” [It was convenient to read on the computer. I do not need to buy books.] (Student 23, Read-Only Group)

All three treatment groups shared these views. In addition, the students in the individual annotation group talked about using annotations. They considered making online annotations to be “fancy,” “fun,” and that it “looked good.” It was easy to read annotations and helped them more effectively recall the text points and acquire grammar knowledge and translations of unknown words. In addition, the students saw making annotations as good typing practice. The students stated,

> “做註解很好玩” [It was very fun to make annotations.] (Student 10, Individual Annotation Group)

> “做註解很新奇。” [It was very fancy to make annotations.] (Student 20, Individual Annotation Group)

> “註解有不同的顏色，看起來很漂亮。” [There were different colors in the annotations. They looked beautiful.] (Student 13, Individual Annotation Group)

> “看註解可以讓我讀到重點” [Reading annotations allowed me to read the main points.] (Student 4, Individual Annotation Group)

> “做註解可以幫助我學習英文閱讀文法、單字意思。” [Making annotations can help me learn English grammar and vocabulary meaning.] (Student 9, Individual Annotation Group)

> “我很喜歡打字，雖然打字很慢，但是很有趣。” [I liked typing very much. Although I was a slow typist, I still thought that it was interesting.] (Student 19, Individual Annotation Group)

The collaborative annotation group remarked on their favorite parts of the online reading activities, and chose aspects similar to those mentioned by the individual annotation group. Yet, they had more positive things to say about the annotation exchange with peers. They regarded supporting peers through annotation exchanges interesting and meaningful. In addition, sharing annotations with each other made the

students excited to see their peers' responses during their reading processes. The students wrote,

> "做註解幫忙別人了解故事，幫忙同學很好玩" [Making annotations can help others understand the story. It was fun to help classmates.] (Student 5, Collaborative Annotation Group)
>
> "可以幫助別人，讓大家知道是什麼意思，有意義。" [I can help others and let them know the text meaning. It was meaningful.] (Student 8, Collaborative Annotation Group)
>
> "別人能回應我，得到答案就會很開心、興奮。" [When someone else responded to me, I can get answers from her/him. I was very happy and excited.] (Student 13, Collaborative Annotation Group)

As for the part that the students did not like, the complaints indicated by the read-only group also occurred in both annotation groups' lists. The collaborative annotation group had one additional dislikes to the individual annotation group. As the students in the read-only group mentioned, online reading might affect their eyesight. Meanwhile, several students criticized the fact that they did not have time to play online games. The students noted,

> "用電腦閱讀容易近視" [Using computer to read might make me near-sighted.] (Student 6, Read-Only Group)
>
> "看電腦久的話，會傷害視力。" [If I looked at the computer too long, my eyesight might get hurt.] (Student 25, Read-Only Group)
>
> "一直看電腦螢幕，不可以休息，好累" [Continuously reading on the computer screen without a break made me exhausted.] (Student 22, Read-Only Group)
>
> "都不能玩線上遊戲" [I cannot play online games.] (Student 24, Read-Only Group)

The individual annotation group also offered a typing issue. Some complained about their slow typing speed; some viewed typing as boring, tiring, and troublesome.

These students wrote,

> “打字速度很慢” [My typing speed was very slow.] (Student 19, Individual Annotation Group)
>
> “打字好麻煩。” [Typing was troublesome.] (Student 23, Individual Annotation Group)
>
> “打字好累好無聊。” [Typing was tiring and boring.] (Student 25, Individual Annotation Group)

In addition to what the students in the read-only group and individual annotation group revealed, the students in the collaborative annotation group brought up the issue of interacting with peers. Both receiving no responses or receiving peers’ responses troubled some students. They felt angry when receiving nonsense annotations or ridiculous or “no-brainer” responses. However, they felt uncomfortable when no one responded to them. If there were too many annotations on the screen, they became anxious when having to deal with the large number of annotations and to provide peers with their responses. They disliked uncooperative teammates. The students were disappointed when their annotations were ignored by their teammates or when peers repeated annotations with exactly the same content as theirs. When making annotations, the students worried about their teammates’ reactions. Furthermore, they were concerned that wrong annotations would affect their teammates’ comprehension. As addressed by the students,

> “如果別人沒有回應我，我會覺得很失望；如果別人亂打字，我會覺得很憤怒” [When no one responded to me, I felt disappointed. If someone else typed something ridiculous, I felt angry.] (Student 13, Collaborative Annotation Group)
>
> “有些人會罵髒話，有些在聊天。” [Some classmates would type dirty words; some would chat.] (Student 14, Collaborative Annotation Group)
>
> “別人回覆的都是談天的內容，浪費我的時間。” [The classmates’ responses were all about chatting. It was a waste of my time to read them.] (Student 15,

Collaborative Annotation Group)

"太多註解在螢幕上，來不及看，又要回應別人，覺得很緊張。" [Too many annotations on the screen. No time to finish reading them all. And I had to respond to others. I felt so nervous.] (Student 21, Collaborative Annotation Group)

"如果我做太多註解，同組人會罵我。" [If I did too many annotations, the teammates would blame me.] (Student 13, Collaborative Annotation Group)

"同學不合作，聊英文之外的話題，這樣很無禮。" [My teammates were not cooperative. They chatted on something other than English topics. It was rude.] (Student 24, Collaborative Annotation Group)

"別人做的註解跟自己重複，不知道是沒有看到或故意打重複，有點失望。" [Others' annotations were the same as mine. I was wondering if they did not read my annotations or they just intentionally repeated mine. I felt a little bit disappointed.] (Student 24, Collaborative Annotation Group)

"我怕我會做錯註解，我的同學也會有錯誤的學習。" [I worried that I would make wrong annotations and so my teammates would learn something wrong.] (Student 26, Collaborative Annotation Group)

Pros and cons about the reading activities. The students in all three groups provided similar advantages and disadvantages of the online reading activities as the likes and dislikes received in the previous section. According to the students in the read-only group, they benefited from the activities because they could use the computer, check online translation or dictionaries whenever they wanted, improve their reading abilities, and understand more vocabulary. As the students noted,

"可以用電腦讀英文。" [I can use a computer to read English.] (Student 14, Read-Only Group)

"可以馬上線上查字典和翻譯，了解意思。" [I can consult online dictionary and translation functions, and understand translations.] (Student 15, Read-Only Group)

"可以增加閱讀能力、學習單字、幫助學英文。" [I can increase my reading ability and learn vocabulary. It was helpful for my English learning.] (Student 1,

Read-Only Group)

The students in the individual annotation group not only mentioned these benefits, but also recognized five more online reading features. They considered the online reading activities to be good for typing practice, a good way to deepen one's impression of vocabulary knowledge and text content, an opportunity to practice a reading strategy, and a convenient way to read. Some students expressed that they had a good time in the activities. The students observed,

> "可以練習打字。" [I can practice typing.] (Student 1, Individual Annotation Group)
>
> "可以記得故事內容，加深對單字的印象。" [I can remember the story content and have a better impression about vocabulary.] (Student 12, Individual Annotation Group)
>
> "我們可以學習英文的閱讀方法。" [We can learn strategies for English reading.] (Student 11, Individual Annotation Group)
>
> "線上閱讀很方便，電腦打開來就可以馬上進行。" [It was convenient to read online. I can promptly start reading when turning on the computer.] (Student 26, Individual Annotation Group)
>
> "能夠使用電腦，很有趣。" [It was interesting to use the computer.] (Student 22, Individual Annotation Group)

In addition to the positive aspects that the students in the read-only group and the individual annotation group noticed, the students in the collaborative annotation group recognized the benefit of interacting with peers. By exchanging annotations, they could support each other, feel less anxious about asking questions, receive language input from others' annotations, and catch the main points of the text without much effort. Moreover, they enjoyed chatting with peers via annotations. The students stated,

> "同學可以互相學習、幫忙" [We can learn from each other and support each other.] (Student 15, Collaborative Annotation Group)

“可以讓大家和自己知道文章的意思” [We can make everybody and myself understand the text meaning.] (Student 8, Collaborative Annotation Group)

“不會的可以問同學，不會有太大壓力。” [If I had a question, I asked my classmates without feeling too much pressure.] (Student 4, Collaborative Annotation Group)

“可以透過別人的註解或回應，認識新的單字和句型。” [I can learn new vocabulary and sentence patterns by reading others’ annotations or responses.] (Student 13, Collaborative Annotation Group)

“能透過大家和自己的註解，了解文章的重點。” [I can get the main points of the text through peers’ and my annotations.] (Student 8, Collaborative Annotation Group)

“可以聊天。” [We can chat.] (Student 11, Collaborative Annotation Group)

Regarding the disadvantages about the online reading activities, the other two annotation groups shared the read-only group’s concerns. The latter group’s primary online reading issue was that reading on the computer screen might hurt their eyesight and tire their eyes. The students wrote,

“傷害視力。” [My eyesight would be hurt.] (Student 7, Read-Only Group)

“會讓眼睛疲勞。” [Reading online would exhaust my eyes.] (Student 15, Read-Only Group)

“眼睛不可以休息。” [My eyes did not get rested.] (Student 27, Read-Only Group)

Although some students in the individual annotation group praised the fact that they could practice their typing skills by making annotations and noted that they had a good time reading on the screen, some students provided opposite responses. They felt annoyed by typing and seemed impatient about making annotations. The students mentioned,

“麻煩要做註解。” [It was troublesome to make annotations.] (Student 10,

Individual Annotation Group)

"一直打字讓我不耐煩。" [I was not patient with typing.] (Student 23, Individual Annotation Group)

The collaborative annotation group noticed the most weaknesses about the online reading activities. In addition to the disadvantages indicated by the read-only group and the individual annotation group, the students started to reflect unfavorably on interactions with each other, such as the usage of "bad" words in annotations, creating off-topic annotations, and having no responses or even negative responses from peers. They claimed that the reading activity might be a waste of their time due to useless annotations. Sometimes, they felt overloaded having to read too many annotations simultaneously. They further doubted the use of online support functions and peers' annotations if they easily and simply received text translations or word definitions without further thinking. The students noted,

"別人會講一些不好的話" [Someone else would type something bad.] (Student 2, Collaborative Annotation Group)

"有時候有人會講髒話和不雅語詞" [Sometimes my teammates would type dirty stuff and had inappropriate expressions.] (Student 14, Collaborative Annotation Group)

"大家會聊天、哈啦，講一些五四三。" [Everybody would chat about something not related to the text.] (Student 15, Collaborative Annotation Group)

"我們這組，沒有一個人會回應我。" [In my team, nobody responded to me.] (Student 13, Collaborative Annotation Group)

"我會被同學罵。" [I would be blamed by my teammates.] (Student 8, Collaborative Annotation Group)

"有些註解沒有用，浪費我的時間。" [Some annotations were unhelpful. It was a waste of my time.] (Student 3, Collaborative Annotation Group)

"一下子太多註解了，我不知道為從那邊開始，容易分心。" [Too many

annotations in a short time. I did not know where to start. I easily got distracted.] (Student 19, Collaborative Annotation Group)

"如果對方就給你答案，或你就去直接翻譯，這樣就無法加深對這個單字的印象了。" [When the teammates directly told you answers or you just consulted the translation website, you did not get a deeper impression about vocabulary.] (Student 26, Collaborative Annotation Group)

The students' attitudes toward peers' annotations and responses. This section specifically focuses on how the students in the collaborative annotation group perceived either receiving or not receiving peers' annotations and responses. Based on the stimulated recall protocols, the six participants experienced a range of feelings in their second and third reading sessions. Depending on the content of peers' annotations, the students reacted differently.

After receiving useful annotations and responses, the students appreciated their peers and admired their good English proficiency levels. Further, the students compared and contrasted their own annotations with their peers' to make a final conclusion. As recalled by the students,

"同學幫忙我不會的，像有些單字我不知道意思，他幫助我，讓我知道、提醒我，很謝謝他。" [My teammates helped me solve what I did not know. Something like unknown words. He helped me, let me know, and reminded me of the meaning. I thanked him a lot.] (Student D, Collaborative Annotation Group, Session 2)

"打這個註解的同學英文很強啊！" [The teammate who made this annotation was very good at English.] (Student F, Collaborative Annotation Group, Session 2)

"最後註解寫著「享受」，但別人回應「喜歡」，我覺得應該是「享受」，不是「喜歡」，因為享受到海邊遊玩，而不是喜歡，不一定要相信同學。" [My last annotation was "享受" (enjoy), but someone else responded "喜歡" (like). I still thought that it was supposed to be "享受" (enjoy) but not "喜歡" (like). It was because the family enjoyed their time at beach but not "liked". So I did not think we had to absolutely believe our teammates.] (Student D,

Collaborative Annotation Group, Session 3)

When receiving unhelpful annotations and responses, the students rarely had a positive feeling. Instead, they described how angry, puzzled, and disappointed they became. The students stated,

> “他們的回應都沒有什麼意義，沒有認真讀啊，只是想聊天而已，就不予置評。” [Their responses were meaningless. The teammates did not read seriously. They just wanted to chat. No comment about that.] (Student C, Collaborative Annotation Group, Session 2)

> “他們只是想要我整個翻譯，然後他們待會寫卷子的時候就可以整篇抄下去，沒有在認真讀啊。” [My teammates just wanted me to translate the whole text. So they could copy my translation when taking the test. They did not work hard.] (Student B, Collaborative Annotation Group, Session 2)

> “同學有些註解怪怪的，為什麼他要這樣打，真奇怪。” [Some annotations of my teammate’s were odd. I was wondering why he did that. How strange.] (Student A, Collaborative Annotation Group, Session 3)

When the students read peers’ responses that agreed or supported their explanations or translations, they felt happy and recognized. However, the process of waiting for peers’ annotations and responses was often accompanied by feelings of uneasiness. Students were eager and nervous to know how their teammates would respond to them. When they did not receive replies, they became disappointed, bitter, and felt ignored. The students noted,

> “看到24號打個沒錯，那時候我超開心的” [When No. 24 responded “Exactly” to me, I was super happy at that time.] (Student E, Collaborative Annotation Group, Session 3)

> “我就很緊張他們到底會不會回復，因為看他們打甚麼東西，看他們會不會說我很棒啊。” [I was very nervous about whether my teammates would reply to me. It was because I would like to read what they responded and see if they would praise me and say “How awesome I am.”] (Student B, Collaborative Annotation Group, Session 2)

> “有時候他們就是不回答我的問題，我不知道該怎麼辦。” [Sometimes they

just did not answer my questions. I did not know what to do.] (Student A, Collaborative Annotation Group, Session 3)

"沒有人回覆我，覺得有點失望，因為只要我會的，我都會回覆別人。" [No response from my peers disappointed me. It was because I would always reply to others as long as I knew answers.] (Student D, Collaborative Annotation Group, Session 3)

Summary. The previous sections document the read-only, individual annotation, and collaborative annotation groups' perspectives on the online reading activities. I reviewed students' likes and dislikes and the perceived advantages and disadvantages. Furthermore, the students in the collaborative annotation group disclosed their feelings about receiving peers' annotations and responses. An overview of the students' opinions is offered in Table 4.31.

Table 4.31
Students' Perceptions about the Online Reading Activities and Peers' Responses

Category	Students' answer
Likes and dislikes about the online reading activity	**Likes** **Three reading groups** ◆ Use of computer and online support (Google Docs and online support functions). **Individual annotation and collaborative annotation groups only** ◆ Making annotations was new, interesting, and fun. ◆ Great memory enhancement (reminded them of an unknown part, word meaning, or text point). ◆ A typing practice. **Collaborative annotation group only** ◆ Meaningful to help self and others learn to read. ◆ Excitement waiting for peers' annotations and responses. **Dislikes** **Three reading groups** ◆ A concern about hurting eyesight. ◆ Tiredness (looking at the computer screen and feeling tired). ◆ A desire to play online games; no time for online games. **Individual annotation and collaborative annotation groups only** ◆ Slow typing speed (boring, troublesome). **Collaborative annotation group only** ◆ No responses from peers (a waste of time; feeling disappointed). ◆ Nonsense annotations (just chatting; feeling angry). ◆ Too many annotations on the screen. ◆ Intensive reading process (making annotations and responses). ◆ A concern of making the wrong annotations (misleading peers). ◆ Uncooperative teammates. ◆ Repetitive content of annotations from peers (feeling ignored).

Table 4.31 (continued)

Category	Students' answers
Pros and cons of online reading activities	**<u>Pros</u>** **Three reading groups** ◆ Using computer. ◆ Using online support functions: to know vocabulary meaning immediately. ◆ Improving reading abilities and increasing English knowledge, such as vocabulary. **Individual annotation and collaborative annotation groups only** ◆ A typing practice (faster than writing by hand). ◆ Helpful to comprehend and remember the content. ◆ Fun. ◆ Learning a reading strategy. ◆ Convenient to read. **Collaborative annotation group only** ◆ Supporting each other; learning with each other. ◆ Able to chat with others. ◆ Able to ask questions of peers (feeling less pressure to ask questions). ◆ Learning more (word and grammar rules) by reading others' annotations. ◆ Easily getting the text points through reading others' annotations. **<u>Cons</u>** **Three reading groups** ◆ A concern of hurting eyesight. **Individual annotation and collaborative annotation groups only** ◆ Troublesome typing. ◆ Feeling bored. ◆ Inconvenient (need to use computer to read). **Collaborative annotation group only** ◆ Using bad words. ◆ Eliciting blame from peers. ◆ A waste of time (annotations unrelated to reading texts; chatting; off-topic responses). ◆ No responses from peers. ◆ Over-relying on online support function. ◆ Feeling distracted (reading my and others' annotations). ◆ A concern of failing to enhance vocabulary impression.

Table 4.31 (continued)

Category	Students' answer
Attitudes toward peer's annotations and responses	◆ Helpful. ◆ Admirable. ◆ Reflective. ◆ Angry. ◆ Puzzled. ◆ Unhelpful. ◆ Anticipated. ◆ Disappointed. ◆ Sad/ Ignored. ◆ Recognized/ Happy.

Chapter 5

Discussion

In this closing chapter, I summarize the findings of the study and discuss the results in relation to previous relevant research. The purpose of the study was to explore the processes and products through which EFL elementary-aged learners in Taiwan applied online annotations to collaborative reading activities. In order to understand the effect of a collaborative annotation exchange during online reading on young learners' reading comprehension, I compared the reading comprehension test performance, comprising of free recall and cued recall portions, of three groups of fifth grade students assigned to read online with no annotation, read online with individual annotations, or read online with collaborative annotations. Results answered my first research question.

Having identified the students' reading comprehension performance, I proceeded to examine their reading affect in terms of reading enjoyment and engagement, presented in response to my second research question. In addition, I investigated students' views of the online reading activity's helpfulness to their reading comprehension. Finally, I explored the reading processes of the students in the two annotation groups, particularly focusing on how they used annotations. Numerous categories were identified regarding the functions of annotations, learners' reactions to their own and peers' annotations, and learners' overall attitudes toward the online reading activities. These data analyses were used to answer my third research question. Results relevant to these research questions are discussed and related to the existing literature in the first section below.

In the next section, I address the limitations of the study. Finally, I conclude my report with suggestions for future research and theoretical, methodological, and instructional implications.

Summary and Discussion of Findings

Findings related to the three research questions are discussed in the following sections.

Research Question 1. *How did reading comprehension differ for fifth grade students who were engaged in different reading activities: read-only, individual annotation, and collaborative annotation?*

Before the research started, the students in the three reading groups were shown to have similar reading comprehension abilities, based on their previous semester's reading scores. Across the three reading sessions, the students in all reading groups steadily improved their performance, as shown by their free recall scores. Despite the fact that there was no statistical difference in the overall free recall performance among the three reading groups, the overall free recall scores showed that the read-only group performed the best whereas the collaborative annotation group had the lowest scores. As for the students' cued recall achievement, no significant difference was found among the three groups. The scores of the read-only group declined throughout the three reading sessions, but the annotation groups either remained the same or improved slightly from the second session to the third session. The overall means on the cued recall test demonstrated that, though not statistically significantly different, the read-only and the individual annotation groups' test performances were comparable, and the collaborative group had the lowest scores.

These findings contradicted previous research on the effect of online notetaking on reading comprehension (Lo et al., 2013; Rahmani & Sadeghi, 2011) as neither

annotation groups achieved higher scores on the reading comprehension tests relative to the control read-only condition. In accord with Hsu and collegaues' (2013) study, the students in the collaborative annotation group did not outperform those in the individual annotation group. Instead, the collaborative group's performance was ranked lowest (though not statistically differently), which contrasted with studies that showed improvement on reading comprehension with collaboration through annotation-sharing (Chang & Hsu, 2011; Hwang & Hsu; 2011; Yang et al., 2011).

These results may be explained by considering that the annotation groups were not fully accustomed to taking notes using online annotation. As reported in the students' background survey, around 40% of the students in the two annotation groups had not written any notes during their previous studies. Students may need more time to practice this reading strategy and grasp the benefit and function of annotations. In particular, students need typing skills in order to make annotations. Regardless of the fact that some students stated that they viewed annotations as a venue for typing practice, several students complained about their slow typing speed and about having to type. This typing issue was also reported in Sadler's (2007) study, where students found typing challenging in their synchronous online communication.

The mediocre effect of interacting with peers on reading comprehension may be explained by cognitive overload. The collaborative annotation group had to devote a great deal of effort to making their own annotations and responding to their group members' annotations during the reading sessions. Thus, they may not have fully concentrated on comprehending the texts and learning from them. Making annotations and responding to others may be distracting. Another potential source of information overload for the students was the quantity of annotations appearing on the screen. As Warschauer (1997) noted, some students may have been overwhelmed with the large

number of messages increasingly showing up on their screens. One student specifically stated that she found it difficult to concentrate on reading when she was receiving many annotations on her computer screen.

In addition, collaborations and interactions with peers in this computer-mediated communication setting may be another critical factor that impacted the learners' reading comprehension performance. The collaborative annotation group most likely did not develop interaction patterns helpful to their learning. For example, insulting language (though generally mild) appeared in some students' annotations, which irritated other students. Several students' survey responses indicated that they felt uncomfortable reading annotations with hostile words and viewed the possibility of such annotations to be a disadvantage of the online reading activities.

Furthermore, the learners in the collaborative annotation group may not have seen annotation exchanges as an opportunity to co-construct meaning with peers. Some students worried about making wrong annotations that might mislead their peers, but did not anticipate peer feedback to be useful in correcting their inaccurate messages. Some students simply repeated annotations with similar content to other students rather than producing new information for the discussion. Ineffective and insufficient collaboration and interaction could hinder students from coming to a better understanding of the reading texts.

In keeping with literature concerning online annotation-sharing, Su and her colleagues (2010) reported that there was a significant positive correlation between learners' learning achievement and their amount of annotation. However, my study did not find any significant results for either annotation groups. Yet, the findings partially supported the argument of Su et al. (2010). The correlation coefficient values in the collaborative group were positive in terms of the relationship between the number of

shared annotations and free recall scores (r = .18) as well as cued recall scores (r = .29). Moreover, my study found that for the individual annotation group, the relationship between the number of annotations and learning performance was negative (r = -.21 for free recall and -.07 for cued recall scores), which did not agree with studies recognizing the effect of notetaking on text comprehension (Slotte & Lonka, 1999). Without sharing annotations with peers, each student in the individual annotation group made about 7.4 annotations per reading session; comparatively, the collaborative annotation group posted about 11.1 annotations per session. The students in the individual annotation group may not have understood the value and purpose of notetaking. In fact, 12 of the 26 students in this group had not had any previous notetaking experience. Some students reported that they made annotations simply because they were required to do so, and some stopped creating more annotations as soon as they had produced the required four annotations.

The use of online support functions, such as translation and dictionary sites, provides another explanation concerning factors affecting online reading comprehension (Al-Shehri & Gitsaki, 2010; Chun, 2001; Liou, 2000). The three reading groups' frequency of using online translation or dictionary websites for the whole text, a paragraph, a sentence, or a word during the reading sessions was statistically similar. To investigate further whether the learners' frequency of online support consultation related to their reading performance, I correlated and found a trend for a negative relationship between the online support consultation frequency and reading comprehension scores. The more often the learners referred to translation and dictionary aids, the worse they achieved on the reading comprehension tests. This phenomenon was statistically significant for cued recall scores. The overall use frequency of online support and the frequency of checking whole text and paragraph translations were significantly

negatively related to the learners' cued recall performance,with *r*s ranging between -.22 and -.26.

One possible explanation could be that when the students simply read Chinese translations of the reading texts provided by the online support function, they did not have exposure to English. The Chinese translated text would have been helpful for the free recall test, which required them to write only in Chinese, but would not have been helpful for the cued recall test, which required them to read English questions and answer options.

Research Question 2. *Were there differences on measures of enjoyment and engagement in the reading tasks for fifth grade students who were engaged in different reading activities: read-only, individual annotation, and collaborative annotation?*

As for the learners' responses to the end-of-session surveys concerning their enjoyment and engagement levels in the reading activities, the statistical analysis did not indicate that there was any significant difference among the three groups. According to previous studies, learners who shared annotations with peers had more fun and became more engaged with their reading (Educause, 2009; Gao, 2013; Razon et al., 2012). The students in the collaborative group were not statistically different from those in the read-only and individual annotation groups. Yet, from an observation of the overall mean enjoyment and engagement levels, the collaborative annotation group scored the highest compared to the other two groups. In addition, the collaborative annotation group was the only group that increased in enjoyment and engagement levels across the three sessions. Their enjoyment levels in the second and third reading sessions were statistically significantly higher than in the first session. This finding may be due to the learners in the collaborative annotation group at first finding this type of reading discussion to be

unfamiliar. As they became more familiar with the discussion mode, their reading enjoyment and engagement increased. In line with the findings of Gao (2013) and Razon et al. (2013), these findings corroborated the claim that annotation exchanges promote students' affect when learning.

Following this open, exploratory investigation, I further investigated learners' views about the helpfulness of the reading activities for their English reading. Results indicated that the groups did not differ in their perceptions regarding helpfulness. The students in the three groups may consider online reading to be a fresh, new experience in their English class at school, as they reported that they did not frequently use computers to do independent English reading tasks. Instead, according to the local English teacher, in their usual classroom learning activities, the whole class shared a common screen presented by SmartBoard. Therefore, many students mentioned in the end-of-session surveys that one of their favorite parts about the reading activities was the use of the computer.

The two annotation groups were further asked about their perspectives regarding the helpfulness of and preferences for making annotations. Findings showed that both annotation groups recognized annotations to be a potentially helpful tool that supported their reading comprehension abilities at a comparable level, whereas the collaborative annotation group significantly enjoyed making annotations more than the individual annotation group. In the end-of-session surveys, the students in both annotation groups agreed that composing annotations was a fun, helpful method of understanding and memorizing texts, a useful reading strategy, and good for typing practice. Those in the collaborative annotation group additionally noted that they could use annotations to support each other, chat with classmates, and learn from peers. These findings echoed

Nokelainen and colleagues' (2005) study that suggested that the interactive nature of annotation exchanges allows learners to enjoy the reading process.

When I asked the learners in the collaborative annotation group to compare their own and peers' annotations and responses, I found that students similarly valued self-authored and teammates' annotations and responses. No significant difference was obtained. Throughout the reading sessions, the learners expressed that peer annotations as well as their own and peer responses were increasingly helpful in enhancing their reading comprehension. Based on the learners' responses to the surveys, students exchanged annotations to support each other, have less anxiety about raising questions, receive solutions from peers, and easily catch the main points in the text. These comments supported Oxford's (1997) assertion that collaborative learning is beneficial for learners as it helps them develop supportive, caring relationships and lowers their anxiety.

Regardless of their expressed positive views about peer annotations and responses, it is interesting to note that the students' desire to discuss with the same peers decreased as the reading sessions progressed. The annotation-sharing activity was not without its noted disadvantages. The students pointed out that some of their teammates posted inappropriate annotations or scolded other classmates, and some seemed to want only to chat rather than to discuss the reading texts. This may have led to the students' low desire to work with the same peers in subsequent discussion group.

Research Question 3. *What did the process of interacting with the text look like for the learners who had been assigned to either the individual or collaborative annotation groups (in terms of the nature of the annotations and text-based recall interviews)?*

In an attempt to understand the processes experienced by the two annotation groups when interacting with texts, I first examined how the students in both groups approached the reading texts, including the use of online support aids, and the time involved in making annotations and reading peers' annotations. Then, I analyzed trends regarding the amount of annotation in each reading session. I proceeded to identify and categorize the different types of functions individual annotations served and observed the distribution of these functions, especially focusing on the two most prevalent functions, translations and responses to peers. I further explored how the responses of the collaborative annotation group related to their reading comprehension, enjoyment, engagement, perceptions of the reading activities' helpfulness, and their translation annotations. My last step analyzed the learners' perspectives on annotation usage, investigating their positive and negative reasons for making annotations and responding to peers.

Based on my analysis of the interviewees' recall protocols, the whole reading process proved to be vigorous and dynamic. The learners did not simply adopt one approach to undertaking the reading tasks. Some students described that they started reading from the first sentence to the last. Some would quickly scan the text, and some carefully read every sentence. The students had different ways of processing the pictures in the text for predicting text content; alternatively, some simply ignored the pictures. Unlike the students in the collaborative annotation group, some students in the other groups reported that they read the text only once before undertaking the reading comprehension test. This finding may be explained by considering that the students in the collaborative annotation group were attracted by newly added annotations from peers and so reread the highlighted text. When the students read the text more than once, they reread the text after they had finished the whole text or a single paragraph. They had

various reading foci during repeated readings. Some students targeted unknown words; some put an emphasis on difficult sentences. In addition, the learners in both annotation groups developed different ways of dealing with annotations. They made annotations after they finished a sentence, a paragraph, or the whole text. Moreover, the learners in the collaborative annotation group weighted peers' annotations differently. Some gave peers' annotations priority over their text reading. Whenever they found new annotations from team members, they stopped reading the text and looked at the annotations from peers. Others would read peers' annotations only after they had completed their own text reading. These findings demonstrated the diverse and dynamic nature of these young learners' reading processes. Similar to Vogler and her colleagues' (2013) study concerning learners' moves while participating in online discussion, most learners in the individual annotation group finished reading a sentence, a paragraph, or the whole text and then composed their annotations. Yet, the collaborative annotation group presented a more complex picture in their reading processes. Some sequentially processed the reading text and then moved on to annotation parts, and some adopted "a coordinated dance" move, as coined by Vogler et al. (2013), in that students read the text and then composed their annotation as well as reading new annotations from peers, or read peers' annotations first and then went back to reading texts.

When the learners encountered reading difficulties, such as indecipherable words or sentences, their problem-solving strategy relied most heavily on consulting online translation and dictionary resources. The students immediately resorted to these online support resources when they had decoding problems or in their second round of reading. As decoding abilities are fundamental and important to reading comprehension (Grabe, 2009; Koda, 2005), using online support aids to compensate for insufficient word knowledge has been found to be very common for language learners in online reading

settings (Huang et al., 2009). One student described her way of taking advantage of the online Google translation affordance for vocabulary learning. However, misuse of translation functions also occurred. Some students copied and pasted the full text into the translation website without even trying to read the text first.

When it came to trends in the number of annotations, the individual annotation and collaborative annotation groups displayed distinct patterns. Overall, the individual annotation group made the fewest annotations in the second session, whereas the collaborative annotation group showed a successive decrease in the number of annotations across the three sessions. More specifically, six patterns appeared among the 26 students in the individual annotation group, with most students displaying a U-shaped pattern. In contrast, four patterns emerged from the nine teams in the collaborative annotation group, with most teams decreasing their annotations across the sessions. It is noteworthy that the individual annotation group's reading enjoyment and engagement levels were at their highest in the second session when they made the fewest annotations, and the collaborative annotation group increased both levels of engagement and enjoyment throughout the sessions as they reduced the number of annotations they made across the three sessions. Future studies should examine this trend further.

Nine function categories of annotations emerged from a total of 1510 annotations (579 annotations from the individual annotation group and 931 from the collaborative annotation group): "translate the text," "display grammar knowledge," "show playfulness," "self-reflect about the text," "identify text structure," "question the text/ reading materials," and two codes unique to the collaborative annotation group, "moderate the discussion" and "respond to peers," and "other (unable to assign to any codes)." "Translation" was the most common function of the annotations made by the individual annotation group (81.9% of all annotations) whereas "responses to peers" was

the most typical function performed by the collaborative annotation group (45.1% of all annotations), with "translation" being their second most frequent (43.8%). This may be due to the fact that the students in the individual annotation group specifically focused on unknown, difficult words when making annotations, as many stated on the surveys. For the collaborative annotation group, the higher percentage of "responses to peers" annotations may be attributable to the affordance of the task that encouraged interaction with peers.

With such a high percentage of translation annotations, I focused on how the students used translation annotations during the reading activities. Despite the fact that the proportion of translation annotations in the individual annotation group decreased across the three sessions, it was surprising to see that 21 of the 26 students only had annotations consisting of translations or had 80% of their annotations in the translation category. In contrast to the individual collaborative annotation group, the nine teams in the collaborative annotation group had an increasing number of translation annotations across the three sessions. The reason for this tendency may be that students were gaining familiarity with the online support functions that they could quickly and easily access, and came to rely on the Chinese meanings for English texts from translation and dictionary websites.

As for interactions and collaborations among students in the collaborative annotation group, students who had made an incorrect translation annotation received useful feedback from their peers. Especially the correction rate of wrong translations of single words was up to nearly 70%. In addition, teammates successfully answered 51.9% of students' questions. When the learners replied to their teammates, the proportion of related-to-reading-text responses (31% of all annotations) was higher than that of unrelated-to-reading-text responses (14%). The proportion of related-to-reading-text

responses fluctuated across the three sessions whereas the proportion of unrelated-to-reading-text responses diminished across reading sessions.

Annotation exchange is the essence of the collaborative annotations. Learners shared their annotations with teammates, and gave and received responses from each other. Through an analysis of how the number of "responding to peers annotations" related to their reading comprehension, enjoyment, engagement, perceptions of the helpfulness of the reading activities, and translation annotations, I found a significant, negative correlation between the proportion of translation annotations and the proportion of related-to-reading-text responses as well as the proportion of unrelated-to-reading-text responses (r = -.69 and r = -.52, respectively). The more translation annotations the students produced, the fewer responses they made to peers. This may suggest that some students in the collaborative annotation group minimized their interaction with classmates because they had a more convenient, easier way of acquiring Chinese translations of English texts via online support functions. In addition, there was a significant, positive correlation between scores on cued recall tests and the proportion of related-to-reading-text responses (r = .51). The more related-to-reading-text responses the students produced, the higher their scores on the cued recall test. Furthermore, it was interesting to note that, though not significant, the correlation coefficient values between the proportion of related-to-reading-text responses and the students' reading enjoyment as well as engagement were negative whereas the correlation coefficient values between the proportion of unrelated-to-reading-text responses and the students' reading enjoyment as well as engagement were positive. This finding implied that the students seemed to have more fun and were more engaged with the reading tasks when they discussed something unrelated to the reading text.

When asked about their views of annotation use, interviewees reported four main reasons for making annotations and four reasons for not making annotations. These reasons triangulated the findings for Research Questions 1 and 2. Interviewees stated that: they composed annotations because these notes were helpful, serving as reminders about text-related information; they had to fulfill the requirement of at least four annotations in each reading session; they wanted to use annotations to attract peers' attention; and they wanted to be supportive of peers, enabling them to better understand the text via translation annotations. When they did not make annotations, it was because they forgot to do so, they had fulfilled the requirement of crafting four annotations, they did not have time to make annotations, and they did not see the value of annotations on an easy text. Additionally, the interviewees in the collaborative annotation group provided four explanations for both responding to peers and not responding to peers, accordingly. They stated that they wanted to understand their peers' perspectives, they were inclined to help others, they wanted to joke with their peers, and they wanted to express their agreement with and appreciation of peers' annotations. As for reasons for feeling reluctant to respond to peers, the interviewees remarked that their own and peers' high or low English proficiency levels had influenced their willingness to reply to them. Sometimes they wanted to ignore certain peers or felt ignored by their teammates. The final reason for not responding to peers was a desire to take the comprehension test as quickly as possible before memory faded.

Possible Factors Affecting the Efficacy of Collaborative Annotation Activities

Findings through the quantitative and qualitative data analyses suggested a number of possible factors that may have influenced the efficacy of annotation exchanges on reading comprehension and reading affect. One of the factors was concerned with

students' readiness for such tasks. Student participation was likely influenced by whether they had sufficient training for notetaking practices and experiences and understood the value of making notes while reading. Numerous students in the collaborative annotation group had never had any experience taking notes during either their Chinese or English reading. In addition, some annotations with improper words revealed the importance of enhancing students' awareness about the benefits of collaborative learning and equipping students with skills to learn collaboratively. Students' lack of adequate *netiquette* (Shea, 1994) in their online communication led to deviant expressions in annotations. The two orientation trainings before the reading sessions appeared to be unsatisfactory preparation for students who had had little experience in notetaking and collaborating with peers.

Another issue related to students' readiness for the reading task was how they dealt with peers' annotations. Without adopting strategies to cope with annotations from peers, some students complained that too many annotations were present on the screen, causing information overload and making the reading task difficult. Instead of transforming themselves into strategic readers by planning their reading, students passively received peers' messages, thus possibly affecting their reading comprehension and reading enjoyment and engagement.

Task design is an additional factor involved in the efficacy of collaborative annotation. The study findings showed that the more often the students consulted online dictionary and translation websites, the fewer annotations they crafted in response to peers. Once they grasped the Chinese translation of the reading texts, the need to interact with teammates via online annotations decreased. This may imply that the task design was not supportive of peer interaction via annotation exchange.

Similar to task design, choices of various text types may have also affected students' participation in annotation-sharing. The students only read narrative texts in the

present study. One student responded in the end-of-session survey that little recognition was given for discussing the narrative texts. Once she understood the texts, she did not see the value of exchanging annotations with teammates. Unlike persuasive texts, wherein readers can entertain particular stances that either agree or disagree with text arguments and share their viewpoints with peers, narrative texts likely did not elicit students' motivation to exchange annotations because these texts may have been viewed as mere stories. Furthermore, the difficulty level of reading texts could have influenced the effectiveness of annotation exchange. Some students felt less interested in making annotations when reading texts that were too easy for them.

The final factor is associated with students' emerging literacy skills. As beginning learners of English, most of their English reading tasks were led by their teacher. Students most likely had different preexisting expectations about how to undertake reading activities compared to what they found themselves doing in the collaborative annotation activities. In addition, the students' basic proficiency levels may have lead them to put more emphasis on word meanings, which can be achieved via online support consultation. As I mentioned earlier, this could have minimized the need to interact with others via annotations.

Finally, the appropriateness of using annotation as a discussion platform has a role in the reading activity. For the students, online annotation may be viewed as simply a new computer-mediated communication tool, functioning as a different venue for communication. As Thorne (2003) suggested, technology users in distinct generations and at various power levels may have different preferences and perceptions about using specific technology communication tools for building peer relationships and social interaction. The young students in the current study could favorably discuss and perhaps had already become more accustomed to interacting with peers via other communication

media, such as social networking sites, thus affecting their participation in the annotation-exchange reading activities.

Limitations of the Study

A number of limitations should be acknowledged when it comes to interpreting the study findings.

First, there were several contextual constraints. Each session took place during the last morning period before lunchtime and was limited to 40 minutes. Before the session started, it took some time for the young students to settle down and prepare for the reading task, which meant that their reading time was less than 40 minutes. In addition to reading the texts, the students had to take the free recall and the cued recall test, and had to complete the end-of-session survey about their reading enjoyment and engagement. Due to time constraints, the students sometimes rushed to finish the reading activity, which may have hampered the quality of their reading comprehension. In addition, the students sat in rows at the computer lab, and it was not difficult for them to talk to their neighbors, regardless of being warned several times not to do so. Students could see each other's computer screens when sitting close to each other. This type of in-person interaction may have affected the effect of different reading groups and reduced the students' interaction via annotations. Finally, although no interviewees reported any technical problems during their reading session, some computers did not work very well or very fast. Technical issues affected a few students' participation in the reading activities.

The second limitation was concerned with the availability of online support functions. The consultation of online translation and dictionary resources has been demonstrated to be a common online reading strategy used by EFL learners (Huang et al.,

2009). However, some students in my study misused the support by simply translating the whole text and copying and pasting the Chinese translations into their annotations. The way they used the online resources did not support their English reading comprehension abilities. The use of online support functions may be a confounding variable to the effect of the annotation usage.

Finally, there were some concerns that my research design may have restricted the generalizability of the findings to other L2 reading learning contexts. To begin with, I adopted a convenience sampling to recruit the students at a large school located near the downtown section of a mid-sized city in Taiwan. These students' English learning resources and access to computer technology may be different from other young learners. The students in my study may not be representative of the whole population of elementary school students in Taiwan. Second, each treatment had fewer than 30 students. More students are needed to increase the power to find differences, if they exist. Next, the duration of the treatment was short, with only three 40-minute sessions. The students may not have been able to explore fully the function of annotations and experience the interactive nature of collaborative learning. Additionally, students may have been affected by social desirability bias. They may have provided responses that would be perceived as favorable or expected by the researcher, teacher, or their peers. This may have misled data interpretation. Last but not least, the reading materials in the study were narrative texts, a type of text common in the students' textbooks and learning handouts. It is not known, therefore, if the learners would have used different annotations and interacted with peers in another way had they received alternate types of texts for the reading task.

Suggestions for Future Studies

The present study is one of very few research studies that directly examined elementary-aged language learners' online reading processes and products when using digitized annotations. As is true of most research studies, it raises more relevant topics for further investigation. In addition to study limitations that may require future research, the study findings suggest several future directions. The first suggestion is concerned with reading texts and tasks. The present study only used narrative texts. How will different types of texts affect learners' use of annotation exchange? Will readers have more interactions via annotations if they read an argumentative or informative text? In addition, the reading task in my study was solely to read the texts. It would be interesting to explore the effect of various tasks on learners' use of online annotations. For instance, if reading tasks added pre-reading (e.g., guessing story content and previewing words) and post-reading activities (e.g., sharing reflections), would such tasks encourage students' active use of annotation?

Second, the "who" issue in the annotation exchange activity may matter. The teacher and I did not involve ourselves in the students' reading activities. Previous research has found that students' interaction patterns were different when the teacher joined or did not join students' online discussion (Park & the D-team, 2012). Elementary school students may display diverse profiles in terms of what they annotate and how they interact with peers via online annotations when the teacher participates in the reading task with the students. More studies are needed to explore this teacher effect. Moreover, group characteristics are also worthy of further investigation. Which type of group composition is more beneficial for learners? Should groups be composed of students with similar or different proficiency levels to experience better collaboration that boosts reading comprehension scores? How do readers with homogeneous or heterogeneous computer

skills collaborate with each other via annotations? Do students' interactions via annotations become better if students can choose their teammates? Should learners change their teammates every time? These issues may be interesting to investigate.

Third, it is worth examining the relationship between annotation functions and the students' proficiency levels as well as patterns of interaction and students' reading achievement and experience. What type of annotations do proficient learners and less proficient learners make? Is there an association between annotation functions and proficiency levels? Is it true that learners at a basic proficiency level prefer to ask questions via annotations and learners at an advanced proficiency level play a consultant role? Furthermore, which type of annotation interaction could lead to better reading comprehension and higher reading affect?

Fourth, it is noteworthy to observe how students participate in annotation-taking and sharing activities. In the current study, fifth graders relied heavily on online support functions to solve reading difficulties. A significant negative relationship existed between the frequency of online support consultation and the proportion of responses to peers. What would happen if online dictionaries and translations functions were disabled? Next, how students deal with peers' annotations awaits more exploration. As the recall protocol data demonstrated, some students encountered distractions from peers' annotations and some did not. Is there a connection between the ways the students dealt with peers' annotations and their reading comprehension and affect? Also, Wolfe (2008) suggested that students might be adversely affected by reading peers' annotations. Further investigations are needed to see if this is the case in EFL elementary-aged students. Moreover, the overwhelming majority of annotations in the study were written in Chinese (except for those that were particularly made to display playfulness). It would be intriguing to observe whether or not EFL elementary-aged students could make

annotations in the target language, English, and under what conditions. When can they do it and what kind of annotations do they make? Do they feel more comfortable making annotations in English when participating in the individual annotation group or in the collaborative annotation group? How do they feel when receiving annotations written in English and how do they respond to them? More research is needed.

Finally, the trend of the amount of annotation throughout the three sessions fluctuated in the individual annotation group but showed a steady decline in the collaborative annotation group. If the duration of the reading activity is lengthened and takes place across more than three sessions, will learners become more enthusiastic about using annotations or will the opposite occur? These are possible issues for future research to explore.

Implications for Research

Theoretical implications. Bonk and Cunningham (1998) summarized theoretical perspectives on collaborative technology tools from a learner-centered view, a constructivist view, and a sociocultural view. They asserted that these views are complementary, and that construction of knowledge by means of interaction and collaboration can engender successful learning. In an online L2 reading context, learners interact not only with their peers or teachers but also with the computer technology that brings its own abundant resources. The ecology of interaction in an online reading activity may be different from other learning activities. Learners may rely more on using online resources (e.g., online translation) instead of interacting with their peers to establish their reading comprehension. The study findings showed that the more translation annotations the students made, the fewer responses they gave to each other,

leading to the question: what type of peer-to-peer interaction in such a reading context better benefits learners?

Moreover, the concept of the zone of proximal development involves "interaction between an expert and a novice in which the expert eventually transmits an ability to the novice through social interaction" (Donato, 2000; p. 17). In online reading contexts, readers need both traditional reading strategies and technology skills (Afflerbach & Cho, 2010; Coiro, 2007). The presence of an expert can help learners become equipped with more reading abilities, advanced technology skills, or both competencies, and is not solely restricted to better reading proficiency.

Methodological implications. In an attempt to understand how young EFL learners in Taiwan applied online annotations in a collaborative reading activity, data in the study were collected from various sources. The students' reading comprehension was measured by free recall and cued recall tests. Bernhardt (1983, 1991) considered free recall to be a purer measure of comprehension for providing information about how learners store, organize, and retrieve information. Test questions do not interfere with readers' understanding about texts (Alderson, 2000). As the literature suggests, it is appropriate for learners to perform free recall in their first language in order to prevent learners' L2 productive abilities from masking their reading comprehension (Lee, 1986; Wolf, 1993). My study found that a few students used whole text translation by relying on a translation website and read in Chinese rather than in English, even though this behavior was highly discouraged and the students were specifically advised not to do so. It is suggested that, in this case, free recall in the learners' L1 may not be the ideal tool for measuring reading comprehension if the learners directly read the translated text and wrote the free recall in their first language.

Second, the students' free recall protocols were evaluated based on pausal segmentations in my study. As suggested by Chang (2006), various scoring systems for free recall might lead to different results. Further research is needed to examine if different scoring systems, such as a propositional system (Alderson, 2000), would result in different findings.

Third, I found no statistical difference in the groups' immediate reading comprehension tests. The effect of collaboration and tracking information from the text on an immediate reading comprehension measure was not significant. It is still unknown what their longer term reading retention was, suggesting the need to implement a delayed reading test and investigate if the effect of annotation-sharing on memory is superior to the effect of simply making annotations or only reading the text.

Fourth, the Likert-scale reading enjoyment and engagement surveys provided an easy way for the students to quantify their reading affect. In order to gain a deeper picture of why learners had high, medium, or low enjoyment and engagement, open-ended items after the Likert-scale questions might be added. In this scenario, learners could provide more information to explain their answers on the rating scales.

Another point related to the reading enjoyment and engagement survey was students' timing. The students first took the reading comprehension test and then completed the survey. It is possible that the students' reading enjoyment and engagement was affected by their perceptions of their reading comprehension test performance. Thus, the survey could precede the reading comprehension test.

Finally, the text-based stimulated recall provided information about students' reading process (Gass & Mackey, 2000). Based on the protocols of the students in the collaborative annotation group, the students read the annotations in a non-linear way. Some annotations appeared early while some were late. They had to scroll their screen up

and down to read peers' annotations and responses. When showing the text with annotations, students may have experienced some difficulty in re-engaging their reading process. Thus, recording their screen behaviors might serve a better recall stimulus.

Pedagogical implications. Students' learning autonomy (Benson, 2001) may have been boosted by means of online annotations. Learners could check their reading comprehension by utilizing the annotation's highlight function and exchange messages with each other as they co-constructed text understanding. However, the effect of sharing annotations with peers on reading comprehension was not significant in my study. According to the students' responses to the surveys and their recall protocols, some peers' inappropriate behaviors were viewed as a debilitating factor and were adversely connected to the use of annotations. Despite the fact that there was a positive (though insignificant) relationship between the number of unrelated-to-text responses and the level of reading enjoyment and engagement, numerous students expressed in the surveys and recall protocols their negative feelings about encountering peers' responses that were unhelpful to their reading comprehension. It is important for instructors to guide learners about how to collaborate with peers in an online context. Such training regarding collaborative learning allows students to experience supportive, respectful learning contexts and to understand the crucial role of appropriate netiquette in online collaborative tasks.

Some students reported that they encountered distractions from their peers' annotations during their reading process. It is critical for instructors to teach students strategies concerning how to deal with annotation exchange tasks. For example, students can separate the reading tasks into different stages. They could simply focus on reading their text during their first time reading and then make their own annotations. After that,

they could read others' annotations and respond to them. By doing so, students could take control and become more aware of their reading process and focus, minimizing distraction from peers' annotations.

Second, group dynamics play a crucial role in collaborative learning activities (Dörnyei, 1997). It was found that some students intentionally ignored their peers or were overlooked by teammates. In addition, the learners reported that some of their reluctance to exchange annotations with peers stemmed from their different proficiency levels. Both group formation and peer relationships affected their willingness to participate in reading activities. Therefore, instructors need to be sensitive toward interaction among peers by reviewing students' annotations and creating learning environments where peers' interactions bring rewarding and useful experiences.

Next, it was found that a great many of the students stopped making annotations when they had achieved the basic requirement of four annotations. This finding suggests that they may have been engaging in the annotation task simply to please their teacher (or the researcher) without understanding the purpose of notetaking during the reading process and sharing annotations with peers. It is essential for instructors to explain to learners the purpose and values of annotating the text in order to encourage their active usage. In addition, students need to be provided with training about notetaking and be given opportunities to practice taking notes in order to gain experience and become familiar with this reading strategy.

Fourth, the frequency of the use of online support functions was demonstrated to have a significant, negative relationship with the learners' reading comprehension performance. Learners may not deeply process the information when they rely too much on translation and dictionary websites. An important topic for teachers to discuss with students is how learners can strategically use online support functions to enhance reading

comprehension. After all, online reading has become a prevailing, popular activity, and guidance about how best to proceed when reading online seems to be an important aspect of a teacher's role when teaching young learners.

Appendix A

Research Assent and Consent Form

Parental Permission for Children Participation in Research

The purpose of this form is to provide you with information about a study to be conducted in your child's English class and to ask your permission to let your child be involved in this study. You do not have to agree to allow your child to participate in the study. There will not be consequences if your child does not participate in the study. Your current and future relationship with Hsinchu Municipal DM Elementary School and University of Texas at Austin will not be affected. The purpose of this study is to examine the effects of different types of online English reading instruction on students' reading development.

Allowing your child to participate in this study involves the following:

1. Allow the researchers to collect your child's score on the last semester's English Reading Test and your child's responses to surveys on learning background. It will take approximately 10 to 15 minutes to complete.
2. Allow the researchers to collect data from school tasks your child will be doing such as class reading comprehension tests.
3. Optional: If you allow, your child may interviewed later (in Mandarin) about experiences with the English instruction. (Note: interviews may be audio-recorded, there will be at most two interviews, and each interview will last at most 30 minutes) If you agree to have your child interviewed, please write your child's name here: _____

There are no foreseeable risks to participating in this study. Your child will receive no direct benefit from participating in this study; however, your child's participation in this study may contribute to improved English instruction for students like your child in the future.

In addition to your permission, your child will be asked specifically whether he or she agrees to participate in the study. Your child's participation in this study is voluntary. Your child may decline to participate or to withdraw from participation at any time. Withdrawal or refusing to participate will not affect your child's relationship with the school or the teacher. You (or your child) can indicate your permission (or your child's permission) in the study now and change your (or your child's) mind later without any penalty.

This research study will take place during regular classroom activities; however, if you do not want your child to participate, your child will not take the survey or be asked to be interviewed.

This study with not reveal your child's names. The data resulting from your participation will be used only for research purpose.

The teacher will answer any questions about the research, now or during the course of the project. For questions about your rights or any dissatisfaction with any part of this study, you can contact,

anonymously if you wish, Office of Research Support, (512) 471-8871; Email: orsc@uts.cc.utexas.edu

_____

I have been informed about this study's purpose, procedures, possible benefits and risks, and I have received a copy of this form. I have been given the opportunity to ask questions before I sign, and I have been told that I can ask other questions at any time. I voluntarily agree my child's participation in this study. By signing this form, I am not waiving any of my child's legal rights.

Printed Name of Child:_____

Child's School ID number: _____

Signature of Parent(s) or Legal Guardian: _____

Date: _____

Signature of Investigator: _____

Date: _____

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Educational Psychology
The University of Texas at Austin

Assent for Participation in Research

You have been asked to be in a research study about reading English on a website. This study was explained to your parents and they said that you could be in it if you want to. We are doing this study to find how to help you better read English on the Internet and love reading English when you read online.

If you agree to be in this study, you will be asked to do the following in Spring 2014:

1. Allow me to know your score on the last semester's English Reading Test.
2. Fill out learning background. It will take about 10-15 minutes each.
3. Optional: If you are interested in having an interview later (If you want to talk to us, we will ask you questions like how you enjoy reading English online and how you use the reading website), please write down your name. (Note: interviews may be audio-recorded.)
   Name:_____. The interview will take 20-30 minutes.

There are no risks to participating in this study. You will not receive anything participating in this study; but your participation in this study will help teachers teach English better to students, like you, in the future.

You can choose to participate in the study or not. You can say "no" to join the study or stop your participation at any time. If you quit or do not want to participate in the study, do not worry. It will not affect your relationship with the school or the teacher and your course grade. You can even decide you want to be in the study now, and change your mind later. No one will be unhappy.

If you want to participate, write down your name on this assent form and bring it back to your teacher. If you do not want to join the study, you will have English learning handouts while other students fill out the surveys and take the English test. Your responses will only be kept private and used for research purposes.

If you have any question about the study, you can contact Mr. Li-Tang Yu at 0918xxxxxx or send him an e-mail to ltyu@utexas.edu for any questions.

If you have read this page and understood it, you can decide to join or not join the study. Then you can write down your name and school number below if you want to join the study. If you have any questions at any time, feel free to ask Mr. Yu. If you do not want to join the study, just let Mr. Yu know. And it is fine.

Signature of Participant:_____ Student School #:_____ Date:_____

Appendix B

Reading Texts

Reading 1 A Happy Father's Day

Today is Father's Day. Emily and her father are going on a trip tonight. They will go to Danshui to watch the sunset. But Emily's father didn't know about it. It's a surprise.

After school, Emily made chicken, vegetables and rice. She put the food in a big lunch box. She took out two apples and some grapes. Her father loves fruit. She also found her father's favorite kite. The kite looks like a big bird. She packed the lunch box, the fruit and the kite in her backpack.

Emily took the MRT to her father's office. She opened the door. "Emily, what are you doing here?" said Emily's father. Emily said, "Happy Father's Day, Dad! Come with me. I'm taking you to Danshui to celebrate." Emily's father smiled and said, "Wow! Thank you. What a wonderful surprise!"

Source:

http://www.945enet.com.tw/Promo/20111012/02/PDF/08_Part%208.pdf

Reading 2 A family holiday

Vicky lives with her parents and her two brothers, Sam and Paul, in the city. Last week, they had a holiday by the sea. Sam is ten, Vicky is eight but Paul is only five. They went to the movie theater on Wednesday because it rained all day. They saw a movie about sharks. The sharks had very big teeth. Paul didn't like watching them and he closed his eyes.

On Friday, the family ate breakfast in the garden because it was very sunny, but Paul didn't want any. Then they all went to the beach. The sea was very blue. Paul looked. There were three beautiful dolphins in the water! He ran to the sea and swam to them. Then Paul's dad threw a ball in the sea and the dolphins played with it. It was great and Paul stopped thinking about the sharks in the movie. That evening, all the family went to the movie theater again. This time the movie was about a funny dolphin and they all enjoyed it.

Source:

http://www.cambridgeenglish.org/images/153311-flyers-sample-papers-volume-2.pdf

Reading 3 Jack's Good Book

One day last week, Jack had to go to the shops with his mom after school. Jack had a very good book and he didn't want to stop reading it. So Jack read his book and followed his mom into every shop. But when they went into the supermarket, Jack didn't see a banana that was on the floor and he stood on it and fell. He hurt his leg very badly. 'I need to take him to the hospital,' said Mom, and the woman from the supermarket phoned the hospital to get an ambulance.

Jack lay on the bed in the back of the ambulance and read his book. At the hospital they had to wait for a long time to see the doctor but Jack didn't mind because he could read his book.

Then the doctor told Jack, 'Your leg is broken. You have to stay here for three more days.' 'That's OK,' said Jack.

Jack's parents went to visit him every day and the woman from the supermarket brought him some sweets. They were very surprised that Jack was so happy all the time.

Two days later Jack phoned his Mom. 'Can you come and get me?' he asked. 'What's the matter?' asked Mom. 'I've finished my book,' said Jack, 'and I need to go back to school to get another one!'

Source:

http://www.cambridgeenglish.org/images/153310-movers-sample-papers-volume-2.pdf

Appendix C

Learning Background Survey

Read-Only Group

Dear students,

Greeting! There are three parts in the survey: “Basic Information”, “English Learning Experience”, and “Computer Learning Experience”. Please answer the questions carefully. Your response will not affect your grade in English class. Please do not worry. Your response is used for the research purpose only. After your complete the survey, please check again whether you have answered every item.

I. Basic Information

1、Gender：□(1)Male □ (2)Female

II. English Learning Experience

1、When did you start learning English?

□(1)Before grade 1 □(2)Grade 1 □(3) Grade 2 □(4) Grade 3 □(5) Grade 4 □(6) Grade 5

2、How much time do you study English per week?

□(1）Less than or equal to one hour

□(2）Between one and three hours

□(3）Between three and five hours

□(4）Between five and ten hours

□(5）More than ten hours

3、Do you like English?

(Extremely unlike) 1 2 3 4 5 (Extremely like)

4、Do you think that English is important?

(Extremely unimportant) 1 2 3 4 5 (Extremely important)

5、Do you like English class at school?

(Extremely unlike) 1 2 3 4 5 (Extremely like)

6、Do your parents care about your English learning?

(Not at all) 1 2 3 4 5 (Extremely care)

7、Self-evaluation about your English proficiency levels:

General English Proficiency	(Poor) 1 2 3 4 5 (Extremely good)

Reading skill	(Poor) 1	2	3	4	5 (Extremely good)

8、Is it easy to develop English reading abilities?

(Very difficult) 1 2 3 4 5 (Very easy)

9、Do you agree that computer technology is helpful for your English learning?

(Extremely disagree) 1 2 3 4 5 (Extremely agree)

10、Have you had any collaborative Chinese reading experience with your classmates?

□(1)Never □(2)Yes

11、Have you had any collaborative English reading experience with your classmates?

□(1)Never □(2)Yes

III. Computer Learning Experience

1、Do you have any desktop computer or laptop at home? □(1)Yes □(2)No

2、Do you have access to Internet at home? □(1)Yes □(2)No

3、How much time can you use computer/ laptop per week?

□(1）Less than or equal to one hour

□(2）Between one and three hours

□(3）Between three and five hours

□(4）Between five and ten hours

□(5）More than ten hours

4、When did you start using computer?

□(1)Before grade 1 □(2)Grade 1 □(3) Grade 2 □(4) Grade 3 □(5) Grade 4 □(6) Grade 5

5、For what purpose do you use computer? (Check items that fit your purpose)

□(1)Browse the Internet □(2)Use document processing programs

□(3)Edit photos or videos □(4)Play games □(5)Watch videos □(6)Chat online

□(7)Send or receive e-mails □(8)Use social networking sites □(9)Do homework

□(10)Make websites or blogs

□(11)Online learning, such as_____.

□(12)Others, such as_____.

6、Have you ever used computer technology in the following courses?

□(1)Mandarin □(2)Math □(3)English □(4)Natural Science

□(5)Social science □(6)Art and Humanity □(7)Life □(8)Health and Physical Education □(9) Others, such as_____.

7、Do you like using computer?

(Extremely unlike) 1 2 3 4 5 (Extremely like)

8、Do you feel comfortable reading on screen?

(Extremely uncomfortable) 1 2 3 4 5 (Extremely comfortable)

9、Are you confident in typing in Mandarin?

(Extremely unconfident) 1 2 3 4 5 (Extremely confident)

10、Are you confident in typing in English?

(Extremely unconfident) 1 2 3 4 5 (Extremely confident)

11、Have you ever used Google Documents?

□(1)Never □(2)Yes

(CHINESE VERSION)

親愛的小朋友：

歡迎填寫本問卷。本問卷有三部份，分別為基本資料、電腦學習經驗、和英語學習經驗，請仔細作答。你的答案不會影響你的英語課成績，請放心。填答資料僅供研究活動用，絕不對外公開。作答後，請再檢查一次，確定每一題都有回答到。

第一部分 基本資料

1、性別：□(1)男生 □ (2)女生

第二部分 英語學習經驗

1、什麼時候開始學英語？

□(1)一年級之前 □(2)一年級 □(3)二年級

□(4)三年級 □(5)四年級 □(6)五年級

2、每週花多少時間學英語？

□(1) 1 時以內(包含1 小時) □(2) 1 小時以上-3 小時以內(包含3 小時)

□(3) 3 小時以上-5 小時以內(包含5 小時)

□(4) 5 小時以上-10 小時以內(包含10 小時) □(5) 10 小時以上

3、你喜歡英語嗎？(圈出 1 個數字，數字愈大表示愈喜歡)

(一點也不喜歡)1 2 3 4 5(非常喜歡)

4、你覺得學習英語重要嗎？圈出 1 個數字，數字愈大表示愈重要)

(一點也不重要)1 2 3 4 5(非常重要)

5、你喜歡上學校英語課嗎？(圈出 1 個數字，數字愈大表示愈喜歡)

(一點也不喜歡)1 2 3 4 5(非常喜歡)

6、父母親對你英語學習的態度是：

(一點也不關心)1 2 3 4 5(非常關心)

7、你覺得你的英語能力如何：(圈出 1 個數字，數字愈大表示能力愈好)

英語能力	(非常不好) 1	2	3	4	5(非常好)
閱讀能力	(非常不好) 1	2	3	4	5(非常好)

8、你覺得閱讀能力容易學習嗎？

(非常不容易)1　　2　　3　　4　　5(非常容易)

9、電腦科技可以幫助你學習英語？

□(1)非常不同意 □(2)不同意 □(3)普通 □(4)同意 □(5)非常同意

10、你和其他同學有「合作閱讀**中文**」的經驗？

□(1)沒有 □(2)有

11、你和其他同學有「合作閱讀**英文**」的經驗？

□(1)沒有 □(2)有

第三部分 電腦學習經驗

1、家裡有電腦或筆記型電腦嗎？□(1)有 □(2)沒有

2、家裡可使用網路嗎？ □(1)可以 □(2)不可以

3、請問你「一星期」大約上網的時間有多久：

□(1) 1 小時以內(包含1 小時)

□(2) 1 小時以上-3 小時以內(包含3 小時)

□(3) 3 小時以上-5 小時以內(包含5 小時)

□(4) 5 小時以上-10 小時以內(包含10 小時)

□(5) 10 小時以上

4、什麼時候開始接觸電腦？

□(1)一年級之前 □(2)一年級 □(3)二年級

□(4)三年級 □(5)四年級 □(6)五年級

5、使用電腦做什麼用途？(可複選，勾選所有你用電腦的用途)

□(1)上網瀏覽資料 □(2)使用文書處理軟體，如 Word、Powerpoint

□(3)處理照片或影片 □(4)玩遊戲 □(5)看影片 □(6)聊天

□(7)收發伊媚兒 □(8)使用社交網站，如臉書 □(9)寫作業

□(10)製作網頁、部落格

□(11)線上學習，如_____(填入所做活動)

□(12)其它，如_____(填入所做活動)

6、你是否曾使用過電腦科技在下列課程？(可複選)

□(1)國語 □(2)數學 □(3)英語 □(4)自然與生活科技

□(5)社會 □(6)藝術與人文 □(7)生活 □(8)健康與體育

□(9)其它，如_____

7、你喜歡使用電腦科技網路嗎？(選擇 1 個數字，愈大代表愈喜歡)

(非常不喜歡)1　　2　　3　　4　　5(非常喜歡)

8、在螢幕上閱讀，你感到舒適嗎？(選擇 1 個數字，愈大代表愈舒適)

(非常不舒適)1　　2　　3　　4　　5(非常舒適)

9、對於中文打字有信心嗎？(選擇數字，愈大代表愈有信心)

(非常沒有信心)1　　2　　3　　4　　5(非常有信心)

10、對於英文打字有信心嗎？（選擇數字，愈大代表愈有信心）
(非常沒有信心)1　　2　　3　　4　　5(非常有信心)
11、曾經使用過Google Documents嗎？
□(1)沒有　　□(2)有的

Individual Annotation Group and Collaborative Annotation Group

Dear students,

Greeting! There are three parts in the survey: "Basic Information", "English Learning Experience", and "Computer Learning Experience". Please answer the questions carefully. Your response will not affect your grade in English class. Please do not worry. Your response is used for the research purpose only. After your complete the survey, please check again whether you have answered every item.

I. Basic Information

1、Gender：□(1)Male　□ (2)Female

II. English Learning Experience

1、When did you start learning English?
□(1)Before grade 1 □(2)Grade 1 □(3) Grade 2 □(4) Grade 3 □(5) Grade 4 □(6) Grade 5
2、How much time do you study English per week?
□(1）Less than or equal to one hour
□(2）Between one and three hours
□(3）Between three and five hours
□(4）Between five and ten hours
□(5）More than ten hours
3、Do you like English?
(Extremely unlike) 1　　2　　3　　4　　5 (Extremely like)
4、Do you think that English is important?
(Extremely unimportant) 1　　2　　3　　4　　5 (Extremely important)
5、Do you like English class at school?
(Extremely unlike) 1　　2　　3　　4　　5 (Extremely like)
6、Do your parents care about your English learning?
(Not at all) 1　　2　　3　　4　　5 (Extremely care)
7、Self-evaluation about your English proficiency levels:

General English Proficiency	(Poor) 1　　2　　3　　4　　5 (Extremely good)

Reading skill	(Poor) 1	2	3	4	5 (Extremely good)

8、Is it easy to develop English reading skills?
(Very difficult) 1 2 3 4 5 (Very easy)

9、Do you agree that computer technology is helpful for your English learning?
(Extremely disagree) 1 2 3 4 5 (Extremely agree)

10、Do you take notes when you study?
□(1) No □(2) Yes

11、Have you had any collaborative Chinese reading experience with your classmates?
□(1)Never □(2)Yes

12、Have you had any collaborative English reading experience with your classmates?
□(1)Never □(2)Yes

III. Computer Learning Experience

1、Do you have any desktop computer or laptop at home? □(1)Yes □(2)No

2、Do you have access to Internet at home? □(1)Yes □(2)No

3、How much time can you use computer/ laptop per week?
□(1）Less than or equal to one hour
□(2）Between one and three hours
□(3）Between three and five hours
□(4）Between five and ten hours
□(5）More than ten hours

4、When did you start using computer?
□(1)Before grade 1 □(2)Grade 1 □(3) Grade 2 □(4) Grade 3 □(5) Grade 4 □(6) Grade 5

5、For what purpose do you use computer? (Check items that fit your purpose)
□(1)Browse the Internet □(2)Use document processing programs
□(3)Edit photos or videos □(4)Play games □(5)Watch videos □(6)Chat online
□(7)Send or receive e-mails □(8)Use social networking sites □(9)Do homework
□(10)Make websites or blogs
□(11)Online learning, such as_____.
□(12)Others, such as_____.

6、Have you every use computer technology in the following courses?
□(1)Mandarin □(2)Math □(3)English □(4)Natural Science
□(5)Social science □(6)Art and Humanity □(7)Life □(8)Health and Physical Education □(9) Others, such as_____.

7、Do you like using computer?
(Extremely unlike) 1 2 3 4 5 (Extremely like)

8、Do you feel comfortable reading on screen?
(Extremely uncomfortable) 1 2 3 4 5 (Extremely comfortable)

9、Are you confident in typing in Mandarin?

(Extremely unconfident) 1 2 3 4 5 (Extremely confident)

10、Are you confident in typing in English?

(Extremely unconfident) 1 2 3 4 5 (Extremely confident)

11、Have you ever used *Google Documents*?

□(1)Never □(2)Yes (Please answer Question 12, 13, and 14)

12、How often do you use Google Documents?

□(1)Several times in a day □(2)Once in a day

□(3)Three to five times in a week □(4)One to two time in a week

□(5)One to two times in a month □(6)Rarely use it.

13、Have you ever used "annotation functions" in Google Documents?

□(1)Yes □(2)No

14、Have you ever shared with others your annotations on Google Documents?

□(1)Yes □(2)No

(CHINESE VERSION)

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□(1)一年級之前 □(2)一年級 □(3)二年級

□(4)三年級 □(5)四年級 □(6)五年級

2、每週花多少時間學英語？

□(1) 1 時以內(包含1 小時) □(2) 1 小時以上-3 小時以內(包含3 小時)

□(3) 3 小時以上-5 小時以內(包含5 小時)

□(4) 5 小時以上-10 小時以內(包含10 小時) □(5) 10 小時以上

3、你喜歡英語嗎？(圈出 1 個數字，數字愈大表示愈喜歡)

(一點也不喜歡)1 2 3 4 5(非常喜歡)

4、你覺得學習英語重要嗎？圈出 1 個數字，數字愈大表示愈重要)

(一點也不重要)1 2 3 4 5(非常重要)

5、你喜歡上學校英語課嗎？(圈出 1 個數字，數字愈大表示愈喜歡)

(一點也不喜歡)1 2 3 4 5(非常喜歡)

6、父母親對你英語學習的態度是：

(一點也不關心)1　　2　　3　　4　　5(非常關心)

7、你覺得你的英語能力如何：(圈出 1 個數字，數字愈大表示能力愈好)

英語能力	(非常不好) 1	2	3	4	5(非常好)
閱讀能力	(非常不好) 1	2	3	4	5(非常好)

8、你覺得閱讀能力容易學習嗎？

(非常不容易)1　　2　　3　　4　　5(非常容易)

9、電腦科技可以幫助你學習英語？

□(1)非常不同意　□(2)不同意　□(3)普通　□(4)同意　□(5)非常同意

10、你讀書時會做筆記嗎？

□(1)不會　　□(2)會

11、你和其他同學有「合作閱讀**中文**」的經驗？

□(1)沒有　　□(2)有

12、你和其他同學有「合作閱讀**英文**」的經驗？

□(1)沒有　　□(2)有

第三部分 電腦學習經驗

1、家裡有電腦或筆記型電腦嗎？□(1)有　□(2)沒有

2、家裡可使用網路嗎？ □(1)可以　□(2)不可以

3、請問你「一星期」大約上網的時間有多久：

□(1) 1 小時以內(包含1 小時)

□(2) 1 小時以上-3 小時以內(包含3 小時)

□(3) 3 小時以上-5 小時以內(包含5 小時)

□(4) 5 小時以上-10 小時以內(包含10 小時)

□(5) 10 小時以上

4、什麼時候開始接觸電腦？

□(1)一年級之前 □(2)一年級 □(3)二年級

□(4)三年級 □(5)四年級 □(6)五年級

5、使用電腦做什麼用途？(可複選，勾選所有你用電腦的用途)

□(1)上網瀏覽資料　□(2)使用文書處理軟體，如 Word、Powerpoint

□(3)處理照片或影片　□(4)玩遊戲　□(5)看影片　□(6)聊天

□(7)收發 e-mail　□(8)使用社交網站，如臉書　□(9)寫作業

□(10)製作網頁、部落格

□(11)線上學習，如_____(填入所做活動)

□(12)其它，如_____(填入所做活動)

6、你是否曾使用過電腦科技在下列課程？(可複選)

□(1)國語　□(2)數學　□(3)英語　□(4)自然與生活科技

□(5)社會　□(6)藝術與人文　□(7)生活　□(8)健康與體育

□(9)其它，如_____

7、你喜歡使用電腦科技網路嗎？（選擇 1 個數字，愈大代表愈喜歡）

(非常不喜歡)1　　2　　3　　4　　5(非常喜歡)

8、在螢幕上閱讀，你感到舒適嗎？（選擇 1 個數字，愈大代表愈舒適）

(非常不舒適)1　　2　　3　　4　　5(非常舒適)

9、對於中文打字有信心嗎？（選擇數字，愈大代表愈有信心）

(非常沒有信心)1　　2　　3　　4　　5(非常有信心)

10、對於英文打字有信心嗎？（選擇數字，愈大代表愈有信心）

(非常沒有信心)1　　2　　3　　4　　5(非常有信心)

11、曾經使用過 Google Documents 嗎？

□(1)沒有(請跳過第 12、13、14 題)　　□(2)有的(請繼續回答下面題目)

12、多常使用 Google Documents？

□(1)一天好幾次　□(2)一天一次　□(3)一週有 3 到 5 次

□(4)一週有 1、2 次 □(5)一個月 1、2 次　□(6)非常少使用

13、你曾經使用 Google Documents 來做註解（文件旁邊空白處的筆記）嗎？

□(1)沒有　□(2)有

14、你曾經和別人在 Google Documents 的分享過筆記/註解嗎？

□(1)沒有　□(2)有

Appendix D

Reading Comprehension Tests

The Free Recall Part in the Reading Comprehension Tests

The following two parts are used to measure your reading comprehension. Please complete them as possibly as you can. Before starting to answer them, please turn off your computer.

The first part of the test is to recall the text you just read. Please write down every detail about the story. The second part is multiple-choice items. Please select only one correct answer to the question. After you finish the first part, you can turn to the second page. BUT when starting to answer multiple-choice questions, you cannot go back to Part I and revise your answer.

I. Recall the story. Please do you best and write down the whole story.

Finish this part first, and then go to the second part.
You cannot go back to this page if you start working on the next page.

(CHINESE VERSION)

小朋友：

接下來有兩大題要看看你了解故事內容的程度，請盡**最大的努力**完成。做答前，請先把**電腦關掉**；做答時，不要東張西望，只要專心在自己的回答過程。

測驗一共有兩大題型。第一是故事回憶，請寫出所有關於故事的內容。第二大題是選擇題，選出一個關於故事的正確答案。**完成第一題後，再翻到第二頁選擇題。一但你開始作答選擇題時，你不能修改第一題的答案**。

I. **回憶故事：**請儘量寫下故事完整內容。

第一大題完成後，再開始寫第二大題。
開始寫第二大題時，就不能修改第一大題。

The Cued Recall Part in the Three Reading Comprehension Tests

Test 1

( )1. What is the special day in the story?
①Mother's Day ②Father's Day ③Earth Day ④Halloween

( )2. Did the father know the trip to Danshui?
①Yes, he did. ②No, he did not. ③We don't know.

( )3. Where did Emily put the food?
①On a table. ②Under a chair. ③In a lunch box. ④In a trash can.

( )4. What did the father love?
①Chicken. ②Vegetables. ③Rice. ④Fruits.

( )5. Emily found the kite. What did the kite look like?
①A bird. ②A cat. ③A dog. ④An elephant.

( )6. How did Emily go to her father's office?
①By car. ②By MRT. ③By spaceship. ④On foot.

( )7. Did the father like Emily's gift?
①Yes, he did. ②No, he did not. ③We do not know.

Test 2

( )1. The family had a holiday _____.
① by the sea
② in the zoo
③ in the library
④ at school

( )2. It _____ all day on Wednesday and the family went to the movie theater.
① snowed
② rained
③ was cloudy
④was windy

( )3. Paul didn't enjoy seeing _____ in the movie.

① tigers
② monkeys
③ bears
④ sharks

( )4. The family had breakfast in_____ on Friday.
① the restaurant
② the garden
③ the supermarket
④ the store

( )5. Paul saw _____ in the water.
① fish
② sharks
③ turtles
④ dolphins

( )6. Paul's dad _____ into the water.
① threw a ball
② kicked a ball
③ fell
④ put dolphins

( )7. Did Paul enjoy the movie about the dolphins?
① Yes, he did.
② No, he did not.
③ We don't know.
④ He did not go to see that movie.

Test 3

( )1. Jack stand on a banana _____.
① in the bookstore.
② in the train station.
③ in the classroom.
④ in the supermarket

( )2 _____ decided to take Jack to the hospital.

① Jacky's dad
② Jacky's mom
③ The woman in the supermarket
④ The doctor

( )3. The woman from the supermarket asked the hospital for _____.
① an ambulance
② a taxi
③ a bus
④ a bike

( )4. Jack waited for a long time before he saw _____.
① the doctor
② the nurse
③ the teacher
④ the police officer

( )5. The woman from the supermarket gave Jack _____ when she saw him in hospital.
① homework
② a book
③ some sweets
④ a banana

( )6. After two days in hospital, what did Jack do to his mother?
① He phoned his mom.
②He wrote a letter to his mom.
③He sang a song to his mom.
④He danced with his mom.

( )7. What did Jack want to do so he could get another book to read?
①He wanted to go to the supermarket.
②He wanted to go home.
③He wanted to go to school.
④He wanted to stay in the hospital.

Appendix E

Reading Enjoyment and Engagement Surveys

Items	Not at all----Medium-----Very			
Items for the read-only group, the individual annotation group, and the collaborative annotation group				
• To what degree did you have fun in today's reading activity?	1	2	3	4
• To what degree were you engaged in today's reading activity?	1	2	3	4
• Do you think that the online reading activity helps you develop English reading abilities?	1	2	3	4
Items for the individual annotation group and the collaborative annotation group				
• To what degree did you feel your annotations were useful to your English reading?	1	2	3	4
• To what degree did you enjoy making annotations while you were reading?	1	2	3	4
Items specifically for the collaborative annotation group				
• To what degree did you feel other's annotations were helpful to your English reading comprehension?	1	2	3	4
• To what degree did you feel other's comments were helpful to your English reading comprehension?	1	2	3	4
• To what degree did you feel your annotations were helpful to other's English reading comprehension?	1	2	3	4
• To what degree did you feel your comments were helpful to other's English reading comprehension?	1	2	3	4
• To what degree do you want to participate in the online discussion with the same classmates next time?	1	2	3	4
Items specifically for the individual annotation group in the final session				
◆ To what degree did you want to read others' annotations while you were reading?	1	2	3	4
• To what degree did you want to use annotations for discussion with peers while you were reading?	1	2	3	4

Open-ended questions for all groups:

- What did you like and dislike about the online reading activity?

_____

_____

- What advantages and disadvantages did the activity have?

_____

_____

- What difficulties did you encounter while reading and how did you solve them?

_____

_____

- What impressed you the most in today's reading activity?

_____

_____

An additional question for the individual annotation group in the third end-of-session survey:

- Why do you want or not want to read others' annotations? And why do you want or not want to discuss reading texts with peers by using annotations?

_____

_____

(Chinese version)

題目	一點也不			非常
線上閱讀、獨立註解、合作註解組共同問題				
• 你覺得線上閱讀活動有趣嗎？	1	2	3	4
• 你投入閱讀活動的程度為何？	1	2	3	4
• 你覺得線上閱讀活動能幫助你學習英文閱讀能力嗎？	1	2	3	4
獨立註解、合作註解組共同問題				
• 你覺得做註解能幫助你學習英文閱讀能力嗎？	1	2	3	4
• 你喜歡在閱讀時做註解筆記嗎？	1	2	3	4
合作註解組專屬問題				
• 你覺得別人的註解能幫助你理解英文閱讀故事嗎？	1	2	3	4
• 你覺得別人的回應能幫助你理解英文閱讀故事嗎？	1	2	3	4
• 你覺得你的註解可以幫助別人理解英文閱讀故事嗎？	1	2	3	4
• 你覺得你的回應可以幫助別人理解英文閱讀故事嗎？	1	2	3	4

• 你想和同組同學下次繼續參加此閱讀討論活動？	1	2	3	4
獨立註解組在最後問卷專屬問題				
• 當你閱讀時，你會想要看別人的註解筆記？	1	2	3	4
• 當你閱讀時，你會想要用註解和別人討論？	1	2	3	4

共同開放式問題

- 關於今天的線上閱讀活動，你喜歡或不喜歡哪些地方？

_____

_____

- 線上閱讀活動有哪些優點、缺點？

_____

_____

- 在線上閱讀時，你有遇到什麼困難嗎？你怎麼克服困難呢？

_____

_____

- 今天的線上閱讀活動，讓你印象深刻的有什麼？

_____

_____

獨立註解組在第三次問卷之專屬問題

- 你為什麼會想（或不想）要看別人的註解？和想用（或不想用）註解與同學進行閱讀討論呢？

_____

_____

Appendix F

Stimulated Recall Protocols

Interview opening statement:
What we're going to do now is to read the story with your annotations (and others' comments). I am interested in what you were thinking at the time you were reading the story (and others' comments), and making the annotations. What I'd like you to do is tell me what you were thinking what was in your mind at that time while you were reading on Google Docs.

(Chinese Translation)
訪談開場白：
我們待會要進行的是再把故事看一遍，看看你的註解（和別人的註解回應）。我想要了解的是，當你在讀這個故事時（還有別人的註解回應），你在想些什麼呢？你需要做的事情，就是告訴我，當你閱讀Google Docs的故事時，你心裡在想些什麼。

Questions:
- What were you thinking here/ at this point/ right then?
- Can you tell me what you were thinking at that point?
- How did you feel when you read the responses?
- Why did you make an annotation here?
- Do you remember thinking anything when you made this annotation?
- Do you remember thinking anything when you read this response?
- Can you tell me what you thought when you team member made this annotation?

(Chinese Translation)
引導回憶問句：
- 這時候你在想什麼？
- 你能告訴我你這時候在想些什麼？
- 當你讀到這個回應時，你感覺如何？
- 你為什麼在這邊做一個註解？
- 當你做這個註解時，你記得你在想什麼嗎？
- 當你讀到這個回應時，你記得你在想什麼嗎？
- 你能告訴我，當你讀到你的組員的註解時，你在想什麼嗎？

Adapted from:
Gass, S. M., & Mackey, A. (2000). *Stimulated recall methodology in second language research*. Mahwah: L. Erlbaum Associates.

Appendix G

Frequency of Online Support Consultation Survey

Please check the item that describes the frequency of use of online support functions.

1. I used online support functions to check the whole text translation.
☐1) Never
☐2) Seldom
☐3) Sometimes
☐4) Often
☐5) Every time

2. I used online support functions to check a paragraph translation.
☐1) Never
☐2) Seldom
☐3) Sometimes
☐4) Often
☐5) Every time

3. I used online support functions to check a sentence translation.
☐1) Never
☐2) Seldom
☐3) Sometimes
☐4) Often
☐5) Every time

4. I used online support functions to check a word meaning.
☐1) Never
☐2) Seldom
☐3) Sometimes
☐4) Often
☐5) Every time

(Chinese version)

請勾選適合你情形的選項：

1、使用網路功能，來翻譯整篇故事。
☐1）從未使用過

□2）很少使用過
□3）有時使用過
□4）常常使用
□5）每次都用

2、使用網路功能，來翻譯故事段落。
□1）從未使用過
□2）很少使用過
□3）有時使用過
□4）常常使用
□5）每次都用

3、使用網路功能，來翻譯故事句子。
□1）從未使用過
□2）很少使用過
□3）有時使用過
□4）常常使用
□5）每次都用

4、使用網路功能，來翻譯故事的單字。
□1）從未使用過
□2）很少使用過
□3）有時使用過
□4）常常使用
□5）每次都用

Appendix H

Pausal Unit Marking Scheme

Reading 1: A Happy Father's Day

Pausal Unit	Student's answer
Today is Father's Day.	
Emily and her father are going on a trip tonight.	
They will go to Danshui	
to watch the sunset.	
But Emily's father didn't know about it.	
It's a surprise.	
After school,	
Emily made chicken,	
vegetables	
and rice.	
She put the food in a big lunch box.	
She took out two apples and some graphs..	
Her father loves fruit.	
She also found her father's favorite kite.	
The kite looks like a big bird.	
She packed the lunch box,	
the fruit,	
and the kite	
in her backpack.	
Emily took the MRT to her father's office.	
She opened the door.	
"Emily,	
what are you doing here?"	
said Emily's father.	
Emily said,	
"Happy Father's Day, Dad!"	
Come with me.	
I'm taking you to Danshui to celebrate."	
Emily's father smiled	

and said,	
"Wow!	
Thank you.	
What a wonderful surprise!"	

Reading 2: A Family Holiday

Pausal Unit	Student's answer
Vicky lives with her parents and her two brothers.	
Sam and Paul,	
in the city.	
Last week,	
they had a holiday by the sea.	
Sam is ten,	
Vicky is eight	
but Paul is only five.	
They went to the movie theater	
on Wednesday	
because it rained all day.	
They saw a movie about sharks.	
The sharks had very big teeth.	
Paul didn't like watching them	
and he closed his eyes.	
On Friday,	
the family ate breakfast in the garden	
because it was very sunny	
but Paul didn't want any.	
Then they all went to the beach.	
The sea was very blue.	
Paul looked.	
There were three beautiful dolphins in the water!	
He ran to the sea	
and swam to them.	
Then Paul's dad threw a ball in the sea	

and the dolphins played with it.	
It was great	
and Paul stopped thinking about the sharks in the movie.	
That evening,	
all the family went to the movie theater again.	
This time	
the movie was about a funny dolphin	
and they all enjoyed it.	

Reading 3: Jack's Good Book

Pausal Unit	Student's answer
One day last week,	
Jack had to go to the shops with his mom after school.	
Jack had a very good book	
and he didn't want to stop reading it.	
So Jack read his book	
and followed his Mom into every shop.	
But when they went into the supermarket,	
Jack didn't see a banana that was on the floor	
and he stood on it and fell.	
He hurt his leg very badly.	
'I need to take him to the hospital,'	
said Mom,	
and the woman from the supermarket phoned the hospital	
to get an ambulance.	
Jack lay on the bed	
in the back of the ambulance	
and read his book.	
At the hospital	
they had to wait for a long time	
to see the doctor	
but Jack didn't mind	
because he could read his book.	

Then the doctor told Jack,	
‘Your leg is broken.	
You have to stay here for three more days.’	
‘That's OK,’	
said Jack.	
Jack's parents went to visit him every day	
and the woman from the supermarket brought him some sweets.	
They were very surprised	
that Jack was so happy all the time.	
Two days later	
Jack phoned his Mom.	
‘Can you come and get me?’	
he asked	
‘What's the matter?’	
asked Mom	
‘I've finished my book,’	
said Jack.	
‘and I need to go back to school	
and to get another one.’	

Appendix I

Coding Scheme of Annotation Functions

Code			Example
1. Translate the text	A. A word translation	1. Correct	Highlight: happy Annotate: 歡樂
		2. Incorrect	Highlight: think Annotate: 謝謝(thank)
	B. A phrase translation	1. Correct	Highlight: lunch box Annotate: 午餐盒
		2. Incorrect	Highlight: After school Annotate: 在學校後面 (At the back side of school)
	C. A sentence translation	1. Correct	Highlight: Today is Father's Day. Annotate: 今天是父親節
		2. Incorrect	Highlight: the woman from the supermarket phoned the hospital to get an ambulance. Annotate: 媽媽打電話叫救護車來 (Mother phoned to get an ambulance.)
	D. More than one sentence translation	1. Correct	Highlight: The sharks had very big teeth. Paul didn't like watching them and he closed his eyes. Annotate: 鯊魚擁有很利的牙齒，保羅不喜歡看這部電影，因此他閉上他的眼睛。
		2. Incorrect	Highlight: Vicky lives with her parents and her two brothers, Sam and Paul, in the city. Last week, they had a holiday by the sea. Sam is ten, Vicky is eight but Paul is only five. They went to the movie theater on Wednesday because it rained all day. Annotate: 維基的生活與她

		的父母和她的兩個兄弟，山姆和保羅，在這個城市。上週，他們有一個海邊度假。山姆是 10，玉萍是八，但保羅是只有五個。他們去了週三的電影院，因為下雨一整天。 (Vicky's life and her parents and her two brothers, Sam and Paul, in this city. Last week, they had a beach vacation. Sam is ten [Note. The student should add "years old". Otherwise, it is confusing.], Vicky is 8, but Paul is only five. They went to see Wednesday's movie theater because it rained all day.
E. A paragraph translation	1. Correct	Highlight: After school, Emily made chicken, vegetables and rice. She put the food in a big lunch box. She took out two apples and some grapes. Her father loves fruit. She also found her father's favorite kite. The kite looks like a big bird. She packed the lunch box, the fruit and the kite in her backpack. Annotate: 放學後，艾米莉料理雞肉、蔬菜和米飯。她把食物放進一個大飯盒。她拿出兩顆蘋果和一些葡萄。她的父親喜歡水果。她還發現了她父親最喜歡的風箏。風箏看起來像一個大的鳥。她把飯盒、水果和風箏收在背包裡。

	2. Incorrect	No example.
F. More than one paragraph translation	1. Correct	Highlight: [Paragraph 1] Then the doctor told Jack, 'Your leg is broken. You have to stay here for three more days.' 'That's OK,' said Jack. [Paragraph 2] Jack's parents went to visit him every day and the woman from the supermarket brought him some sweets. They were very surprised that Jack was so happy all the time. Annotate: 然後醫生告訴傑克，"你的腿斷了。你要在這裡待 3 天。" "沒關係，"傑克說。 傑克的父母每天都去看望他，在超市的那個女人帶給他一些甜食。他們非常驚訝的是，傑克一直都很開心。
	2. Incorrect	No example.
G. Whole text translation	1. Correct	Highlight: Reading 3 text Annotate: 上週有一天，傑克放學後和他的媽媽去商店。傑克有一本很好的書，他不希望停止閱讀它。於是，傑克讀他的書，並跟著他的媽媽到每一家店。但是，當他們走進超市，傑克沒看到在地板上的香蕉，他站在它上面摔倒了。他傷了腿非常糟糕。 "我要帶他去醫院。"媽媽說。超市的那個女人打電話給醫院獲得救護車。

		傑克躺在救護車後面的床上，看他的書。在醫院，他們不得不等待很長的時間去看病，但傑克不介意，因為他能讀他的書。 然後醫生告訴傑克，“你的腿壞了 。你要在這裡停留 3 天。“ “沒關係，”傑克說。 傑克的父母每天都去看望他，超市的那個女人帶給他一些甜食 。他們非常驚訝的是，傑克一直都很高興。 兩天後，傑克打電話給他的媽媽。 “你能來幫我嗎？他問 “出了什麼事？媽媽問 “我已經讀完了我的書，”傑克說，“我要回去學校，再拿一本書！
	2. Incorrect	No example.
2. Display grammar knowledge		Highlight: taking Annotate: take 現在進行式 (The present progressive form of “take”)
3. Show playfulness (use for humorous comments, use of orthographic, punctuation, emoticon)		Highlight: “Wow” Annotate:!!!!! Highlight: surprise Annotate:驚喜@@@@@ (Surprise) Highlight: What’s the matter? Annotate: 蝦咪待機

		(Expression of a Chinese dialect.)
4. Self-reflect about the text	A. Personal opinion/ experience about the text and picture	Highlight: But Emily's father didn't know about it. It's a surprise. Annotate: WOW!真是個不錯的禮物呢!我喜歡!!XD (This is a really good present! I like it!!) Highlight: Emily took the MRT to her father's office. Annotate: 我只有坐過一次 MRT (I only took MRT once.) Highlight: highlight the picture in the text Annotate: 真美麗 (How beautiful.) Highlight: They had a holiday by the sea. Annotate: 好棒 (Awesome.)
	B. Real-life connection to the text	Highlight: Danshui Annotate: 在台灣北部(In the northern Taiwan)
5. Identify text structure		Highlight: After school Annotate: 下段開始 (The beginning of the next paragraph.)
6. Question the text / reading materials (like pictures in the Google Doc)		Highlight: favorite Annotate: 這是電視嗎？ (Does it mean TV?)
7. Others (non-interpretable annotations)		
8. Moderate the discussion		Highlight: the whole text Annotate: this is 課文要討論 (Text for discussion.)

9. Respond to peers	A. About the text	1. Seek answers or support from peers about text meaning, translation, and their annotation content	Annotation responded: 這不是電視 (This is not a TV.) Response: 是什麼？ (What is it?)
		2. Explain the annotation content or answer peer's question	Annotation responded: 這是名詞還是動詞還是形容詞? (Is it a noun, a verb, or an adjective?) Response: 動詞 (A verb.)
		3. Connect real life to reading text	Annotation responded: 父親節快樂 (Happy Father's Day.) Response:現在不是父親節 (Today is not Father's Day.)
		4. Correct peer's comments	Annotation responded: 「精彩」(Wonderful) Response: 應該是「很好」才對 (It should mean "great".)
		5. Self-disclosure of personal emotion, opinions about text or peer's comments	Annotation responded: 他父親最喜愛的風箏 (Her father's favorite kite.) Response: 我也要 (I want that, too.)
		6. Display agreement, support, understanding, and appreciation	Annotation responded: 真的? (Really?) Response: 相信他; 對 (Trust him. Yes.)
		7. Provide wrong and unhelpful answer, translation, explanation	Annotation responded: 這是甚麼(What is it?)(Highlight vegetable)? 幫我解決 (Help me solve it.) Response: 爬 (Crawl.) Annotation responded: 這是甚麼? (What does it mean?) Response: 自己想(Figure it out on your own.)
	B. Not about	1. Humiliate/	Annotation responded:??

	the text	depreciate/ quarrel with peers	Response: 14 閉嘴 (Shut up. No. 14) Annotation responded:跟我走 (The translation of "come with me.") Response: 誰要跟你走 (Who wants to go with you?)
		2. Provide non-interpretable comments unrelated to discussion (with meaningless expression)	Annotation responded: 你 (translate "you") Response: ㄊㄟㄎㄧ伊恩 (Usage of Chinese phonetic letters and nonsense Chinese characters.)
		3. Personal communication; side talks	Annotation responded: 父親節 (Father's Day) Response: 道~~欠～ (Apology.)
		4. Show playfulness (display humor)	Highlight: Sam Annotation responded: 賴奕勳(One of the peers' English name is Sam. So the student pointed it out.) Response: 17 噁心~~~ (Gross.) Highlight: the whole text Annotation responded: 16 說爛透了 (No 16 said it sucked.) Response:討厭!!!!!!!!!!!!! (I hate you.)
		5. Moderate the discussion	Annotation responded: 誰跟我們一組？(Who else discusses with us?) Response: 還有 8 號 (No. 8)
		6. Advise, question peers' discussion behaviors or comments not	Annotation responded: 嬌嬌 (Jiao Jiao- non-sense Chinese characters) Response: 你打什麼? (What

	related to text	did you type?)

References

Abraham, L. B. (2008). Computer-mediated glosses in second language reading comprehension and vocabulary learning: A meta-analysis. *Computer Assisted Language Learning, 21*(3), 199-226. doi:10.1080/09588220802090246

AbuSeileek, A. F. M. (2008). Hypermedia annotation presentation: Learners' preferences and effect on EFL reading comprehension and vocabulary acquisition. *CALICO Journal, 25*(2), 260-275. doi:0.11139/cj.25.2.260-275

AbuSeileek, A. F. M. (2011). Hypermedia annotation presentation: The effect of location and type on the EFL learners' achievement in reading comprehension and vocabulary acquisition. *Computers & Education, 57*(1), 1281-1291. doi:10.1016/j.compedu.2011.01.011

Aebersold, J. A., & Field, M. L. (1997). *From reader to reading teacher: Issues and strategies for second language classrooms*. Cambridge: Cambridge University Press.

Afflerbach, P., & Cho, B. (2010). Determining and describing reading strategies: Internet and traditional forms of reading. In H. S. Waters & W. Schneider (Eds.), *Metacognition, strategy use, and instruction* (pp. 201-225). New York: Guilford Press.

Alderson, J. C. (1984). Reading in a foreign language: A reading problem or a language problem? In J. C. Alderson & A. H. Urquhart (Eds.), *Reading in a foreign language* (pp. 122-135). New York: Longman.

Alderson, J. C. (2000). *Assessing reading*. Cambridge: Cambridge University Press.

Al-Seghayer, K. (2007). The role of organizational devices in ESL readers' construction of mental representations of hypertext content. *CALICO journal, 24*(3), 531-559. doi:10.11139/cj.24.3.531-559

Al-Shehri, S., & Gitsaki, C. (2010). Online reading: A preliminary study of the impact of integrated and split-attention formats on L2 students' cognitive load. *ReCALL, 22*(3), 356-375. doi:10.1017/S0958344010000212

Anderson, N. J. (1999). *Exploring second language reading: Issues and strategies*. Boston: Heinle & Heinle.

Bangert-Drowns, R. L., Hurley, M. M., & Wilkinson, B. (2004). The effects of school-based writing-to-learn interventions on academic achievement: A meta-analysis. *Review of educational research, 74*(1), 29-58. doi:10.3102/00346543074001029

Beck, I. L., McKeown, M. G., Sandora, C., Kucan, L., & Worthy, J. (1996). Questioning the author: A yearlong classroom implementation to engage students with text. *The Elementary School Journal*, *96*(4), 385-414.

Benson, P. (2001). *Teaching and researching autonomy in language learning*. Harlow, England: Longman.

Bernhardt, E. B. (1983). Three approaches to reading comprehension in intermediate German. *The Modern Language Journal*, *67*(2), 111-115. doi:10.1111/j.1540-4781.1983.tb01478.x

Bernhardt, E. B. (1991). *Reading development in a second language: Theoretical, empirical, and classroom perspectives*. Norwood: Ablex Pub. Corp.

Bernhardt, E. B. (2011). *Understanding advanced second language reading*. New York: Routledge.

Bonk, C. J., & Cunningham, D. J. (1998). Searching for learner-centered, constructivist, and sociocultural components of collaborative educational learning tools. In C. J. Bonk & K. S. King (Eds.), *Electronic collaborators: Learner-centered technologies for literacy, apprenticeship, and discourse* (pp. 25-50). Mahwah: Erlbaum.

Bui, D. C., Myerson, J., & Hale, S. (2013). Note-taking with computers: Exploring alternative strategies for improved recall. *Journal of Educational Psychology*, *105*(2), 299-309. doi:10.1037/a0030367

Calfee, R. C., & Sperling, M. (2010). *On mixed methods: Approaches to language and literacy research*. New York: Teachers College Press.

Cárdenas-Claros, M. S., & Gruba, P. A. (2009). Help options in CALL: A systematic review. *CALICO Journal*, *27*(1), 69-90. doi:10.11139/cj.27.1.69-90

Carrell, P. L. (1992). Awareness of text structure: Effects on recall. *Language learning*, *42*(1), 1-18. doi:10.1111/j.1467-1770.1992.tb00698.x

Carrell, P. L., Devine, J., & Eskey, D. E. (1988). *Interactive approaches to second language reading*. Cambridge: Cambridge University Press.

Carrell, P. L., Pharis, B. G., & Liberto, J. C. (1989). Metacognitive strategy training for ESL reading. *TESOL Quarterly*, *23*(4), 647-678. doi:10.2307/3587536

Chang, C. K., & Hsu, C. K. (2011). A mobile-assisted synchronously collaborative translation-annotation system for English as a foreign language (EFL) reading comprehension. *Computer Assisted Language Learning*, *24*(2), 155-180. doi:10.1080/09588221.2010.536952

Chang, M. M., & Lin, M. C. (2014). The effect of reflective learning e-journals on reading comprehension and communication in language learning. *Computers & Education, 71*, 124-132. doi:10.1016/j.compedu.2013.09.023

Chang, Y. F. (2006). On the use of the immediate recall task as a measure of second language reading comprehension. *Language Testing, 23*(4), 520-543. doi:10.1191/0265532206lt340oa

Chapelle, C. A. (2003). *English language learning and technology: Lectures on applied linguistics in the age of information and communication technology*. Amsterdam: John Benjamins.

Chapelle, C. A. (2005). CALICO at center stage: Our emerging rights and responsibilities. *CALICO Journal, 23*(1), 5-15. doi:dx.doi.org/10.11139/cj.23.1.5-15

Chapelle, C., & Jamieson, J. (2008). *Tips for teaching with CALL: Practical approaches to computer-assisted language learning*. White Plains: Pearson Education.

Chen, C. M., & Chen, F. Y. (2014). Enhancing digital reading performance with a collaborative reading annotation system. *Computers & Education, 77*, 67-81. doi:10.1016/j.compedu.2014.04.010

Chen, H. I. (2013). Identity practices of multilingual writers in social networking spaces. *Language Learning & Technology, 17*(2), 143-170. Retrieved from http://llt.msu.edu/issues/june2013/chen.pdf

Chen, I., & Yen, J. C. (2013). Hypertext annotation: Effects of presentation formats and learner proficiency on reading comprehension and vocabulary learning in foreign languages. *Computers & Education, 63*, 416-423. doi:10.1016/j.compedu.2013.01.005

Chen, J. M., Chen, M. C., & Sun, Y. S. (2010). A novel approach for enhancing student reading comprehension and assisting teacher assessment of literacy. *Computers & Education, 55*(3), 1367-1382. doi:10.1016/j.compedu.2010.06.011

Chiang, M. H. (2007). A novel idea: English as foreign language reading via virtual literature circles. *English Teaching and Learning, 31*(4), 1-37.

Chun, D. M. (2001). L2 reading on the web: Strategies for accessing information in hypermedia. *Computer Assisted Language Learning, 14*(5), 367-403. doi:10.1076/call.14.5.367.5775

Chun, D. M. (2006). CALL technologies for L2 reading. In L. Ducate & N. Arnold (Eds.), *Calling on CALL: From theory and research to new directions in foreign language*

teaching (pp. 69-98). CALICO Monograph Series Volume 5. San Marcos: Computer Assisted Language Instruction Consortium.

Chun, D. M., & Plass, J. L. (1996). Facilitating reading comprehension with multimedia. *System*, *24*(4), 503-519. doi:10.1016/S0346-251X(96)00038-3

Coffey, G. (2012). Literacy and technology: Integrating technology with small group, peer-led discussion of literature. *International Electronic Journal of Elementary Education*, *4*(2), 395-405. Retrieved from http://www.iejee.com/4_2_2012/IEJEE_4_2_Coffey_395_405.pdf

Coiro, J., & Dobler, E. (2007). Exploring the online reading comprehension strategies used by sixth-grade skilled readers to search for and locate information on the Internet. *Reading Research Quarterly*, *42*(2), 214-257. doi:10.1598/RRQ.42.2.2

Coiro, J., Knobel, M., Lankshear, C., & Leu, D. J. (2008). Central issues in new literacies and new literacies research. In J. Coiro, M. Knobel, C. Lankshear, & D. J. Leu (Eds.), *Handbook of research on new literacies* (pp. 1-21). New York: Lawrence Erlbaum.

Conrad, S. (2000). Will corpus linguistics revolutionize grammar teaching in the 21st century?. *TESOL Quarterly*, *34*(3), 548-560. doi: 10.2307/3587743

Cook, L. K., & Mayer, R. E. (1988). Teaching readers about the structure of scientific text. *Journal of Educational Psychology*, *80*(4), 448-456. doi:10.1037/0022-0663.80.4.448

Corbin, J., & Strauss, A. L. (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Thousand Oaks: Sage Publications.

Daniels, H. (2002). *Literature circles: Voice and choice in book clubs and reading groups*. Portland: Stenhouse Publishers.

Day, R. R., & Bamford, J. (1998). *Extensive reading in the second language classroom*. Cambridge: Cambridge University Press.

Di Vesta, F. J., & Gray, G. S. (1972). Listening and note taking. *Journal of Educational Psychology*, *63*(1), 8-14. doi:10.1037/h0032243

Dijk, J. A. G. M. (2005). *The deepening divide: Inequality in the information society*. Thousand Oaks: Sage Publications.

Dobao, A. F. (2012). Collaborative writing tasks in the L2 classroom: Comparing group, pair, and individual work. *Journal of Second Language Writing*, *21*(1), 40-58. doi:10.1016/j.jslw.2011.12.002

Donato, R. (2000). Sociocultural contributions to understanding the foreign and second language classroom. In J. P. Lantolf (Ed.). *Sociocultural theory and second language learning* (pp. 27-50). Oxford: Oxford University Press.

Dörnyei, Z. (1997). Psychological processes in cooperative language learning: Group dynamics and motivation. *The Modern Language Journal, 81*(4), 482-493. doi: 10.1111/j.1540-4781.1997.tb05515.x

Dörnyei, Z. (2007). *Research methods in applied linguistics*. Oxford: Oxford University Press.

Dreyer, C., & Nel, C. (2003). Teaching reading strategies and reading comprehension within a technology-enhanced learning environment. *System, 31*(3), 349-365. doi: 10.1016/S0346-251X(03)00047-2

Dudeney, G., & Hockly, N. (2007). *How to teach English with technology*. Harlow: Pearson/Longman.

Educause (2009, Oct 5). *7 things you should know about collaborative annotations*. Retrieved from https://net.educause.edu/ir/library/pdf/ELI7054.pdf

Einstein, G. O., Morris, J., & Smith, S. (1985). Note-taking, individual differences, and memory for lecture information. *Journal of Educational Psychology, 77*(5), 522-532. doi:10.1037/0022-0663.77.5.522

Freeman, D. E., & Freeman, Y. S. (1994). *Between worlds: Access to second language acquisition*. Portsmouth: Heinemann.

Gambrell, L. B. (2004). Shifts in the conversation: Teacher-led, peer-led, and computer-mediated discussions. *The Reading Teacher*, *58*(2), 212-215. doi:10.1598/RT.58.2.9

Gao, F. (2013). A case study of using a social annotation tool to support collaboratively learning. *The Internet and Higher Education, 17*, 76-83. doi:10.1016/j.iheduc.2012.11.002

Garrett, N. (1991). Technology in the service of language learning: Trends and issues. *The Modern Language Journal*, *75*(1), 74-101. doi:10.1111/j.1540-4781.1991.tb01085.x

Gass, S. M., & Mackey, A. (2000). *Stimulated recall methodology in second language research*. Mahwah: L. Erlbaum Associates.

Glover, I., Xu, Z., & Hardaker, G. (2007). Online annotation- Research and practices. *Computers & Education*, *49*(4), 1308-1320. doi:10.1016/j.compedu.2006.02.006

Grabe, W. (1991). Current developments in second language reading research. *TESOL Quarterly*, *25*(3), 375-406. doi:10.2307/3586977

Grabe, W. (2009). *Reading in a second language: Moving from theory to practice*. New York: Cambridge University Press.

Grabe, W., & Stoller, F. L. (2011). *Teaching and researching reading*. Harlow: Longman.

Hayati, A. M., & Jalilifar, A. (2009). The impact of note-taking strategies on listening comprehension of EFL learners. *English Language Teaching*, *2*(1), 101-111. doi:10.5539/elt.v2n1p101

Hockly, N. (2013). Mobile learning. *ELT Journal, 67*(1), 80-84. doi:10.1093/elt/ccs064

Horwitz, E. K. (2013). *Becoming a language teacher: A practical guide to second language learning and teaching*. Boston: Pearson/ Allyn and Bacon.

Hsieh, M. F. (2011). Learning English as a foreign language in Taiwan: Students' experiences and beyond. *Language Awareness, 20*(3), 255-270. doi:10.1080/09658416.2011.573856

Hsu, C. K., Hwang, G. J., & Chang, C. K. (2013). A personalized recommendation-based mobile learning approach to improving the reading performance of EFL students. *Computers & Education, 63*, 327-336. doi:10.1016/j.compedu.2012.12.004

Huang, H. C., Chern, C. L., & Lin, C. C. (2009). EFL learners' use of online reading strategies and comprehension of texts: An exploratory study. *Computers & Education, 52*(1), 13-26. doi:10.1016/j.compedu.2008.06.003

Huang, H. T., & Liou, H. C. (2007). Vocabulary learning in an automated graded reading program. *Language Learning & Technology*, *11*(3), 64-82. Retrieved from http://llt.msu.edu/vol11num3/pdf/huangliou.pdf

Huang, L. L., & Lin, C. C. (2011). EFL learners' reading on mobile phones. *The JALT CALL Journal*, *7*(1), 61-78. Retrieved from http://journal.jaltcall.org/articles/7_1_Huang.pdf

Hubbard, P. (2004). Learner training for effective use of CALL. In S. Fotos & C. Browne (Eds.), *New perspectives on CALL for second language classrooms* (pp. 45-68). Mahwah, NJ: Lawrence Erlbaum.

Hwang, W. Y., & Hsu, G. L. (2011). The effects of pre-reading and sharing mechanisms on learning with the use of annotations. *Turkish Online Journal of Educational Technology-TOJET*, *10*(2), 234-249. Retrieved from http://www.tojet.net/articles/v10i2/10223.pdf

Hwang, W. Y., Wang, C. Y., & Sharples, M. (2007). A study of multimedia annotation of web-based materials. *Computers & Education, 48*(4), 680-699. doi:10.1016/j.compedu.2005.04.020

International Reading Association. (2009). *New literacies and 21st-century technologies: A position statement of the International Reading Association*. Retrieved from http://www.reading.org/Libraries/position-statements-and-resolutions/ps1067_NewLiteracies21stCentury.pdf.

Jenkins, H. (2009). *Confronting the challenges of participatory culture: Media education for the 21st century*. Cambridge: The MIT Press.

Jiang, X., & Grabe, W. (2007). Graphic organizers in reading instruction: Research findings and issues. *Reading in a Foreign Language*, *19*(1), 34-55. Retrieved from http://nflrc.hawaii.edu/rfl/april2007/jiang/jiang.html

Jiang, X., & Grabe, W. (2009). Building reading abilities with graphic organizers. In R. Cohen (Ed.), *Teaching reading*. (pp. 25-42). Alexandria, VA: TESOL.

Johnson, R. E. (1970). Recall of prose as a function of the structural importance of the linguistic units. *Journal of Verbal Learning and Verbal Behavior, 9*(1), 12-20. doi:10.1016/S0022-5371(70)80003-2

Johnson, T. E., Archibald, T. N., & Tenenbaum, G. (2010). Individual and team annotation effects on students' reading comprehension, critical thinking, and meta-cognitive skills. *Computers in Human Behavior, 26*(6), 1496-1507. doi:10.1016/j.chb.2010.05.014

Kern, R. G. (1989). Second language reading strategy instruction: Its effects on comprehension and word inferences ability. *The Modern Language Journal, 73*(2), 135-149. doi:10.1111/j.1540-4781.1989.tb02535.x

Kessler, G. (2013). Collaborative language learning in co-constructed participatory culture. *CALICO Journal, 30*(3), 307-322. doi:10.11139/cj.30.3.307-322

Khalsa, D. K., Maloney-Krichmar, D., Peyton, J. K. (2007). Theory and research: Interaction via computers. In J. Egbert & E. Hanson-Smith (Eds.), *CALL Environments: Research, practice and critical issues*. (pp. 19-40). Alexandria: TESOL.

Kiili, C., Laurinen, L., Marttunen, M., & Leu, D. J. (2012). Working on understanding during collaborative online reading. *Journal of Literacy Research, 44*(4), 448-483. doi:10.1177/1086296X12457166

Kim, M. (2004). Literature discussions in adult L2 learning. *Language and Education*, *18*(2), 145-166. doi:10.1080/09500780408666872

Klingner, J. K., & Vaughn, S. (2000). The helping behaviors of fifth graders while using collaborative strategic reading during ESL content classes. *TESOL Quarterly*, *34*(1), 69-98. doi:10.2307/3588097

Klingner, J. K., Vaughn, S., & Schumm, J. S. (1998). Collaborative strategic reading during social studies in heterogeneous fourth-grade classrooms. *The Elementary School Journal*, *99*(1), 3-22.

Koda, K. (1993). Transferred L1 strategies and L2 syntactic structure in L2 sentence comprehension. *The Modern Language Journal*, *77*(4), 490-500. doi:10.1111/j.1540-4781.1993.tb01997.x

Koda, K. (2005). *Insights into second language reading: A cross-linguistic approach*. Cambridge, UK: Cambridge University Press.

Lan, Y. J., Sung, Y. T., & Chang, K. E. (2007). A mobile-device-supported peer-assisted learning system for collaborative early EFL reading. *Language Learning & Technology*, *11*(3), 130-151. Retrieved from http://llt.msu.edu/vol11num3/pdf/lansungchang.pdf

Lan, Y. J., Sung, Y. T., & Chang, K. E. (2009). Let us read together: Development and evaluation of a computer assisted reciprocal early English reading system. *Computers & Education*, *53*(4), 1188-1198. doi:10.1016/j.compedu.2009.06.002

Lan, Y. J., Sung, Y. T., & Chang, K. E. (2013). From particular to popular: Facilitating EFL reading through mobile-supported cooperation. *Language Learning & Technology* *17*(3), 23-38. Retrieved from http://llt.msu.edu/issues/october2013/action.pdf

Language Training and Teaching Center (n.d.). *Cambridge English exams*. Retrieved from https://www.lttc.ntu.edu.tw/YLEmain.htm

Laufer, B. (1997). The lexical plight in second language reading: Words you don't know, words you think you know, and words you can't guess. In J. Coady & T. Huckin (Eds.), *Second language vocabulary acquisition: A rationale for pedagogy* (pp. 20-34). New York: Cambridge University Press.

Laufer, B., & Hill, M. (2000). What lexical information do L2 learners select in a CALL dictionary and how does it affect word retention. *Language Learning & Technology*, *3*(2), 58-76. Retrieved from http://llt.msu.edu/vol3num2/laufer-hill/index.html

Lee, J. F. (1986). On the use of the recall task to measure L2 reading comprehension. *Studies in Second Language Acquisition*, *8*(2), 201-211. doi:10.1017/S0272263100006082

Lee, J. W., & Schallert, D. L. (1997). The relative contribution of L2 language proficiency and L1 reading ability to L2 reading performance: A test of the threshold hypothesis in an EFL context. *TESOL Quarterly*, *31*(4), 713-739. doi:10.2307/3587757

Lee, S. K. (2007). Effects of textual enhancement and topic familiarity on Korean EFL students' reading comprehension and learning of passive form. *Language Learning*, *57*(1), 87-118. doi:10.1111/j.1467-9922.2007.00400.x

Leu, D. J., Everett‐Cacopardo, H., Zawilinski, J., Mcverry, G., & O'Byrne, W. I. (2013). New literacies of online reading comprehension. *The encyclopedia of applied linguistics*. doi:10.1002/9781405198431.wbeal0865

Leu, D. J., Kinzer, C. K., Coiro, J. L., & Cammack, D. W. (2004). Toward a theory of new literacies emerging from the Internet and other information and communication technologies. In R. B. Ruddell & N. Unrau (Eds.), *Theoretical models and processes of reading* (pp. 1568-1611). Newark: International Reading Association.

Levy, M. (2009). Technologies in use for second language learning. *The Modern Language Journal*, *93*(s1), 769-782. doi:10.1111/j.1540-4781.2009.00972.x

Liao, Y. K. C. (2007). Effects of computer-assisted instruction on students' achievement in Taiwan: A meta-analysis. *Computers & Education*, *48*(2), 216-233. doi:10.1016/j.compedu.2004.12.005

Lin, C. M. (2011). A survey on E-reading habits and behaviors of elementary school students in Taiwan. *National Central Library Bulletin, 100* (2), 30-59. Retrieved from http://www.ncl.edu.tw/upload/P1010104001/cats/100-2-30-59.pdf

Lin, H., & Chen, T. (2007). Reading authentic EFL text using visualization and advance organizers in a multimedia learning environment. *Language Learning & Technology*, *11*(3), 83-106. Retrieved from http://llt.msu.edu/vol11num3/pdf/linchen.pdf

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills: Sage.

Liou, H. C. (2000). The electronic bilingual dictionary as a reading aid to EFL learners: Research findings and implications. *Computer Assisted Language Learning*, *13*(4-5), 467-476. doi:10.1076/0958-8221(200012)13:4-5;1-E;FT467

Liu, P. L., Chen, C. J., & Chang, Y. J. (2010). Effects of a computer-assisted concept mapping learning strategy on EFL college students' English reading comprehension. *Computers & Education*, *54*(2), 436-445. doi:10.1016/j.compedu.2009.08.027

Lo, J.-J., Yeh, S.-W., & Sung, C.-S. (2013). Learning paragraph structure with online annotations: An interactive approach to enhancing EFL reading comprehension. *System, 41*(2), 413-427. doi:10.1016/j.system.2013.03.003

Lomicka, L. (1998). To gloss or not to gloss: An investigation of reading comprehension online. *Language Learning and Technology*, *1*(2), 41-50. Retrieved from http://llt.msu.edu/vol1num2/article2/default.html

Long, M. H. (1985). Input and second language acquisition theory. In S. Gass and C. Madden (Eds.) *Input in second language acquisition* (pp. 377-393). Rowley: Newbury House.

Lu, J., & Deng, L. (2012). Reading actively online: An exploratory investigation of online annotation tools for inquiry learning. *Canadian Journal of Learning and Technology*, *38*(3), 1-16. Retrieved from http://www.cjlt.ca/index.php/cjlt/article/view/677/349

Lu, J., & Deng, L. (2013). Examining students' use of online annotation tools in support of argumentative reading. *Australasian Journal of Educational Technology, 29*(2), 161-171. Retrieved from http://ascilite.org.au/ajet/submission/index.php/AJET/article/view/159/49

Macaro, E. (1997). *Target language, collaborative learning and autonomy*. Clevedon: Multilingual Matters.

Mackey, A., & Gass, S. M. (2005). *Second language research: Methodology and design*. Mahwah: Lawrence Erlbaum.

Malloy, J. A., & Gambrell, L. B. (2010). The contribution of discussion to reading comprehension and critical thinking. In A. McGill-Franzen, & R. L. Allington (Eds.) *Handbook of reading disabilities research* (pp. 253-262). New York: Routledge.

Marshall, C. C. (2010). *Reading and writing the electronic book*. San Rafael: Morgan & Claypool Publishers.

McElvain, C. M. (2010). Transactional literature circles and the reading comprehension of English learners in the mainstream classroom. *Journal of Research in Reading*, *33*(2), 178-205. doi:10.1111/j.1467-9817.2009.01403.x

Mendenhall, A., & Johnson, T. E. (2010). Fostering the development of critical thinking skills, and reading comprehension of undergraduates using a Web 2.0 tool coupled with a learning system. *Interactive Learning Environments*, *18*(3), 263-276. doi:10.1080/10494820.2010.500537

Mendenhall, A., Kim, C., & Johnson, T. E. (2011). Implementation of an online social annotation tool in a college English course. In D. Ifenthaler, P. Isaias, J. M. Spector, P. Kinshuk & D. Sampson (Eds.), *Multiple perspectives on problem solving and learning in the digital age* (pp. 313-323). New York: Springer.

Meyer, B. J., & Poon, L. W. (2001). Effects of structure strategy training and signaling on recall of text. *Journal of Educational Psychology*, *93*(1), 141-159. doi: 10.1037/0022-0663.93.1.141

Ministry of Education. (2001) *General guidelines of grades 1-9 curriculum for elementary and junior high school education*. Retrieved from http://www.fhjh.tp.edu.tw/eng_www/G1-9%20curriculum.doc

Murphy, P. (2007). Reading comprehension exercise online: The effect of feedback, proficiency and interaction. *Language Learning & Technology*, *11*(3), 107-129. Retrieved from http://llt.msu.edu/vol11num3/murphy/default.html

Murphy, P. (2010). Web-based collaborative reading exercises for learners in remote locations: the effects of computer-mediated feedback and interaction via computer-mediated communication. *ReCALL*, *22*(2), 112-134. doi:10.1017/S0958344010000030

Nation, I. S. P. (2001). *Learning vocabulary in another language*. Cambridge: Cambridge University Press.

National Reading Panel. (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction*. Retrieved from http://www.pbs.org/teacherline/courses/rdla155/pdfs/c2s5_11teachingchildren.pdf

Nokelainen, P., Miettinen, M., Kurhila, J., Floréen, P., & Tirri, H. (2005). A shared document-based annotation tool to support learner-centred collaborative learning. *British Journal of Educational Technology*, *36*(5), 757-770. doi:10.1111/j.1467-8535.2005.00474.x

Novak, E., Razzouk, R., & Johnson, T. E. (2012). The educational use of social annotation tools in higher education: A literature review. *The Internet and Higher Education*, *15*(1), 39-49. doi:10.1016/j.iheduc.2011.09.002

Nunan, D. (1992). *Collaborative language learning and teaching*. Cambridge: Cambridge University Press.

O'Bryan, A. (2008). Providing pedagogical learner training in CALL: Impact on student use of language-learning strategies and glosses. *CALICO Journal*, *26*(1), 142-159. doi:10.11139/cj.26.1.142-159

Ortega, L. (2007). Meaning L2 practice in foreign language classrooms: A cognitive-interactionist SLA perspective. In R. M. DeKeyser (Ed.), *Practice in second language: Perspectives from applied linguistics and cognitive psychology* (pp. 180-207). New York: Cambridge University Press.

Ortega, L. (2009). *Understanding second language acquisition*. London: Hodder Education.

Oxford, R. L. (1997). Cooperative learning, collaborative learning, and interaction: Three communicative strands in the language classroom. *The Modern Language Journal*, *81*(4), 443-456. doi:10.1111/j.1540-4781.1997.tb05510.x

Park, H. R., & Kim, D. (2011). Reading-strategy use by English as a second language learners in online reading tasks. *Computers & Education*, *57*(3), 2156-2166. doi:10.1016/j.compedu.2011.05.014

Park, J. B. & D-team. (2012). *Does it matter if the teacher is there?: The teacher's contribution to emerging patterns of interactions in online classroom discussions.* Paper presented at the 2012 Literacy Research Association. San Diego, California.

Partnership for 21st Century Skills (2009). *Framework for 21st Century Learning*. Retrieved from http://www.p21.org/index.php?option=com_content&task=view&id=254&Itemid=120

Peters, E. (2007). Manipulating L2 learners' online dictionary use and its effect on L2 word retention. *Language Learning & Technology*, *11*(2), 36-58. Retrieved from http://llt.msu.edu/vol11num2/peters

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon*, *9*(5), 1-6. Retrieved from http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf

Pulido, D. (2009). Vocabulary processing and acquisition through reading: Evidence for the rich getting richer. In Z. Han & N. J. Anderson (Eds.), *Second language reading research and instruction: Crossing the boundaries* (pp. 65-82). Ann Arbor: University of Michigan Press.

Qian, D. D. (1999). Assessing the roles of depth and breadth of vocabulary knowledge in reading comprehension. *Canadian Modern Language Review*, *56*(2), 282-308. doi:10.3138/cmlr.56.2.282

Quade, A. M. (1996). *An assessment of retention and depth of processing associated with notetaking using traditional pencil and paper and an on-line notepad during computer-delivered instruction*. Paper presented at the proceedings of selected research and development presentations at the 1996 national convention of the Association for Educational Communications and Technology 18th, Indianapolis, IN.

Rahmani, M., & Sadeghi, K. (2011). Effects of note-taking training on reading comprehension and recall. *Reading Matrix*, *11*(2), 116-128. Retrieved from http://www.readingmatrix.com/articles/april_2011/rahmani_sadeghi.pdf

Raphael, T. E., & McMahon, S. I. (1994). Book club: An alternative framework for reading instruction. *The Reading Teacher*, *48*(2), 102-116.

Razon, S., Turner, J., Johnson, T. E., Arsal, G., & Tenenbaum, G. (2012). Effects of a collaborative annotation method on students' learning and learning-related motivation and affect. *Computers in Human Behavior, 28*(2), 350-359. doi:10.1016/j.chb.2011.10.004

Rodrigo, V., Krashen, S., & Gribbons, B. (2004). The effectiveness of two comprehensible-input approaches to foreign language instruction at the intermediate level. *System*, *32*(1), 53-60. doi:10.1016/j.system.2003.08.003

Roy, D., Brine, J., & Murasawa, F. (2014). Usability of English note-taking applications in a foreign language learning context. *Computer Assisted Language Learning*, (ahead-of-print), doi: 10.1080/09588221.2014.889715

Sauro, S. (2009). Computer-mediated corrective feedback and the development of L2 grammar. *Language Learning & Technology, 13*(1), 96-120. Retrieved from http://llt.msu.edu/vol13num1/sauro.pdf

Sadler, R. (2007). Computer-mediated communication and a cautionary tale of two cities. *CALICO Journal*, *25*(1), 11-30. doi:10.11139/cj.25.1.11-30

Schmitt, N., Jiang, X., & Grabe, W. (2011). The percentage of words known in a text and reading comprehension. *The Modern Language Journal*, *95*(1), 26-43. doi:10.1111/j.1540-4781.2011.01146.x

Scott, V. M. & Huntington, J. A. (2007). Literature, the interpretive mode, and novice learners. *The Modern Language Journal, 91*(1), 3-14. doi:10.1111/j.1540-4781.2007.00506.x

Shea, V. (1994). *Netiquette*. San Francisco: Albion Books.

Shehadeh, A. (2011). Effects and student perceptions of collaborative writing in L2. *Journal of Second Language Writing, 20*(4), 286-305. doi:10.1016/j.jslw.2011.05.010

Shelton-Strong, S. J. (2012). Literature circles in ELT. *ELT Journal, 66*(2), 214-223. doi:10.1093/elt/ccr049

Shih, M. (1992). Beyond comprehension exercises in the ESL academic reading class. *TESOL Quarterly, 26*(2), 289-318. doi:10.2307/3587007

Simpson, M. L., & Nist, S. L. (1990). Textbook annotation: An effective and efficient study strategy for college students. *Journal of Reading, 34*(2), 122-129.

Slotte, V., & Lonka, K. (1999). Review and process effects of spontaneous note-taking on text comprehension. *Contemporary Educational Psychology, 24*(1), 1-20. doi:10.1006/ceps.1998.0980

Stanovich, K. E. (1980). Toward an interactive-compensatory model of individual differences in the acquisition of literacy. *Reading Research Quarterly, 16*(1), 32-71.

Storch, N. (2005). Collaborative writing: Product, process, and students' reflections. *Journal of Second Language Writing, 14*(3), 153-173. doi:10.1016/j.jslw.2005.05.002

Su, A., Yang, S. J., Hwang, W.-Y., & Zhang, J. (2010). A Web 2.0-based collaborative annotation system for enhancing knowledge sharing in collaborative learning environments. *Computers & Education, 55*(2), 752-766. doi:10.1016/j.compedu.2010.03.008

Swain, M. (1993). The output hypothesis: Just speaking and writing aren't enough. *Canadian Modern Language Review, 50*(1), 158-164.

Swain, M. (2000). The output hypothesis and beyond: Mediating acquisition through collaborative dialogue. In J. Lantolf (Ed.), *Sociocultural theory and second language learning* (pp. 97-114). Oxford: Oxford University Press.

Swain, M. (2001). Integrating language and content teaching through collaborative tasks. *Canadian Modern Language Review, 58*(1), 44-63. doi:10.3138/cmlr.58.1.44

Swain, M. (2006). Languaging, agency and collaboration in advanced second language learning. In H. Byrnes (Ed.), *Advanced language learning: The contribution of Halliday and Vygotsky* (pp. 95-108). London: Continuum.

Swain, M., & Lapkin, S. (1998). Interaction and second language learning: Two adolescent French immersion students working together. *The Modern Language Journal*, *82*(3), 320-337. doi:10.1111/j.1540-4781.1998.tb01209.x

Taylor, A. M. (2006). The effects of CALL versus traditional L1 glosses on L2 reading comprehension. *CALICO journal*, *23*(2), 309-318. doi:10.11139/cj.23.2.309-318

Taylor, A. M. (2009). CALL-based versus paper-based glosses: is there a difference in reading comprehension?. *CALICO Journal*, *27*(1), 147-160. doi:10.11139/cj.27.1.147-160

Taylor, A. M. (2013). CALL versus paper: In which context are L1 glosses more effective?. *CALICO Journal*, *30*(1), 63-81. doi:10.11139/cj.30.1.63-81

Thorne, S. L. (2003). Artifacts and cultures-of-use in intercultural communication. *Language Learning & Technology*, *7*(2), 38-67. Retrieved from http://www.llt.msu.edu/vol7num2/pdf/thorne.pdf

Trabasso, T., & Bouchard, E. (2002). Teaching readers how to comprehend text strategically. In C. C. Block & M. Pressley (Eds.), *Comprehension instruction: Research-based best practices* (pp. 176-200). New York: The Guilford Press.

Tsai, T. F., & Wu, Y. (2010). Effects of note-taking instruction and note-taking languages on college EFL students' listening comprehension. *New Horizons in Education*, *58*(1), 120-132.

Tsai, Y. R. & Talley, P. C. (2013). The effect of a course management system (CMS)-supported strategy instruction on EFL reading comprehension and strategy use, *Computer Assisted Language Learning* (ahead-of-print), doi:10.1080/09588221.2012.757754

Tsui, A. B. (1996). Reticence and anxiety in second language learning. In K. Bailey & D. Nunan (Eds.), *Voices from the language classroom*, (pp. 145-167). Cambridge: Cambridge University Press.

Van Gelderen, A., Schoonen, R., De Glopper, K., Hulstijn, J., Simis, A., Snellings, P., & Stevenson, M. (2004). Linguistic knowledge, processing speed, and metacognitive knowledge in first-and second-language reading comprehension: A componential analysis. *Journal of Educational Psychology*, *96*(1), 19-30. doi:10.1037/0022-0663.96.1.19

Vannestål, M. E., & Lindquist, H. (2007). Learning English grammar with a corpus: Experimenting with concordancing in a university grammar course. *ReCALL*, *19*(3), 329-350. doi:10.1017/S0958344007000638

Vogler, J. S., Schallert, D. L., Park, Y., Song, K., Chiang, Y. H. V., Jordan, M. E., Lee, SoonAh, Cheng, A. C. J., Lee, J. E., Part, J. B. & Sanders, A. J. (2013). A microgenetic analysis of classroom discussion practices: How literacy processes intermingle in the negotiation of meaning in an online discussion. *Journal of Literacy Research*, *45*(3), 211-239. doi:10.1177/1086296X13499846

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge: Harvard University Press.

Warschauer, M. (1997). Computer-mediated collaborative learning: Theory and practice. *The Modern Language Journal*, *81*(4), 470-481. doi:10.1111/j.1540-4781.1997.tb05514.x

Warschauer, M., & Healey, D. (1998). Computers and language learning: An overview. *Language Teaching, 31*(2), 57-71. doi:10.1017/S0261444800012970

Wen, J. R., & Shih, W. L. (2008). Exploring the information literacy competence standards for elementary and high school teachers. *Computers & Education*, *50*(3), 787-806. doi:10.1016/j.compedu.2006.08.011

Wenden, A. (1991). *Learner strategies for learner autonomy: Planning and implementing learner training for language learners*. New York: Prentice Hall.

Wigglesworth, G., & Storch, N. (2009). Pairs versus individual writing: Effects on fluency, complexity and accuracy. *Language Testing, 26*(3), 445-466. doi:10.1177/0265532209104670

Wilson, K. (1999). Note-taking in the academic writing process of nonnative speaker students: Is it important as a process or a product?. *Journal of College Reading and Learning, 29*(2), 166-179.

Wolf, D. F. (1993). A comparison of assessment tasks used to measure FL reading comprehension. *The Modern Language Journal*, *77*(4), 473-489. doi:10.1111/j.1540-4781.1993.tb01995.x

Wolfe, J. L. (2008). Annotations and the collaborative digital library: Effects of an aligned annotation interface on student argumentation and reading strategies. *International Journal of Computer-Supported Collaborative Learning, 3*(2), 141-164. doi:10.1007/s11412-008-9040-x

Wolfe, J. L., & Neuwirth, C. M. (2001). From the margins to the center: The future of annotation. *Journal of Business and Technical Communication*, *15*(3), 333-371. doi: 10.1177/105065190101500304

Xu, J. (2010). Using multimedia vocabulary annotations in L2 reading and listening activities. *CALICO Journal, 27*(2), 311-327. doi:10.11139/cj.27.2.311-327

Yang, C. C., Tseng, S. S., Shih, W. C., & Liang, T. (2012). A Cross-Text annotation sharing mechanism for enhancing students' comprehension of poetry. *Turkish Online Journal of Educational Technology-TOJET, 11*(4), 13-24. Retrieved from http://www.tojet.net/articles/v11i4/1142.pdf

Yang, J. C., & Akahori, K. (2000). A discourse structure analysis of technical Japanese texts and its implementation on the WWW. *Computer Assisted Language Learning*, *13*(2), 119-141. doi:10.1076/0958-8221(200004)13:2;1-D;FT119

Yang, S. J., Zhang, J., Su, A. Y., & Tsai, J. J. (2011). A collaborative multimedia annotation tool for enhancing knowledge sharing in CSCL. *Interactive Learning Environments*, *19*(1), 45-62. doi:10.1080/10494820.2011.528881

Yang, X., Yu, S., & Sun, Z. (2013). The effect of collaborative annotation on Chinese reading level in primary schools in China. *British Journal of Educational Technology*, *44*(1), 95-111. doi:10.1111/j.1467-8535.2011.01277.x

Yang, Y. F., & Hung, Y. C. (2008). The impact of externalizing readers' mental representation on the comprehension of online texts. *Educational Technology & Society*, *11* (4), 246-264. Retrieved from http://www.ifets.info/journals/11_4/18.pdf

Yanguas, I. (2009). Multimedia glosses and their effect on L2 text comprehension and vocabulary learning. *Language Learning & Technology*, *13*(2), 48-67. Retrieved from http://llt.msu.edu/vol13num2/yanguas.pdf

Yoshii, M. (2006). L1 and L2 glosses: Their effects on incidental vocabulary learning. *Language Learning & Technology, 10*(3), 85-101. Retrieved from http://llt.msu.edu/vol10num3/yoshii/default.html

Yu, L. T. (2006).The discussion of collaborative teaching in the primary school: A case of Hsinchu municipal Jiadong Primary School. *The Elementary Education Journal*, *53*(3), 34-40.

Yu, L. T., Liou, H. C., Chang, J. S., & Vongpumivitch, V. (2011). Integrating concordancing into vocabulary learning for EFL primary school students. *English Teaching & Learning*, *35*(1), 47-84.

Zhang, S., & Duke, N. K. (2008). Strategies for Internet reading with different reading purposes: A descriptive study of twelve good Internet readers. *Journal of Literacy Research*, *40*(1), 128-162. doi:10.1080/10862960802070491

Zoghi, M., Mustapha, R., Maasum, T., & Mohd, N. R. (2010). Collaborative strategic reading with university EFL learners. *Journal of College Reading and Learning*, *41*(1), 67-94.

Vita

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