EVALUATION OF THE EFFECTIVENESS OF THREE INSTRUCTIONAL MODALITIES FOR BEST PRACTICES OF MILITARY TRAINING AND EDUCATION

A Dissertation

Presented to the Faculty of the College of Education

of Trident University International

in Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy in Educational Leadership

by

DANIEL R. MANRIQUE

Cypress, California

2015

(Defended January 30, 2015)

Approved by:

Office of Academic Affairs

Date: February 13, 2015

Dean: Dr. Holly Orozco

Director, PhD Program: Dr. Wenling Li

Committee Chair: Dr. Heeja Kim

Committee Member: Dr. Wenling Li

Committee Member: Dr. Liston Bailey

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

TUI UNIVERSITY
COLLEGE OF EDUCATION
CYPRESS, CA 90630

EVALUATION OF THE EFFECTIVENESS OF THREE INSTRUCTIONAL MODALITIES FOR BEST PRACTICES OF MILITARY TRAINING AND EDUCATION

This dissertation, written by

Daniel R. Manrique

BIOGRAPHICAL SKETCH

Daniel Robert Manrique was born in Venezuela and attended College in Kansas City, Missouri, USA, and in Giessen, Germany. He earned a Bachelor of Arts degree in Mathematics from Thomas Edison State College (1995) in New Jersey. In 2009 Daniel graduated summa cum Laude with a Masters of Arts degree in Education, then completed a Master of Health Science in Emergency Management (2010) from Trident University International.

Professionally, Daniel is a military veteran that has worked as a Commissioned Officer in the United States Army with a specialty in Nuclear Weapons Counter Proliferation. Over his years of service, he has also been an Air Defense Artillery Officer, International Project Manager, and has served as Assistant Professor of Military Science for the University of Puerto Rico and the University of Central Florida.

Daniel possesses more than 24 years of professional experience in federal service which includes leading US delegations in Diplomatic missions, serving as an International Observer in Emergency Management exercises, and training personnel from allied forces in a variety of disciplinary military fields.

DEDICATION

I dedicate this dissertation and my Doctoral degree to my mother Maria Teresa and to all my family. My mother has always been a hard worker, a role model and a dedicated source of support and motivation, overcoming many obstacles throughout her life to ensure her five children were successful. Finally, I special thanks all my family for the unconditional love, support and encouragement that continuously provide me, they have been the inspiration which impulse me to achieve all my goals and specially this important goal in my life.

ACKNOWLEDGEMENTS

I want to express my deepest appreciation to my committee's chair, Dr. Heeja Kim who patiently provided outstanding guidance, recommendations, mentoring and encouragement; she, was always available and generous with her time and made me feel confident at all times by sharing her positive attitude, advice and expertise which kept me motivated to achieve my ultimate dissertation goal. I also want to express a special thanks to my committee's members; Dr. Wenling Li and Dr. Liston Bailey whom provided a thoughtful and challenging questioning, valuable suggestions and careful reviews of my work. Additionally, I would like to thank Mister Walton Morris, Senior Instructor for the Defense Support to Civil Authorities course for his support and cooperation. Dr. Michael Wesolek for his mentoring and guidance, Dr. Heidi Sato for her support during the Institutional Review Process and lastly to all the faculty and staff from TUI University who guided and provided me with all necessary support from the earlier stage of the program thru the dissertation phase.

Finally, I really appreciate all support that I received from every individual that assisted and helped me during the critical steps for completing this dissertation, to include Dr. Sara Brady and Ms. Jody Woodson for assistance with statistical analyses, and Dr. Rev. Vijaya Channahsorah for editing and proofreading.

Thank you!

TABLE OF CONTENTS

Page

Page

Page

Page

LIST OF TABLES

Page

Page

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

The following terms are defined for the purposes of clarity and understanding in reading this study:

AAR -	After Action Report
AC -	Active Component. Service components on active duty; Army, Navy, etc., as differentiated from the Reserve Component (RC)
ADL-	Advanced Distributed Learning
AR -	Army Regulation, a Department of the Army publication
ARNG-	Army National Guard
BCA-	Budget Control Act
CBRNE-	Chemical, Biological, Radiological, Nuclear, [High Yield] Explosive
CERFP-	CBRNE Enhanced Response Force Packages
CD-	Civil Defense
CONPLAN-	Concept Plan
CRS-	Congressional Research Service
DA PAM-	Department of the Army Pamphlet
DCO-	Defense Coordinating Officer
DHS-	Department of Homeland Security
DOD-	Department of Defense
DOMS-	The Director Of Military Support.
DSCA-	Defense Support of Civil Authorities, formerly called Military Assistance to Civil Authorities.
EM-	Emergency Management; Emergency Manager(s)

EMAC-	Emergency Management Assistance Compact, a program of support involving state-to-state mutual aid. (Website: www.emacweb.org).
EMD-	Emergency Management Director (Parish - PEMD, State - SEMD)
EOC-	Emergency Operations Center
EPLO-	Emergency Preparedness Liaison Officer (DOD 3025.16 establishes policy for EPLOs. Each service manages its own pool of EPLOs.).
ESF-	Emergency Support Function, as described in federal plans (NRP, and NRF)
FCO-	Federal Coordinating Officer
FEMA-	Federal Emergency Management Agency
FM-	Field Manual, a Department of the Army doctrine publication
FOUO-	For Official Use Only, a document classification indicating that the contents are not open to the public at large.
FRP-	Federal Response Plan (published by FEMA in April 1992)
FY-	Fiscal Year
HD-	Homeland Defense
HS-	Homeland Security
IRB-	Institutional Review Board
LNO-	Liaison Officer
MOOTW-	Military Operations Other Than War
MTT-	Mobil Training Team
NEMA-	National Emergency Management Association
NG-	National Guard

NRF-	National Response Framework
NRP-	National Response Plan
NSEP-	National Security Emergency Preparedness Planning
QDR-	Quadrennial Defense Review
USARNORTH-	U.S. Army North, a headquarters unit, formerly Fifth Army, now assigned under U.S. NORTHCOM with a domestic disaster response mission.
VTC-	Video Teleconferencing

EVALUATION OF THE EFFECTIVENESS OF THREE INSTRUCTIONAL MODALITIES FOR BEST PRACTICES OF MILITARY TRAINING AND EDUCATION

ABSTRACT

Trident University International 2015

This study examined three different instructional delivery modalities in order to identify the best practices for training and education of military personnel from the Department of Defense (DOD) in preparation for supporting civilian authorities during emergencies, disasters, and catastrophic events. This quantitative research sought to identify the best practices for military education recognizing the instructional delivery that results in the highest student academic performance and the highest level of personal learning satisfaction in order to identify program effectiveness and maximize the use of educational budget for DOD.

The population for this research study consisted of nine hundred students (n=900), divided into three groups of 300 students who graduated from the US Army North (USARNORTH) training program for Defense Support to Civil Authorities (DSCA) course level II, conducted from 2012 to 2014. Each group was composed of five courses of 60 students each who have completed the Defense Support to Civilian Authorities (DSCA) program via one of the three instructional delivery methods: face-to-face instruction, n=300; digital instruction, n=300; or web-based instruction, n=300. This study used secondary data collected from 2012 to 2014 from students' academic final grades and satisfaction survey feedback to identify the best instructional methodology. The finding after conducting all statistical analyses reveled that in fact the overall, type of instruction significantly affected participants' reported course satisfaction and course success, even when controlling for educational level, branch of service, gender, and instructor teaching experience. Based upon the findings, participants who received

face to face instruction had higher course success (final grades) than did participants who had web-based and digital instruction. Participants who had face-to-face instruction also reported higher course satisfaction than did participants who had web-based and digital instruction. When examining the differences between digital and web-based instruction, parametric and nonparametric findings suggests that when controlling for demographic covariates, participants who had web-based instruction were more likely to report higher satisfaction responses than were participants who had digital instruction. However, the results were mixed between web-based and digital instruction for course success. Finally, the results of this study provide a better understanding of the most effective instructional approach and practical contributions that could improve current military education modalities and enhance instruction delivery by supporting face to face education as the instructional method that provides a higher level of students 'success and satisfaction which can be used to justify allocation of funds and resources for educational programs for DOD which is currently impacted by a ten-year cut in spending due to caps instituted by the Budget Control Act (BCA) of 2011 (Quadrennial Defense Review (QDR2014).

CHAPTER 1

INTRODUCTION

This chapter describes this research study and identifies the three different instructional methods: face to face, digital instruction, and web based, that were analyzed. Additionally, this chapter identifies previous studies conducted to address students' success and students' satisfaction in different settings, in addition to the impact that new technologies have had on the way that students interact with instructors and classmates. Finally, the chapter defines the Problem Statement that led to the research questions and explains the importance and benefits of conducting this analysis, as well as how the results contribute to the academic body of knowledge.

Academic leaders in the United States have indicated that the effectiveness of face-to-face and online education is critical to students' success and satisfaction (Allen & Seaman, 2008; Allen & Seaman, 2010). According to previous studies, online learning does not differ considerably from traditional face to face classroom learning in terms of learning outcomes (Allen & Seaman, 2010; Allen, Bourhis, Burrell, & Mabry, 2002; Biner, Bink, Huffman, & Dean, 1997; Brown & Liedholm, 2002; Johnson, 2014). In addition, student satisfaction with online learning programs is comparable to face-to-face instruction (Allen & Seaman, 2010).

In recent years, online learning has emerged as a viable alternative to conventional, in-person instruction (Bernard et al. 2004b; Larreamendy-Joerns & Leinhardt 2006; Tallent-Runnels et al. 2006). As a subset of distance education (a much larger form of instruction), online learning has become the method-of-choice for numerous institutions to provide students with the opportunity and convenience of learning from a distance (Simonson et al. 2003; Moore & Kearsley 2005). Due, to recent advances in Internet-based technologies, what was once

considered a sub-standard substitute for traditional classroom instruction has become a part of mainstream education in the 21st century (Moore 2003; Moore & Kearsley 2005).

Evidence of the tremendous growth in online learning was not difficult to find; for example, the U.S. Department of Defense (an organization that spends more than $17 billion annually on military training), recently committed to the development of the Advanced Distributed Learning (ADL) network to support distance learning. The ADL initiative is designed to capitalize on the capabilities of computer technology to make education and training available to students' success and satisfaction are important indicators of the quality of learning experiences (Moore & Kearsley, 1996; Yukselturk & Yildirim, 2008).

Rationale for the Research

It was worthwhile to conduct this investigation on student success and satisfaction in educational settings because the academic outcomes are a direct result of the level of motivation and satisfaction produced by a particular educational program. In addition, the way that new technologies altered the approach that students take in interacting with instructors and classmates (Kaminski, Switzer, and Gloeckner, 2009), also has an impact on education and academic results.

Moreover, the Department of Defense is also facing changes and equally uncertain fiscal environment. Beginning with the Fiscal Year (FY) 2012 appropriations, the DOD began absorbing significant impacts to the $487 billion, ten-year cut in spending due to caps instituted by the Budget Control Act (BCA) of 2011. The BCA also instituted a sequestration mechanism requiring cuts of about $50 billion annually in programs. Information about these impacts is important for institutions operating in highly competitive markets needing to identify cost effective ways of delivering high quality education.

This study used a quantitative research method to explore military student success and personal satisfaction after completing the DSCA certification course. The DSCA certification course is intended for DOD civilian and military personnel to obtain official qualification as Defense Support to Civil Authorities Specialist and the results of this study were intended to help improving military instructional learning for the DSCA course and any other military course with similar setting structure.

Although many cases have been studied and published serving as guidelines for comparing face-to-face and distance learning education, there are only a limited number of studies that have compared face-to-face to distance learning instruction divided into the two modalities of web-based and digital instruction. (Web-based instruction and digital instruction are defined in Chapter 2). Most of these comparative studies examined only two modalities and focus only on the relationships between two variables: face-to-face and on line instruction.

In order to gain a better understanding of which instructional modality resulted in higher learning success and what was the optimal method of synchronous and asynchronous events that supported learning satisfaction, this study used student feedback on perceived best practices to explore and compare their academic performance across three different instructional delivery methods and practices. Moreover, students' personal perceptions provided insight into their level of satisfaction, which represented valuable data leading to improved learning experiences (Hirumi, 2005).

The results of this study also offer important contributions to the academic body of knowledge regarding learner-centered practices in a technical training learning environment. Additionally, military training for emergency management and other career fields might also

benefit from considering the results of this study and implementing the most effective learning delivery method to their programs.

The current DSCA course selected for this study was designed based upon progressive and constructivist principles. Both methods complement each other and served as an excellent background for the DOD forces looking to aid the civilian population in times of national crisis. The course was mainly delivered in a resident setting and offered throughout the United States, conducted by a Mobile Training Team (MTT) via face-to-face instruction, digital instruction, or web-based.

The use of a quantitative research methodology was highly deductive in that it tested theories through statistical analysis using structured data in the form of numbers (Simon, 2005); additionally, the advantage of using a quantitative research design was that it allows an excellent way of accepting or rejecting a hypothesis, which are presented in Chapter 2. The quantitative analysis took external factors into account, and, as the study was properly designed, the results were considered valid and unbiased.

This study used secondary data that consisted of a population divided into three groups of 300 students (n=900), graduated from the DSCA level II courses, conducted from 2012 to 2014. These data were initially collected by USARNORTH and were used only to assess the courses' outcome for institution internal assessments; until this point the data had not been applied in any other study to compare the three different instructional delivery methods. Therefore, in this study, the secondary data provided by USARNORTH was used for the first time to identify students' success and personal satisfaction from personnel who have graduated from DSCA courses as well. Additionally, the survey used for this study was also developed by USARNORTH, and there were not sub-scale instruments that needed to be validated.

The United States military understands the importance of information communication technology (ICT) in education, which has rapidly been changing in terms of methods for acquiring, experiencing, and sharing knowledge as a response to a continually changing environment. The military had been directed by the senior DOD leadership to consider the insertion of emerging training technologies into military training and education as means to quickly reshape the workforce (Shuford, et al., 2007). In addition, due to a need to reduce costs, the United States' military training infrastructure has been experiencing challenges related to the implementation of minimal staffing, the integration of complex combat systems, and reduced time-to-train, which required new approaches and instructional methods to be developed.

The role of the U.S. DOD forces understanding the requirements presented above were also expanded to the federal functions in an effort to support disaster incident response. This participation of DOD has always been the last resort because the commitment of military resources to missions inside our territory detracts from national defense, the constitution, and federal legislation limit operations of federal armed forces on domestic soil. However, federal incident management response to a state's request for assistance can include participation of DOD resources. The DOD participation in incident management is called Military Support to Civil Authorities (MSCA). In civilian circles, DOD support is called Defense Support to Civil Authorities (DSCA); both are the same concept. Ultimately, all DOD's support for disaster response is temporary, with the end state or goal to transfer all emergency functions back to civilian authorities.

Problem Statement

Student success and satisfaction are considered important factors in measuring the quality of education. This research study sought to identify if there were any significant difference in

student success and student satisfaction after completing the same training and education program using one of the following delivery methods: via digital instruction, face-to-face, or web based education. Understanding the factors that lead to high levels of students' success and satisfaction help improve the quality of educational programs at all levels and this was conducted by examination of student academic results and level of satisfaction as a primary means of information to assess an effective education program. The DOD over the past 13 years has increased its emphasis on the education and training of service members in all areas related to military operations; additionally (Defense Budget Priorities and Choices-Fiscal Year 2014), as a result of the terrorist events that took place in the United States on September 11, 2001, the training for emergency management response to support the Department of Homeland Security (DHS), in the form of the DOD Support to Civilian Authorities (DSCA), took on a very important role as well.

Prior to this research, the researcher did not find any comparative study using the DSCA course to validate any type of instructional method, leading to conclude that there was little empirical research on the training value and the impact of DSCA courses as implemented in a military institutional classroom setting. However, information provide to DSCA students in the course syllabus identifies that the DSCA course program has made some changes to several factors (variables) to improve the quality of instruction, such as classroom organization, fixed time length of instructional periods of training, skill levels, years of teaching experience of current instructors to serve as course facilitators and lecturers, and student to instructor ration (which is 60:1). These variables may have an impact on the applicability and effectiveness of the particular instructional method.

Notwithstanding, due to the challenges that our global economy has been facing during recent years, resulting in limited budget funding for the military with the current economic climate, it is critical that every dollar spent reaps the highest return on investment. Since there were multiple instructional methods currently in use and with a shortage of financial resources available, it was very important to identify the most effective instructional method in order to implement it as part of a solution to the current budgetary, financial, and educational quality challenges. Improving the training and instructional approaches would support better learning outcomes in military organizations. Current economic conditions and changes in the academic marketplace, as well as DOD requirements, are causing institutions to consider restructuring their academic programs.

Although often necessary, the majority of these changes are never easy to implement and good supporting evidence of empirical research is needed to serve as a solid foundation for justifying changes to teaching approaches and processes. Some of the changes or adjustments are sometimes forced by a reduction in faculty positions, scarce resources, the program's reputation, and shifting priorities. However, for DOD, a failure to properly provide good training and education to service members may lead to higher costs, including the loss of lives and not achieving national objectives.

Previous Army publications have emphasized the importance of multiple instructional strategies and of selecting the best approach based on factors such as course content, training objectives and learner experience (United States Army Training and Doctrine Command - TRADOC Regulation 350-70, 2011). According to Mister Walton Morris, Senior Instructor for the Defense Support to Civil Authorities Course (2014), informed during a course introduction

brief, that meeting face to face is not always possible or not possible as often as desired, due to resource constraints, schedule conflicts, and other factors.

Collaborative technologies are available to communicate and work together as teams at any time. But institutions must become familiar with collaborative technologies in order to communicate effectively with remote experts, team members, and others without expending unnecessary resources during the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) process (TRADOC Regulation 350-70, 2011). As a prime example, the Training and Doctrine Command (TRADOC) Pamphlet 350-70-4, Guide to Army Training and Education Development: Process, Frameworks, Models, and Efficiencies (U.S. Army, 2009) identifies digital instruction (DI) and Program for Complex Instruction PCI as the major models for instruction. These two instructional approaches are briefly described in the following sections.

Novelty-based

This research was designed to be novelty-based which studied the exact one course designed to mirror the same curriculum, but delivered via three different instructional methods and for the first time further dividing distance education into two modalities: digital instruction and web based instruction. In addition, this study was conducted using secondary data that had been previously collected (over a period of two years), which allowed for a larger sample population to compare the three different instructional approaches within the same training curricula for DSCA courses. This study also considered the recent innovations in education which included the use of technology in the two different settings of web-based instruction and digital instruction that, coupled with the desire to serve increasing numbers of students to meet their diverse needs, have challenged many institutions to rethink and expand their delivery

systems beyond traditional in-person or the old paper-based distance learning modalities. As a result of the above consideration, this study deemed it important to know the relationship between the curricular training setting offerings within a military organization and the effectiveness of those offerings in terms of both preparedness (shown through scores/ performance) and in student satisfaction.

Finally, the main goal of this study was to identify with supporting statistical evidence of whether differences existed in student success and satisfaction in digital instruction, face-to-face, and web based instruction by examining select variables. Therefore, the results from this study meaningfully contribute to the body of literature in the field of the effectiveness of different learning modalities. Furthermore, the outcomes of this research could also benefit others interested in comparing instructional delivery formats within traditional education and distance education for both military training and civilian educational programs as well.

Theory-based

The nature of this study was theory based, which used a grounded theory method; consequently, this study also consolidated literature on instructional strategies from the fields of education and the cognitive sciences into a coherent framework that could also be used to enhance the designed military training and education systems. In particular, this study was intended to provide a concise, organized, and practical framework for the selection and implementation of research-based instructional strategies relevant to military training goals. The theory-based instructional method utilized to train and educate military students plays a very important role in the learning process, which for this study helped to identify determinants of student success and personal satisfaction (Reigeluth, 2012). For military personnel, the kinds of learning and educational programs may include cognitive, emotional, social, physical, and

spiritual foundations which are based in instructional theories that are derived from learning, research, and theory.

The significance of this study was directed to contribute to identifying the most effective instructional methods and best instructional practices, as has been stated earlier, and which are essential in the development of cost-effective learning environments by offering a reduced training time (Mackay & Stockport, 2006). It is important to note that these three different instructional methods used in this research had already been studied in both K–12 and higher education with students enrolled in distance learning as well as in traditional courses and that the higher education field is quite comparable to the training in military classes. As a result, this research allowed for the use of military personnel as a new study population where the results supported previous studies on best practices for instructional methods at the higher education level.

The Armed Forces of the United States and DOD agencies may be called upon to provide support for civil local authorities which is called Defense Support of Civil Authorities (DSCA). This concept has evolved over the last decade with a focus for Federal forces to become specifically organized, trained, and equipped for the support of civil authorities (Quadrennial Defense Review, 2014). The U.S. Armed Forces has a historical precedent and enduring role in supporting civil authorities during times of emergency, and this role is codified in the national defense strategy as a primary mission for the Department of Defense.

The nature of Defense Support to Civil Authorities in the United States presents a unique challenge based on the history of the country and the interaction among federal, state, local, territorial, and tribal governments and private and nonprofit organizations. These relationships establish the multiple layers and mutually reinforcing structures throughout the state and

territorial governments for interaction based on the U.S. Constitution as well as on common law and traditional relationships.

The question addressed in this study served to identify the best practices for training and education of military and DOD personnel using material and data from the DSCA course. According to the USARNORTH DSCA literature search conducted by the researcher, there were not records of any previous research study comparing face-to-face, digital, and web-based learning conducted to identify the best instructional method for the DSCA program. Therefore, the DSCA course proponent and leadership might concur with and implement the recommendations indicated by the findings of this study to employ optimal practices in redefining, improving, or sustaining the strategy used conducting their training and education in the areas of emergency management and training certifications to provide support to civilian authorities.

The results of this study could also help educational authorities to a better understanding of instructional best practices and variables that may influence training modalities at other military training facilities by adopting the recommended instructional best practices to support operational effectiveness, creating skilled, motivated, and competent service members.

Promoting instructional best practices is essential for developing and implementing plans for different approaches in learning environments. As a result this research study was designed to compare students' results from the use of one of the three instructional methods individually, as an important note; this study did not evaluate distance education from a blended perspective. Therefore, the criteria for synchronous and asynchronous are restrictively used for each individual modality independently. Additionally, this study used the criteria for interaction and flexibility to compare the instruction modalities to assess the highest level of course success and

course satisfaction for students as is presented in Table 1 which includes the criteria of flexibility and interaction used for analyses of students' success and satisfaction.

Table 1.

Instructional delivery methods conceptual perspectives

Instructional delivery methods.	*Advantage*	*Disadvantage*
"Digital Instruction" Delivered via technology such as video and smart software as VTC, may include live interaction with a teacher. (not blended learning)	Technology allows students to advance at their own pace as they learn. (Some interaction and more flexibility)	Loss of communication skills and the ability for people to interact with each other. (no interaction)
"Face to face" Class setting with direct interaction instructor/student / content in real time, students becomes active and interactive learners content.	Confidentiality, adaptability and students better and able to focus on what it being taught, and interaction with others. (more flexibility and interaction)	Travel to class, schedule is predetermined and not subject to change. Students must shape their personal schedules around classes. (less flexibility)
"Web Based Instruction" e-learning is anywhere, any-time instruction delivered over the internet: synchronous (instructor-facilitated) and asynchronous (self-directed, self-paced). (not blended learning)	Quick access to a vast amount of information presented through a variety of mediums. (some flexibility and no interaction)	Computer is what is doing all the work and not the students and low communication skills and people interaction. (some interaction)

Instructional delivery methods evaluation criteria

- Flexibility- flexible learning is multi-layered and multi-faceted. In its broadest sense, it is a continuum of approaches in terms of time, place, pace, content, and mode of learning applied in varying degrees. Its overarching purpose is to increase opportunities and options available to

learners and give them greater control over their learning through a variety of learning modes and interactions. It is not an alternative mode of education, but rather an overarching driving force that provides the learners greater choice (Casey & Wilson, 2005).

Using a pedagogical philosophy, the researcher intended to test how "flexible learning" is learner-centered and encouraged greater independence and autonomy on the part of the learner. Its ethos is to enable and empower learners, give them greater control of their learning, and help them become more self-directed. It increases choices available to both learners and teachers, resulting in a "blurring of traditional internal/external boundaries" (George & Luke, 1995). Conceptions of flexibility also include flexibility of admissions and enrollment processes and flexibility in assessments as well as assessment times. Introducing flexibility or increasing flexibility was not necessarily 'good' in itself. The key issue was how it impacts student learning and the quality of that learning experience. The goal was to improve learning outcomes and maximized learner engagement using appropriate learning approaches, in accordance with the flexible learning theory.

Defining flexible learning theory included placing learner educational needs and choices as the center of educational decision-making. It signified a shift from locating formal, whole classes, didactic teaching at the center of the learning process towards individuals or group management of learning, through the provision of structured resource materials (Drennan, Kennedy, & Pisarski, 2005). Flexibility is generally understood to mean offering choices in the learning environment so that a course of study better meets the individual needs of learners (Bryant et al., 2003). In the broadest sense, flexible learning is about a learner-centered, rather than an instructor-centered, approach to learning. In a learner-centered approach, technology is an enabler; flexible learning and flexible delivery are used interchangeably (Radcliffe, 2002).

Flexible delivery is a term which signifies the desirable social goals of increasing access to education and democratizing learning processes by giving greater control over learning to learners. It also means an educational environment in which unfettered individuals and choice are the values which ultimately determine the shape of education through the competitive marketing of educational products and processes (Nunan, 1996).

- Interaction- interaction within the purview of this study was defined as form of communication between students and the educational content, which is the relationship that exist between the instructor the learner and educational material. Quality of interaction as well as quantity of interaction between students and instructors are assessed in order to analyze student success and satisfaction within an educational program. Interaction that results in knowledge transfer is the basis of education, interactions between teacher and student, student and student, and student and content (Moore, 1989). In the traditional classroom, the primary mode of interaction was face-to-face dialogue between teacher and student (Anderson, 2003b). As media for online delivery of academic coursework expanded with the evolution of the Internet, the primacy of interaction modes shifted. Delivery of education has evolved into a continuum with traditional face-to-face classes at one end and asynchronous courses conducted entirely online at the other. Along the continuum were different combinations of traditional and online delivery methods that are commonly referred to as blended or hybrid. One noted shift in interaction pattern dynamics is increased importance of student/content interaction in online courses (Bernard, et al., 2009).

Types of interaction, according to Moore (1989), have been identified as: Learner to Content Interaction, Learner to Instructor Interaction, and Learner to Learner Interaction to be the three most common types of interaction in distance learning. In addition, he argues that

interactions are not limited to teacher to student interaction, but also include interactions between (or among) students and other students, and students and content. Learner to teacher interaction is what differentiates self-study from distance education. The instructor provides the learner with an organized plan, or curriculum, for mastering the content and communicates with the learner throughout the process (Kelsey & D'souza, 2004). Learner to learner interactions can take various forms, including group projects and discussion groups. Interestingly, the contribution of learner to learner interactions to the overall effectiveness of distance education in the literature has been mixed.

On the other hand, because interaction with an interface can take on many complex forms within learner to interface interaction, sub dimensions are present. Anderson (1998) introduced the teacher to content interaction, content to content, and teacher to teacher interaction as ways of examining challenges that instructors have with course technology. Teacher-content examines the structure and flexibility of the course. Unlike learner to content, this looks at how teachers connect with each other and use this connection to enhance their comfort in interacting with the course. This element also explores the role that professional development plays in the teaching of online classes. Anderson mentioned teacher-teacher interaction as a way of further enhancing the comfort level, and recommends that teachers attend virtual conferences and other World Wide Web modes of interacting to develop their comfort level with and knowledge of technology.

To compare flexibility and interaction, this study used results from previous survey data conducted by the school house using a quantitative analysis designed to best evaluate the relationships that existed between the dependent student outcome criteria variables (course success measured by the final grades and course satisfaction), and the independent predictor

variable of instructional delivery in the areas of digital instruction, face-to- face instruction, and web-based instruction.

The intent for this study was to conduct a quantitative analysis in order to identify student learning outcomes among the three modes of instructional delivery for an emergency and consequence management course. Additionally, this study also aimed to gain an understanding of what type of instruction produced the most personal satisfaction in terms of the level of expertise acquired.

The effectiveness of digital instruction, face-to-face, and web-based instruction was measured by quantitative analysis using students' academic results summarized in the overall final grades.

The three instructional methods studied in this research are further defined as follows:

a. Digital instruction is instruction delivered via technology, such as video and media software, which offers students a personalized sequence of learning experiences and does not include live interaction with a teacher, is largely asynchronous (Dede, Richards, 2012). The most useful digital instruction has the following characteristics: it aligns units of instruction with the school's curriculum, below and above grade-level standards; it allows advancement at a personalized pace, with repetition until a topic is mastered; it includes frequent assessment of mastery and reports of individual and group learning trends that teachers can use to monitor student learning; it recommends next instructional steps for each student and groups of students, including in-person and digital follow-up; it is accessible to all students, who have software, hardware, and Internet connections; and the application includes analytical, creative, and conceptual thinking units to apply knowledge and skills (Dede, Richards, 2012).

b. Face-to-face instruction can be defined as occurring in a class setting with direct interaction among instructor, students, and content, and involves real-time teaching and learning. It is the lecture and textbook method of instructional delivery where the instructor and a group of learners are physically present in the same classroom. The advantage of this method is that it offers a great level of interaction among students, which allows students to focus on what it being taught and to ask for clarifications from the instructors, if needed. It also includes more flexibility and interaction (Higher Education Journal Vol. 68, 2014). On the other hand, the students must shape their personal schedules around classes, including travelling to class, working around a predetermined schedule, and the inability to change that schedule.

c. Web-based instruction (sometimes called e-learning), is anywhere, anytime instruction delivered using the Internet or a corporate intranet to browser-equipped learners. There are two primary models of web-based instruction: synchronous (instructor-facilitated) and asynchronous (self-directed, self-paced). Instruction can be delivered by a combination of static methods (learning portals, hyperlinked pages, screen cam tutorials, streaming audio/video, and live web broadcasts) and interactive methods (threaded discussions, chats, and desk-top video conferencing) (Rosenberg, 2001).

The main difference between the digital and web-based methods is that web-based learning encompasses all educational interventions that make use of the Internet (or a local intranet), while digital instruction is instruction delivered via technology, such as via video or software that offers students a personalized sequence of learning experiences, and does not include live interaction with a teacher. Digital learning can be viewed as stemming from the older kind of online learning based on DVDs or CDs that institutions would mail to students and have them work through.

Research Question (RQ)

RQ: Is there a statistically significant difference between students' use of the three modes of instructional delivery (digital, face-to-face, and web-based instruction) and student course success and course satisfaction?

Nature of the study

This quantitative research study investigated students' course success and course satisfaction using academic and survey results from a single course delivered in one of the following: via face to face, digital instruction or web based instructional methods in order to compare the outcomes from each delivery method to identify the most effective of the three modalities.

Factors contributing to student satisfaction in learning environments according to Bollinger and Martindale (2004) have identified three key factors central to student satisfaction: instructor, technology, and interactivity, these factors also influence student satisfaction in different learning environments, to include face to face and online learning.

The instructor is the main predictor in course satisfaction, the other two factors served as supporting elements (Finaly-Neumann, 1994; Williams & Ceci, 1997). Student satisfaction is highly correlated with the performance of the instructor, particularly with his or her availability and response time (DeBourgh, 1999; Hiltz, 1993). Instructors must be available for consultation with students and, in addition, must be flexible in teaching that is time and plan independent (M. G. Moore & Kearsley, 1996). The instructor not only becomes a facilitator of learning but also a motivator for the student. The instructor's feedback is the most important factor in satisfaction with instruction (Finaly-Neumann, 1994). To keep learners involved and motivated, feedback on assignments must be given in a timely manner (Smith & Dil-lon, 1999). Communication must be

on a regular basis (Mood, 1995) so as to prevent high levels of frustration among students (Hara & Kling, 2003).

Summary

This research sought to identify the best practices for military education and instructional delivery that results in the highest student course success and highest level of personal learning satisfaction among three different instructional modalities. This study focused in measuring students' success and satisfaction in order to compare three different instructional delivery methods to identify the most effective approach which strived to improve the quality of the student experience and provide recommendations as a contribution to the education system.

Many research studies have compared face-to-face and online settings by using theories from face-to-face classrooms, and some researchers have applied characteristics of collaborative face-to-face learning to the study of online learning; or explored the relationship of "verbal immediacy" in research on face-to- face communications to online communications; this study also used similar characteristics as flexibility and interaction. Weber and Lennon (2007) explored the non-linear nature of asynchronous discussions which can branch into numerous "threads" rather than follow the more linear thread of face-to-face discussions; in addition applied theories from the pre-internet world have been analyzed to study online communications methods and face to face as is presented in the next chapter, Chapter 2.

CHAPTER 2

LITERATURE REVIEW

This chapter presents all relevant literature for this study to fully develop the theoretical background and conceptual framework necessary to better understand this research. It also describes the current state of research findings related to the question that this project sought to address by conducting statistical analyses and investigation. Finally, this chapter describes the complete depiction of the DSCA course; also introduces a theoretical orientation and conceptual framework and presents the formal hypotheses which were based on the literature reviewed for this study.

Intention

The focus of this literature review was to determine if similar research had already been conducted, to gather a wide range of facts and information about the research area for DOD and military training to support civil authorities, and to enrich the researcher's body of knowledge about the different instructional approaches implemented for military training education methods.

Current State of Research Findings

The researcher conducted a comprehensive review of a large selection of material available in both public and government libraries and domains finding several studies available that sought to compare traditional and online courses. This review of literature groups the resulted into relevant subject areas including titles and abstracts which initially generated a list to 174 studies potentially containing relevant information for this study. A careful review of this list resulted in 9 relevant articles included in the current study. The electronic search was supplemented with manual searches of the reference lists from the Training and Doctrine

Command library (TRADOC library 2013): Allen, Bourhis, Burrell, and Mabry (2002); Bernard et al. (2004); Hsu (2003); Olson and Wisher (2002); and Paul (2001). There was also a manual search of the *Journal of Asynchronous Learning Networks* from 1996 to 2014 that contributed an additional 4 studies to the current review.

First, Weber and Lennon (2007) measured the effectiveness of online versus face-to-face course delivery by investigating learning outcomes and satisfaction level of students in the same course being offered in the two formats. Learning outcomes were measured by the final exam, course project, and final course grade. Overall satisfaction included two variables: satisfaction with course and satisfaction with instructor. The researchers found no difference in the achievement of course objectives or learning outcomes, but a slightly lower satisfaction level with students in the online course, which could be attributed to the lack of personal interaction noted by students.

Second, Chickering and Gamson's (1987) seminal work on the principles of *good teaching practice* has influenced web-based delivery systems, such as Blackboard or WebCt, in the design and philosophy of courses. After all, a "good teaching practice" is a good teaching practice whether the classroom is a physical one or an electronic one—a sentiment shared by officials of the NEA (2001), an agency in the process of researching online learning and developing a set of evaluative criteria. The seven principles of good teaching practice outlined by Chickering and Gamson (1987) included the following: (a) encourages contacts between students and faculty, (b) encourages cooperation among students, (c) encourages active learning, (d) gives prompt feedback, (e) emphasizes time on task, (f) communicates high expectations, and (g) respects diverse talents and ways of learning.

Third, Peterson and Bond (2004) studied student achievement and satisfaction by targeting a group of postgraduate students seeking a certificate in secondary education at a public university who took either a course on the teaching of secondary reading or a course on the secondary curriculum. For each course, students chose to enroll in either a face-to-face or online section, with approximately 20 students in each of the four sections. Both types of classes included discussion; online courses accomplished this through an asynchronous discussion board. Student withdrawal rates were not discussed. Performance was assessed based on the quality of a course project. As the study did not randomize students, the researchers attempted to control for potential pre-existing differences between groups by administering a pre-assessment of students' general understanding of the principles underlying the project.

However, the pre-assessment was taken "well into the first half of the semester." Online students scored statistically significantly higher on the pre-assessment; after controlling for this difference, the two groups scored equivalently on the final project. Given the tardiness of the pre-test assessment, it was difficult to interpret the result. Did more-prepared students select into the online course, which was reflected in the pre-test scores? Or did the early weeks of the course prepare online students significantly better in terms of underlying project principles? Even without controlling for their pre-test advantage, however, the online group still scored similarly to the face-to-face group on the post-test, indicating that the online students did not retain their advantage over time. In addition, eight students who had taken both an online and a face-to-face teacher education course from the two participating instructors were interviewed, and all eight felt that the face-to-face course had better prepared them for teaching.

Fourth, Schoenfeld-Tacher, McConnell, and Graham (2001) examined students in an upper-division tissue biology course at a state university. Students chose to enroll in either an

online or face to face version of the course; subsequently, 11 students from the online course and 33 from the face-to-face course agreed to participate in the study. It was not clear whether these volunteers represented a majority of each classroom, a small subset of each classroom, or (given the unequal n) a majority of the face-to-face enrollees and a small subset of the online enrollees. The face to face course included traditional lecture and laboratory sessions; the online course included web-based versions of these materials as well as instructor-led synchronous discussions and voluntary learner-led online review sessions. Student withdrawal rates were not discussed. Learning outcomes were assessed using multiple-choice pre- and post-tests. In an attempt to remove potential selection effects due to the non-randomized design, student pre-test scores were treated as a control in the comparison of the group post-tests. Curiously, however, the pre- and post-test scores were not related (with n2 = 0.000). Pre-test scores were also extremely low, with group averages of 10–15 on a scale that seemed to range to 100 (given that post-test group averages were in the 70-80 range with standard deviations above 10). Accordingly, it seems likely that the multiple-choice pre-test scores represented student random guessing and thus did not capture pre-existing differences between the groups in any substantive way. After controlling for the pre-test, online students showed significantly higher adjusted post-test scores; however, given the ineffectiveness of the pre-test, this result may merely reflect differences between students who chose to enroll in the online versus face-to-face course.

Fifth, across several studies, three showed no statistically significant differences in learning outcomes between the two types of courses (Caldwell, 2006; Davis et al., 1999; La Rose et al., 1998). Another study showed no quantitative differences but noted that qualitatively, students felt they were better prepared by the face-to-face course (Peterson & Bond, 2004). It could be argued that the studies showing no statistically significant effects did so only due to

small sample sizes; however, effect sizes in these studies were also quite small, and descriptively the direction of effects was mixed. For example, in Caldwell (2006) face-to-face students performed slightly better on three of six learning outcomes, while online students performed slightly better on the other three.

DSCA Course Program and Literature Information

The DOD DSCA course educates staff personnel from the U.S. military and other federal agencies in planning, coordinating, executing, and supporting DSCA operations. The course is administered in three distinct phases: Phase I is a distance learning preparatory course; Phase II is mainly a resident course but is also presented in other modalities; and Phase III consists of social media elements, including a Homeland Defense and Civil Support newsletter, a Facebook page, and email updates. The course is sponsored for the DOD by the United States Northern Command and is conducted by United States Army North.

DSCA Course Context

The Defense Support of Civil Authorities (DSCA) Course was created in 2006. The mission of the Defense Support of Civil Authorities Course is to empower military forces, DOD civilians, contractor personnel, and federal agencies and their components to successfully plan, coordinate, execute, and support DSCA operations according to established principles. These principles are based on specific national, state, local, and DOD statutes and directives for the foundation of DOD response to domestic emergencies and designated law enforcement actions.

DSCA Course Mission

The mission of the Defense Support of Civil Authorities Course is to empower military forces, DOD civilians, contractor personnel, and federal agencies and their components to successfully plan, coordinate, execute, and support DSCA operations according to established

principles. These principles are based on specific national, state, local, and DOD statutes, directives, and doctrines to form the foundation for the DOD response to domestic emergencies and designated law enforcement actions.

DSCA Phase I Description

DSCA Phase I represents the online portion of the course and is based upon an instructional system design method using specific terminal learning objectives. This Course is delivered as web based instruction, which for the DSCA program is defined as education anywhere, any-time instruction over the internet asynchronous (self-directed, self-paced). Phase I teaches foundational knowledge required for any DSCA-related position.

The terminal learning objectives are measured through exercises requiring students to apply knowledge learned through the supported enabling learning objectives tied to case studies. It resides on the Joint Knowledge Online Learning Content Management System (JKO LCMS 2014), course number J3ST-US010.

DSCA Phase II Description

This phase is based upon progressive, constructivist principles which includes the material learned during Phase I. This Phase II, offers all the additional components that supplement each constituent of the program and serves as an excellent complement of knowledge for the background of member of the Federal Forces responsible for providing support to civilian population in times of national crisis. As previously mentioned, the DSCA Phase II Course is a resident course offered face to face throughout the country and is led by a mobile training team. Understanding “face to face” instruction as a setting with direct interaction instructor to student and content in real time, where students becomes active and interactive learners’ content.

Additionally, the DSCA course is offered using digital instruction and web based instruction. For the DSCA course program Digital Instruction is defined as instruction delivered via technology such as videos and smart software or VTC and may include live interaction with a teacher or instructors and students (not blended learning; person to person, via video teleconference); on other hand, DSCA course also defines Web Based Instruction, as anywhere, any-time instruction delivered over the internet, or via DVD/CDs asynchronous (self-directed, self-paced).

DSCA course follows the arguments presented by Moore (1989), which has identified the three most common types of interaction in distance learning. He argues that interactions are not limited to teacher-student interaction, but also include interactions between students and students, and students and content. Learner-teacher interaction is what differentiates self-study from distance education. The instructor provides the learner with an organized plan, or curriculum, for mastering the content and communicates with the learner throughout the process (Kelsey & D'souza, 2004).

Learner-learner interactions can take various forms including group projects and discussion groups. Interestingly, the contribution of learner-learner interactions to the overall effectiveness of distance education in the literature has been mixed. Some students reported that other learners were essential to their success in a course, while others suggested that fellow learners actually detracted from their success (Biner, Welsh, Barone, Summers, & Dean, 1997).

Learner-content interaction occurs when a student reads a book, views pre-recorded video, or in some way interacts with inanimate learning resources. In order to master the content, the learner must engage in an internal didactic conversation (Holmberg, 1983).

Hillman, Willis, and Gunawardena (1994) added learner-interface interaction to Moore's (1989) framework. Learner-interface interaction occurs between the learner and the technologies used to deliver instruction. Hillman, Willis, and Gunawardena (1994) argue that a student's skill with the communication medium necessary to participate in a distance education course is positively correlated with success in that course. In order to gain any meaning from the course content, the student must be literate in the communication medium's rules of interaction (Kelsey & D'souza, 2004). Anderson and Garrison (1998) further expanded Moore's model by adding teacher-teacher, teacher-content, and content-content interaction. Anderson's (2003) recent interaction model of e-learning incorporates all six types of interaction in an expansive framework, which will serve as a foundation for a comparative study of interactions in face-to-face, online and blended learning environments.

DSCA Phase II uses constructivist principles to apply the knowledge learned in DSCA Phase I online to real-world scenario-based exercises in a team environment, which include web-based and digital course delivery. This approach offers participants a learning environment conducive to advancing their planning, decision-making, and leadership skills. They spend time with their colleagues analyzing case situations in scenario-based exercises, exploring critical issues in depth, analyzing options, and finding viable solutions.

The following represent all classes and subjects that are taught in the DSCA Phase II course:

- Part II Defense Support of Civil Authorities
- The DOD DSCA Mission and Strategy
- DSCA Overview
- U.S. Northern Command

- National Guard Mission
- The US Army Corps of Engineers Mission
- Coast Guard Mission
- DSCA Operational Phases
- Supporting a Comprehensive All Hazards Responses
- Supporting Civilian Law Enforcement Agencies
- Other Domestic Activities and Special Events
- Supporting and Sustaining Activities
- Federal Emergency Management Agency (FEMA)
- Civil Disaster Operations (CDO)
- Defense Coordinating Officer/Element (DCO/DCE)
- Table Exercise Hurricane Scenario
- CBRN Responder Capabilities Project (Overview)
- DSCA Phase III Overview
- NORTHCOM Collaborative Information Environment (CIE)
- DSCA Medical Response
- DSCA Mission Analysis Overview
- Exercise #2 Earthquakes
- Department of Justice (DOJ) and Federal Bureau Investigation (FBI)
- CBRN Responder Capabilities Project Table Presentations
- Nuclear Radiological Group Breakout Session and Presentations

The theory basis for the DSCA course program is constructivism**.** "Constructivism is an educational theory that moves away from a teacher-centered approach or approaches that use only one medium for instruction." The DSCA course incorporates a constructivist approach to education (Dreyfuss et al., 2004a, p. 177).

The foundational principle of constructivism is that learners construct knowledge through their experiences as well as reflections on and responses to those experiences (Goby & Lewis, 2000). Thus, constructivism is a learner-centered approach founded upon the belief that learners derive knowledge through exploration and discovery and that they are continuously constructing and reconstructing meaning with each new experience they encounter (Alesandrini & Larson, 2002). The shared inquiry of a community and authentic activities are vital to the constructivist approach to learning. Constructivism not only stresses diversity in experiences but also in resultant products that are characteristically unique to each student or group of learners (Alesandrini & Larson, 2002).

Active-Duty Military

Active-duty military forces fall under the command of the President of the United States and are available to support state and local civil authorities. There are, however, some restrictions on the role of federal troops in certain situations. In particular, federal troops are subject to the Posse Comitatus Act of 1878, which restricts their involvement in law-enforcement activities (U.S. Department of Defense, June 2005).

Department of Defense Civilian (DOD)

DOD Civilian is a Federal employee of the Department of Defense directly hired, paid from appropriated or non-appropriated funds, under permanent or temporary appointment (http://www.defense.gov/ 2014).

Defense Support of Civil Authorities

The provisions of the tenets of Immediate Response are outlined in DOD Directive 3025.1, which describes the permissive situations where any military individual or unit, upon request by a local official, may respond in an emergency to "save lives, prevent human suffering, or mitigate great property damage." Such support does not require permission by higher military headquarters, nor does it require obtaining a guarantee of reimbursement for costs incurred before responding (DOD, 1993). Otherwise federal military assistance must await the designation of the event as a Presidentially-declared State of Emergency or major disaster.

Statute changes to Title 10, effective Fiscal Year 2000 (October 01, 1999) now allow a Presidential Reserve Call-Up of up to 25,000 Federal Reserve Component personnel to respond to a Weapons of Mass Destruction event. For the US military, this is the only possibility of domestic (non-war fighting) activation of federal RC personnel/units (other than use of RC units in Annual Training Status). Under the provisions of the National Response Framework (NRF) and the Federal Emergency Management Agency's leadership, the DOD, as one of 26 federal departments and agencies, and the American Red Cross must provide requested assistance (DHS, 2008).

As mentioned in the introduction to this section, the goal of this literature review is to determine if academic research has been performed in this area of study and to broaden the researcher's scope of knowledge and awareness of the field. The military is well known for preparing plans and operation orders as steps toward mission execution, events, and contingencies.

The military has been an integral part of domestic disaster response for much of this country's history and has always attempted to provide the best training available for service

member personnel to perform this duty. (Not all military plans for response to domestic disasters are public documents yet.) All plans convey the military's intent to support civilian authorities. However, there are some restrictions to conducting domestic operations as is guide by the Posse Comitatus Act. The researcher identified several instances of discussion about the Posse Comitatus Act, which is a United States federal law prohibiting members of the military from exercising powers that maintain "law and order" on non-federal property, but no comprehensive instruction about military support was included in any of the courses.

This initial literature review demonstrated the need for further research and study to be conducted in order to identify the best educational approach to train military personnel in this particular field and to be adopted by other areas of military education.

A significant aspect and literature about DSCA training was developed after the large response from the Department of Defense forces to Hurricane Andrew in 1992, which many students (especially at military colleges) have written about. Additionally, after 2005, an increased number of documents referring to Hurricane Katrina were developed. Many master's degree theses have been written on Katrina and the National Guard and DOD response. Few authors, though, have published their findings or opinions in magazines or journals (Daniels, 2013). Two articles on this topic appear in one set of two articles close to this research topic and were written for the Journal of Homeland Security and Emergency Management, entitled "An Exploratory Study of Local Emergency Managers' Views of Military Assistance/Defense Support to Civil Authorities (Military Assistance to Civil Authorities / DSCA)" (Milliman, et al., 2006a).

The inclusion of different educational approaches to instruct student personnel in emergency management training within the military serves to improve the knowledge base of

skills required to facilitate and improve Defense Support to Civil Authorities' requests and the integration of federal capabilities with the event response. A search of master's and doctoral dissertations via ProQuest did not reveal any research related to training methodologies for DOD and military members to support civil authority and emergency management.

Emergency Managers views on improving Defense Support/Military Assistance to Civil Authorities Education Programs (Milliman, et al., 2006b). Milliman, et al.'s research methodology was conducted in two phases. Phase one involved conducting initial interviews with emergency managers to determine their knowledge of the Military Assistance to Civil Authorities process. The interviews were conducted with officials in three states at various levels of government emergency management. The responses from phase one were used to develop a survey of local emergency managers to be used in phase two, which focused on Military Assistance to Civil Authorities education and outreach (Milliman et al., 2006a).

The principal difference between the research efforts of Milliman's study and other studies about emergency managers is that Milliman did not attempt to distinguish between DOD and National Guard (NG) military support. However, many of the suggestions from emergency managers in Milliman's study are highly similar to those discovered in the following research conducted in the area of training and education for military personnel in the field of emergency management:

a. "Delivery Mode of Military Assistance to Civil Authorities Education." This study integrates Military Assistance to Civil Authorities education with mainstream educational institutions. In addition, it provides Military Assistance to Civil Authorities education "before and after drills" and takes a marketing approach. Military Assistance to Civil Authorities

education needs to be ongoing as well as provided to all involved in emergency response teams (Milliman, et al., 2006a).

b. "The Content of Military Assistance to Civil Authorities Education." This study only described the agencies and processes involved in Military Assistance to Civil Authorities. It educates emergency managers on how to request military assistance as well as on what assistance the military can provide. Moreover, it addresses communication issues and clarifies funding implications.

c. "Federal/National Disaster Plans." The focus of this study was the replacement of the National Response Plan (DHS, 2004) with the National Response Framework (NRF) (DHS, 2008), which has somewhat changed the operating procedures for disaster response and recovery in the U.S. The DOD has created an NRF Additional Resource, "Department of Defense Support to Domestic Incidents," which proactively explains DSCA (Milliman, et al., 2006a).

The research conducted by Milliman et al. (2006b) on Military Assistance to Civil Authorities training succinctly explains how the DOD provides support.

It was organized into the following six sections:

1. Categories of Capabilities (describing tasks the DOD can do).
2. Requests for Assistance (describing how to obtain DOD support).
3. Criteria (describing qualifiers and considerations for providing support).
4. Request for Assistance Situations (describing procedures for response prior to or after an emergency or disaster).
5. Process (describing steps involved in obtaining DOD support) and additional DOD Support (describing special DOD support).

6. Key DSCA Positions/Structures (describing personnel and units assigned to the domestic disaster mission) (DHS, 2008). Being only five pages in length, the document does not go into any real depth or disclose or propose any training, which is the principal subject of this research. Another research study found during the extended literature review was a study conducted by Wayne Blanchard, Ph.D. This researcher worked diligently for the Federal Emergency Management Agency (FEMA) in the Higher Education Program starting in the 1990s to increase the amount of educational products made available to Emergency Management educational entities, specifically college-level programs.

The goal of FEMA is to encourage and support the dissemination of hazard, disaster, and emergency management-related information in colleges and universities across the U.S. It is believed that in the future, more and more emergency managers in government as well as in business and industry will come to the job with a college education that includes a degree in emergency management. It is also understood that in order to build disaster resilient communities, a broad spectrum of college students and professionals need courses that teach about hazards, risks, vulnerability, and disasters and what to do about them. In support of this effort, the Emergency Management Institute in Emmetsburg, Maryland, developed the Emergency Management Higher Education Program in 1994, with the aim of promoting college-based emergency management education for future emergency managers and other interested personnel.

Theoretical Orientation and Conceptual Framework

The theoretical orientation and conceptual framework served as an academic bridge whose primary purpose was to establish how this study would fulfill the need for further research on instructional methodologies for training military and DOD personnel to identify the best

educational approach. Using the DSCA course as the military training and education program to be studied, this research evaluated the three different instruction delivery modalities currently used to teach the course, which include face-to-face, web-based, and digital instruction.

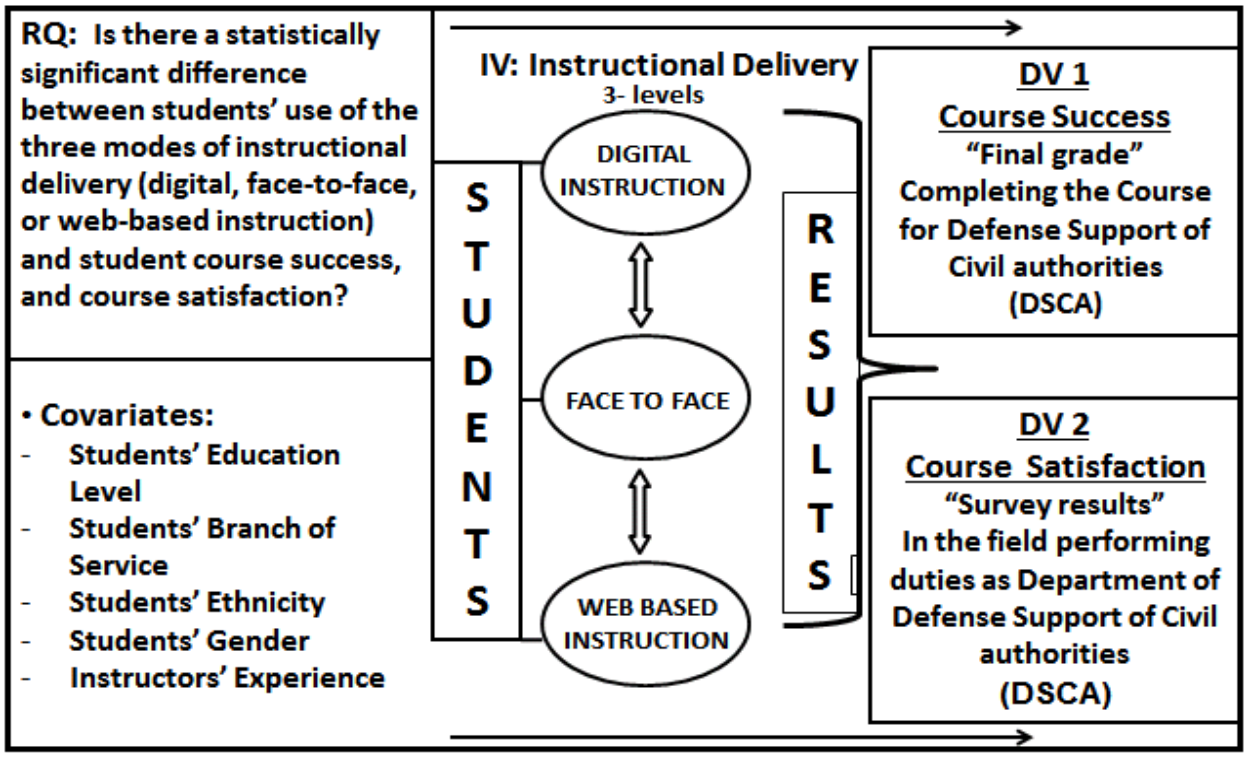
Moskal and Dziuban (2006) found that the top three reasons students enroll in online courses are flexibility, curiosity about or desire to try online courses, and avoidance of scheduling conflicts associated with traditional classes. Online technology was found to empower students to take the role of lifelong learners and to combine employment and study over an extended period of time (Lee & Dziuban, 2002). Pyle and Dziuban (2001), in an earlier study, identified rapid changes in technology associated with distance learning as a major challenge to instructors in order to meet the necessary requirements to conduct distance education as well as face-to-face class sessions. As stated, through this study, the researcher seeks to evaluate the results related to distance and face-to-face education using a military course.

The DSCA certification course for DOD and military personnel was designed to give the official credential of Defense Support to Civil Authorities Specialist. As presented in figure 1 Conceptual Framework, this study envisioned to identify which instructional method produces the largest number of successful graduates, “DV1- Course success” which was measured by comparing the final academic grades achieved by the students during the courses and conducting a complete statistical analysis to ensure the accuracy and validity of findings. “DV2 Course satisfaction” was also measured by analyzing the results from the three different modalities and surveys conducted with personnel that have graduated from the course; the concept is also depicted in the Conceptual Framework.

Figure 1 presents the conceptual framework that contained the research questions for this study as well as all variables that were statistically analyzed.

Figure 1.

Conceptual Framework



This study also used the Kember model as a base model for adult students in a distance education learning environment. Kember et al., (1999) argued that if external influences have a significant impact on traditional students' persistence, this is an important part of this study because military students from the different branch of service components as well as DOD civilians have different levels of education and work experience due to the natures of their jobs. Therefore, these factors could become a part of the correlated variation of two or more variables.

The characteristics of the model developed by Kember et al. (1999) include background variables related to a student, such as level of education, rank, gender, the employment environment, and the educational history of the student, which is very different for military service members than for civilians. The use of technological advances and their implementation in our education system represent a very important tool for teaching and learning; thus it played a very important role for online learning. These advances have become critically important in the use of technology to create the best possible educational approaches, so students may benefit from the best and most appropriate delivery methodology.

Defining Course Success and Satisfaction

Course Success

Students' success is a very important factor in education, and they may consist of different dimensions in alignment with the goals of a course or program (Olmstead, 2007). Course grades are often used as an indicator of student achievement in any instruction setting (Kuo, Y. C., Walker, A. E., Belland, B. R., & Schroder, K. E. (2013). But affective factors can be as important as cognitive factors in explaining and predicting student success and satisfaction (Biner et al., 1997). Among the attitudinal constructs, student satisfaction, referring to student perceptions of learning experiences and the perceived value of a course, may be particularly worthy of investigation. Student satisfaction is related to several outcome variables, such as persistence (Allen & Seaman, 2008), retention (Debourgh, 1999; Koseke, & Koseke, 1991), course quality (Moore & Kearsley, 1996), and student success (Keller, 1983; Pike, 1993; Noel-Levitz, 2011).

Course Satisfaction

Student Satisfaction, the Sloan Consortium defined student satisfaction: "Students are successful in the learning experience and are pleased with their experience" (Moore, 2009, p. 74). Sweeney and Ingram (2001) define student satisfaction as "the perception of enjoyment and accomplishment in the learning environment" (p. 57). These definitions focus on accomplishment and success in learning, and pleasure and enjoyment with the experience. The research on student satisfaction identifies a number of factors including perception of faculty knowledge and performance (DeShields, Kara & Kaynak, 2005; Elliott & Shin, 2002), interaction (Cao, Griffin & Bai, 2009; Wu, Tennyson & Hsia, 2010), communication (Parayitam, Desai & Phelps, 2007; Wuensch, Azia, Kishore & Tabrizi, 2008), the learning environment (Beard & Harper, 2002), and the university image and value (Alves & Raposo, 2007) that lead to higher satisfaction. The literature on student satisfaction is linked to institutional concern for the quality of courses and programs and the need to understand student perceptions, and included research on student satisfaction with traditional, hybrid, and online courses for graduate and undergraduate students.

High satisfaction leads to higher persistence in learning as well as higher motivation in pursuing additional goals (Allen & Seaman, 2008; Biner et al., 1997; Keller, 1987; Koseke, & Koseke, 1991). Higher education institutions consider student satisfaction as one of the major elements in determining the quality of educational programs in today's markets (Yukselturk & Yildirim, 2008). Face-to-face and online learners' perspectives provide valuable information on the areas that matter to students and help institutions gain a better understanding of their strengths and challenges in the provision of programs (Noel-Levitz, 2011). With data on student

satisfaction, course designers, educators, and administrators can identify areas where improvement is needed (Reinhart & Schneider, 2001).

For military students, the definition of academic achievement could be stated as the final result and successful completion of a training course, which is always impacted by the intrinsic and extrinsic motivation factors of promotion in grade and seniority. Kember et al., (1999) defined academic integration and social integration as embracing all facets of the offering of different methods of instruction for the courses' delivery, which included both academic and administrative support systems, the package of study materials, and all forms of contact between instructors and students.

Military students are trained to perform their duties and are employed in a full range of challenging requirements that extends from physical activities to very technical levels of specialties; therefore, the extent to which they are integrated into a learning situation is crucial to their chances of completing a course and successfully executing their required tasks (Kember, et al., 1999).

Hypotheses

The purpose of the hypotheses for this research study was to test the relationships between the constructs that were investigated to explore military student success and personal satisfaction after completing the DSCA certification course. For this study, the statistical hypotheses consisted of the null and alternative hypotheses, which were assumptions about the population parameters. Therefore, these assumptions might or might not be true. The null hypothesis and alternative hypotheses represented the statements regarding the differences or effects that occurred in the population, and they serve as the prediction statements that this study sought to test. As a result, the hypothesis testing could allow the researcher to accept or reject

statistical hypotheses and would also allow for the identification of the level of statistical significance, which is expressed as the *p*-value.

The hypotheses for this study are as follows:

- H_0: Null Hypothesis: There is not a statistically significant difference between students' use of the three instructional delivery methods and student course success and course satisfaction.

- H_1: Alternative Hypothesis: There is a statistically significant difference between students' use of the three instructional delivery methods and student course success and course satisfaction.

Summary

The relevant literature establishing a context and background for this research study was reviewed in this chapter presenting the results of these studies vary with the courses offered, the characteristics of the students enrolled (e.g., gender, age, learning style, and level of academic competence), and the instruction being offered. Thus, it appears that when the literature comparing online and traditional courses was reviewed, the researcher could make a case for either one or both being more or equally effective, depending on the values of the variables used.

Additionally, the cumulative research also indicated that online learning has become an alternative to traditional face-to-face learning (Allen & Seaman, 2008; Parsad & Lewis, 2008). Previous research has found no significant differences in learning outcomes between online learning and traditional face-to-face learning (Allen, Bourhis, Burrell & Mabry, 2002; Biner, Bink, Huffman & Dean, 1997; Brown & Liedholm, 2002; Johnson, 2000). However, the numerous investigations which studied student success and satisfaction (and that compare face to

face education with online education), findings indicate that students in upper level programs felt that face to face education produced the higher level of success and satisfaction, while students in lower levels in college or secondary education stated that online education provided a great level of success and satisfaction. The results presented could be directly related to the level of experience of the students in the use of technology, or to their background in a particular field that provided the foundation for continuing better understanding while in a face to face or an in online setting.

Researchers have been challenged to explore numerous topics in the search to identify characteristics that make a positive difference in student success and satisfaction, which has led to the design of an organized research project to conduct statistical analyses in order to study the impact of external factors or variables which may contribute to higher success and satisfaction, as is fully describe in the next chapter, Chapter 3.

CHAPTER 3

RESEARCH METHODOLOGY

Chapter 3 presents the description in detail of the specific MANCOVA methodology that was used to conduct this research. More importantly, this chapter also presents an overview of the research question and the justification for the selection of this particular statistical method that was used for conducting this study. In addition to the methodology, this chapter presents the instruments and tools that were used to conduct this study. Finally, a description of the sampling methods, statistical tests, and/or other analytical procedures used in the analysis of the data collected, the nature of the research, assumptions, and procedures followed in the research are also covered in this chapter.

Research Problem and Purpose of the Study

This research was a quantitative study that used a comparative design in which comparisons of the dependent variables (students' final grade and satisfaction survey results) made across groups of independent variable and covariates. The planned data analysis included descriptive statistics and Multivariate Analysis of Covariance (MANCOVA) to determine whether relationships existed between the instructional delivery methods and students' final course grades and satisfaction survey results. However, in the event that the MANCOVA model revealed a violation of normality assumption tests, additional nonparametric follow-up tests were conducted to confirm the findings.

The nature of this research was based in Weber and Lennon (2007) who measured the effectiveness of online versus face-to-face course delivery by investigating learning outcomes and satisfaction level of students in the same course being offered in the two formats. Learning outcomes were measured by the final exam, course project, and ultimately by the final course

grade. Overall satisfaction included two variables with course and with instructor. However, this research studies the results from a course that offers exactly the same class material, but is delivered in three different methods.

Therefore, a quantitative method design was the most appropriate for this study because it provided a thorough and in-depth examination of the problem. Furthermore, quantitative research was deductive and required the testing of hypotheses through statistical analysis by using structured data (Shuttleworth, 2008).

Research Design

Population

The population and sample of this study consisted of data collected from a total group of n900 graduated students from the U.S. Army North Training program, for DSCA course level II, from 2012 to 2014.

Sample

The sample was divided into three subgroups of 300 students: 5 courses of 60 students for each of the instructional delivery methods. The three subgroups of sample data were divided equally into five courses of sixty students each. The personnel had completed all DSCA pre-requisite courses, such DOD Defense Support of Civil Authorities DSCA I, and the DSCA phase II course which was the course used for this research study. The main sample for this study was selected from the DSCA II courses only.

The DSCA phase II course focuses on training Senior Military Officers and Senior Non-Commissioned Officers (NCOs), DOD civilians, and their staff to ensure the DOD's readiness to support its Homeland Defense and Civil Support missions. The course prepared participants to perform duties in support of the National, State, Local, and DOD statutes, directives, plans,

command and control relationships, and capabilities with regard to disaster and emergency response. These courses were attended and completed using one of the following instructional approaches: (a) Digital instruction via CDs and DVDs, (b) Face-to-face with book material or manuals, and (c) Web-based instruction via Blackboard/Learning Management System (LMS). The courses contained the same material for the three different instruction approaches; therefore, according to Creswell (2002), having students taking the same course in different modalities allows for a better comparison of the outcomes.

During the initial phase of this study, the goal was to identify what course covered the same material delivered in the three different instructional approaches to compare which instructional delivery (IV) and covariates (CV) account for the greatest variance (DV) in student success. Then, understanding that in a quantitative research, the investigator relies on numerical data (Charles & Mertler, 2002), the researcher used post positivist claims for developing knowledge, such as cause and effect thinking, reduction to specific variables, hypotheses and questions, for the use of measurement and observation to study theories. The researcher isolated variables and correlated them to determine the magnitude and frequency of relationships. In addition, the researcher determined which variables to investigate and chooses instruments that yielded highly reliable and valid scores.

Procedure and Data Analysis

The researcher used SPSS to conduct the statistical analyses. First, all the data were organized and incorporated into a created SPSS database, second all variables were entered into the data base and measurement criteria were assigned; then the researcher organized the data, and cleaned and developed the syntax in order to conduct analyses using MANCOVA as the statistical method. The following were the detailed steps taken to prepare the data for conducting

this analysis: the researcher ensured the data were clean and ready for analysis and entered into an SPSS data file. Second, the researcher identified the Variable of Interest (VOI) chart showing all relevant variables in the dataset. Third, set the SPSS data preparation syntax, which included how variables were coded. Then, SPSS analysis syntax in the order of the table outline for better visual presentation. Finally, reviewed the SPSS output file showing the entire analysis by table and developed the Layterms document that would be used later to write the conclusion.

Quantitative Analysis/MANCOVA

Conducting the MANCOVA using SPSS was performed by selecting the analysis menu and then choosing the "Multivariate" option from the General Linear Model framework option "GLM." This method allowed the multivariate analysis of covariance to answer the research question using supplementary demographic information such as a student's age, ethnicity, education level, and gender. During the initial stage of analysis, the quantitative, numeric data collected and provided to the researcher by USARNORTH was used as secondary data for this study.

These sample data consisted of students' final grades from the DSCA phase II course; this final grade includes the overall score obtained by the student at the completion of the course. Although the DSCA II covers several classes within the course, there was only one final grade for the entire course, and this final grade was used in this study. Additionally, demographic information related to student and instructors' participating in the DSCA II course was also included in the data to be analyzed. During the DSCA II course, the participants took the same class material through only one instructional method from among the three different methods, which were (a) Digital instructional methodology, (b) Face-to-face instructional methodology;

and (c) Web-based instructional methodology. Instructional delivery was only one independent variable (IV), and each methodology serves as a different level.

In straightforward terms, the MANCOVA looked at the influence of one or more independent variables on one dependent variable while removing the effect of one or more covariate factors. To do this, the One-Way MANCOVA first conducted a regression of the covariate variables on the dependent variable. Thus, it eliminated the influence of the covariates from the analysis. Then the residuals (the unexplained variance in the regression model) were subject to a MANOVA, which tested whether the independent variable influenced the dependent variables after the influence of the covariate(s) has been removed. The One-Way MANCOVA included one independent variable and one or more dependent variables; in addition, the MANCOVA could also include more than one covariate, and using SPSS allowed the use of up to 10 (Vogt, 1999).

MANCOVA is an extension of the analysis of covariance (ANCOVA) methods to cover cases where there is more than one dependent variable and where the control of concomitant continuous independent variables-covariates is required. Multivariate analyses are most appropriate for the primary analysis because they allow the researcher to control for the effects of all variables of interest within the same model. This allows for insight into the conditional relationships between the independent variables and the outcome of interest while assessing the effects of covariates.

The most prominent benefit of the MANCOVA design over the simple MANOVA design was the factoring out of noise or error that had been introduced by the covariant. A commonly used multivariate version of the ANOVA F-statistic is Wilks' Lambda (Λ), which represents the ratio between the error variance (or covariance) and the effect variance (or covariance). Similar

to all tests in the ANOVA family, the primary aim of the MANCOVA was to test for significant differences between group means. The process of characterizing a covariate in a data source allowed for the reduction of the magnitude of the error term, represented in the MANCOVA design as MS error. Subsequently, the overall Wilks' Lambda would become larger and more likely to be characterized as significant. This granted the researcher more statistical power to detect differences within the data.

The multivariate aspect of the MANCOVA allowed for the characterization of differences in group means in regards to a linear combination of multiple dependent variables while simultaneously controlling for covariates.

Moreover, is important to mention that several ANOVA tests were conducted as part of the statistical analyses, among them we found ANCOVA which is a merger of ANOVA and regressions for continuous variables and has a covariate (Rutherford, 2001). Its interpretation depended on certain assumptions about the data entered into the model. The relationship between the dependent and independent variables must be linear in parameters. ANCOVA evaluates whether population means that have been adjusted for differences on covariates differ on the levels of dependent variables. The effects of a third variable were statistically controlled for in ANCOVA, and any number of independent variables and CVs were used to create one-way, two-way, and multivariate ANCOVA designs.

ANCOVA assumed that covariates must be linearly related to the dependent variables and that they must have homogeneity of regression effect. It assumes that the covariates should be unrelated to the independent variables and that they should not be overly correlated with one another, i.e., a low r^2 value.

For this study, the first DV was operationalized and measured using the students' final grades in the course; the average course grade ranges from 0.00 to 100.00. The following demographic variables were also included in the model as covariates and were entered into the model in the first step: (a) gender, (b) ethnicity, (c) educational level, (d) teachers' years of instructional experience, and (e) branch of service. The variables representing the instructional methodologies were entered in the second step: (a) Digital instructional methodology, (b) Face-to-face instructional methodology, and (c) Web-based instructional methodology.

Regarding the advantages of using MANCOVA, its application allowed for more power in comparison to other statistical methods due to the different variables in this study. In general, this research was conducted for the purpose of explaining the effects of the independent variable on the dependent variables, and the purpose of the research design was to provide a structure for the research. For this particular research design, the researcher identified and controlled an independent variable with three different levels that could help to explain the observed variation in the dependent variable, which in turn reduced error variance (unexplained variation). Since this research design was structured before the research begins, this method of control is called "experimental control."

The research design is the science (and art) of planning procedures for conducting studies so as to obtain the most valid findings and, in the case of this study, identifies the most effective instructional delivery method. On the other hand, the application of control to subtract statistically the effects of a variable (a control variable) to see what a relationship existed in controlling and explaining variation through research design, and it was also possible to use statistical control to explain variation in the dependent variable.

Statistical control, used when experimental control is difficult, if not impossible, can be achieved by measuring one or more variables in addition to the independent variables of primary interest and by controlling the variation attributed to these variables through statistical analysis rather than through research design. These extraneous variables are called covariates, or control variables. (Covariates should be measured on an interval or ratio scale.) MANCOVA allows the researcher to remove covariates from the list of possible explanations of variance in the dependent variables. MANCOVA does this by using statistical techniques (such as regression to partial out the effects of covariates), rather than direct experimental methods to control extraneous variables.

MANCOVA is used in experimental studies when researchers need to remove the effects of some antecedent variable. For example, pretest scores are used as covariates in pretest and posttest experimental designs. MANCOVA is also used in non-experimental research, such as surveys or nonrandom samples, or in quasi-experiments when subjects cannot be assigned randomly to control and experimental groups. MANCOVA is similarly to all tests in the ANOVA family, but its primary purpose is to test for significant differences between group means. This grants the researcher more statistical power to detect differences within the data. The multivariate aspect of the MANCOVA allows the characterization of differences in group means in regards to a linear combination of multiple dependent variables, while simultaneously controlling for covariates.

Finally, using analysis of MANCOVA for this study would test for significant differences between group means. The process of characterizing a covariate in a data source allows for the reduction of the magnitude of the error term represented in the MANCOVA design as "MS error." Subsequently, the overall Wilks' Lambda would become larger and could be more likely

to be characterized as significant. This grants the researcher more statistical power to detect differences within the data. The multivariate aspect of the MANCOVA allowed for the characterization of differences in group means in regards to a linear combination of multiple dependent variables while simultaneously controlling for covariates.

Additionally, in order to analyze and further explore the dependent variable for the second part of the research question, this study used information already provided by USARNORTH to the researcher with the results from each student satisfaction survey conducted at the end of the course and six months after completion. This information contained composite scores from student survey responses reflecting their satisfaction with the course using the average of students' responses to five Likert rating questions where 1 = strongly disagree and 5 = strongly agree and was calculated to arrive at a satisfaction score for each student in the data set. The following demographic variables were also included in the model as covariates and entered into the model in the first step (a) gender, (b) ethnicity, (c) educational level, (d) teachers' years of instructional experience, and (e) branch of service. The variables representing the instructional methodologies were entered in the second step as follows: (a) Digital instructional methodology, (b) Face-to-face instructional methodology; and (c) Web-based instructional delivery methodology. The change in R^2 from step 1 to step 2 were also assessed.

Power Analysis

A power analysis was conducted during the early stage of the design to determine the minimum sample size required for conducting this study using the selected statistical models. The required sample size was calculated using G*Power 3.1, a power analysis program that is a reliable tool used by researchers for correlation and regression analysis (Faul, Erdfelder, Lang, & Buchner, 2009). The minimum sample size was determined by Cohen's (1992) measures for

effect size was 127 participants. However, since this study used secondary data that was already provided to the researcher and available once the Institutional Review Board (IRB) Process was completed the total sample population of 900 students was used to maximize the accuracy and validity of this research. The first model tested students from each of the three instructional methodologies (digital instruction, face-to-face instruction, or web-based instruction) to compare student academic success in the course (the first dependent variable). The following demographic variables were also included in the model as covariates (a) gender, (b) educational level, (c) teachers' years of instructional experience, and (d) ethnicity (five ethnic groups dummy coded). The α for the test of this model was set at .05 to achieve a power of .80 and a medium effect size (f^2=.15), therefore a minimum total sample size of 127 was required to detect a statistically significant model.

The second model tested whether the three instructional methodologies (digital instruction, face-to-face instruction, or web-based instruction) to identify student level of satisfaction with the course (the second dependent variable). The following demographic variables were also included in the model as covariates (a) gender, (b) educational level, (c) teachers' years of instructional experience, and (d) ethnicity (five ethnic groups dummy coded). The α for the test of this model was set at .05. To achieve power of .80 and a medium effect size (f^2=.15), as stated above, a minimum total sample size of 127 was also required to detect a statistically significant model for course satisfaction.

Extra Power

Given by the power analysis, the sample size required a minimum of 127 individuals for the quantitative analysis portion, but in order to maximize the accuracy of this research, 900 individuals were used. By increasing the sample size decreased the standard error which resulted

in higher statistical power of .999. Thus, the number of participants for this research was 900 students and was sufficient based on the power analysis conducted.

Data Collection Tools and Measurement Instrumentation

This study used secondary data for the quantitative portion of the study (to address the Research Question). These data were from the USARNORTH training and education department, which had already been gathered during the courses and during surveys conducted every six months.

Instrument

The data contained information from 15 DSCA courses and was obtained from the school training department; therefore, there was not need to develop a new instrument to collect data. The data was divided as follows: five courses of 60 students each one delivered either via face-to-face instruction (F-F n=300); five courses of 60 students each one delivered via web-based instruction (WB n=300); and, five courses of 60 students each one delivered via digital instruction (DG n=300) as well, for a grand total of n=900 students graduated over a period of two years.

Note: The data that used for this study was initially collected by USARNORTH to assess the course outcomes only. These data had not been used to conduct any other study to compare instructional methods prior to this study.

The data was provided to the researcher once the IRB process was completed in order to conduct this study and analyses to compare the best or the most successful instructional method. In addition, the survey information was also provided as part of the secondary data, to be used for conducting analysis of personal satisfaction after graduated from the DSCA course and while

working in the field using skills and learning from the course. (The information from the survey was used for analysis of the second part of the Research Question (RQ) course satisfaction).

Survey validity and reliability for this study

The instrument was designed specifically for measuring students' satisfaction after completing the DSCA II Course offered by USARNORTH.

The development of the survey instrument was based on the identification of the intended outcome that was to be measured. For the purposes of this study, the outcome measured was student satisfaction. The first step in survey development was a review of the literature specific to the outcome measurement issue of concern. Based on the literature, the student satisfaction survey instrument was developed based on the typology of face to face and online interaction by Moore & Kearsley (2005, 1996). This typology of online interaction included: learner-content interaction, learner-instructor interaction and learner-learner interaction. A fourth type of online interaction that of learner-technology interaction identified by Hanna, Dudka & Runlee (2000) and Palloff & Pratt (2001) was also included as a construct to be measured. A fifth construct of general satisfaction was also included as part of this survey instrument.

These five constructs served as the foundation for the development of survey questions that would be a measure of each construct. Subject matter experts in the field of adult education and distance education as well as a panel of measurement experts examined these constructs, which included the definitions and questions for each construct. Several questions were modified or eliminated based on the experience of experts in the field. This step of survey development was necessary and was referred to as establishing content validity. After content validity was conducted the instrument had 15 items. Following the establishment of content validity a pilot

study utilizing the instrument was conducted. Conducting a pilot study served to establish construct validity.

The purpose of construct validity was to determine if the constructs being measured were a valid conceptualization of the phenomena being tested. Data from the pilot study were then analyzed through the use of factor analysis to determine if indeed given items loaded on the intended construct. As part of this process, items that did not load on the intended construct were eliminated, as they were not an adequate measure of that construct.

This pilot study was conducted (n = 1,200 students) at the USARNORTH training department with students that completed the DSCA II course, either face to face and distance based. The survey instrument was presented as a link within the DSCA II's learning management system. Through factor analysis of the data the instrument was reduced to 10 items as five items had low factor loading that overlapped across all constructs, indicating that they were not a good measure of that specific construct.

The final instrument included seven items that measured learner-content interaction, four items that measured learner-instructor interaction, and learner-course content interaction, and six items that measured general satisfaction and showed a Cronbach's alpha of .97 for the single construct. Factor loading for learner-content interaction ranged from .604 to .780, learner-instructor interaction factor loading ranged from .594 to .841 and learner satisfaction ranged from .588 to .786. Consequently, questions within each construct were considered to have good internal or construct validity.

To be effective, an instrument must have both validity and reliability. Analysis of data from a pilot study determined the reliability of the instrument or the Cronbach's alpha, which is the internal consistency or reliability coefficient for an instrument and required only one

administration. Cronbach's alpha scores range from zero through one, with a coefficient closer to one indicating higher reliability. Reliability coefficients should be at least .70 or higher to be considered reliable for affective instruments (Wallen & Fraenkel, 2001). The Student Satisfaction Survey instrument pilot study indicated a Cronbach's alpha of .90 for the constructs of both learner-content interaction and general satisfaction. The constructs of learner-instructor interaction and learner-learner interaction resulted in a Cronbach's alpha of .89. Hence, removal of these six items resulted in a valid and highly reliable instrument that can be used at any institution of higher learning that offers both, face to face and online courses, and that is concerned with measuring the outcome of student satisfaction.

Survey Instrument

The following includes the definitions for each construct within the student satisfaction survey. Learner to content interaction is defined as the non-human interaction the student has with the subject matter (Moore & Kearsley, 1996). This includes interaction with course content, lessons, learning activities, learning objects, videos, assignments, websites, and projects. Learner to instructor interaction is defined as the human interaction consisting of two-way communication between the learner and the instructor (Moore & Kearsley, 1996). This type of interaction is necessary for content clarification, student feedback, and to minimize the impact of distance. The interaction may occur face to face or via e-mail and discussion boards. General satisfaction is defined as the overall needs of the student have been met. All survey items included a five-point Likert scale of 1 = strongly disagree; 2 = disagree; 3 = neither agree/nor disagree; 4 = agree; 5 = strongly agree, construct within the Student Satisfaction Survey (Strachota, 2003). Since the instrument already existed and was pretested, the survey used for

this study did not require scale or subscale instruments that needed to be validated. Following were the advantages of using secondary data for analysis (Koziol & Arthur 2011):

- The data collection was already completed; therefore it saved time, effort, and money.
- Additionally, secondary data was ideal for use in classroom examples, semester projects, master's theses, dissertations, and supplemental studies.
- Studies funded by the government generally involve larger samples that are more representative of the target population, which means that the data might be of higher quality and have a greater external validity.
- Oversampling of low prevalence groups/behaviors allowed for increased statistical precision.

On the other hand, the potential disadvantages of using secondary data analysis were:

- The study design and data collection had already been completed, so they could not be "tailored."
- The data might not facilitate or addressed the particular research question.
- Limited information regarding the study design and data collection procedures.
- Data lack of depth (the greater the breadth, the harder it is to measure any one construct in depth).
- The constructs could be operationally defined by a single survey item or a subset of test items, which could lead to reliability and validity concerns.
- Post hoc attempts to construct measurement models unsuccessful (survey items could "fall together").

- Certain fields or experimental programs might place less value on secondary data analysis.
- Required previous knowledge of survey statistics/methods which are not generally provided by basic graduate statistics courses.

Variables and Measurements

Dependent Variables

The dependent variable for Research Question (Course success) was measured as the final course grade and reflects an average of all graded assignments from all classes and evaluations during the entire course. This is a continuous dependent variable which was analyzed using MANCOVA.

The second dependent variable for Research Question second part (Course satisfaction) used the survey information for the quantitative analyses of student course satisfaction, and was measured using the average of 5-point Likert rating questions included in the survey administered by the Army North Training Department at the conclusion of the courses. The survey items assess student satisfaction with the course using a 5-point Likert rating scale where 1 = strongly disagree and 5 = strongly agree (See Appendix 2), then was analyzed using MANCOVA.

Independent Variable

The course instruction types were represented as one variable with three modes as follows: digital instruction, face-to-face instruction, and web-based instruction.

The following covariates and demographics variables were also included in the model:

- Gender (dichotomous): Male, Female.

- Educational Level (ordinal): Associate's Degree, Bachelor's Degree, Master's Degree, and Ph.D.
- Instructors' Teaching Experience (ordinal): 0 to 4 years = 1, 5 to 9 years = 2, 10 to 15 years = 3, 16 to 20 years = 4, 21 years and more = 5.
- Ethnicity: (categorical): Caucasian, African American, Native American Indian, Hispanic, and Asian.
- Branch of Service: (categorical): Army, Navy, Air Force, Marines, and DOD Civilian.

Table 2.

Variables and their measurements

Variables	**Data Type**	**Score Category/Range**	**Data Source (in Appendix)**
Instructional Delivery Type: - Face-to-Face Education - Web-Based Instruction - Digital Instruction	IV	Nominal scales / Discrete Variable. Each instructional type had a value number assigned in SPSS: 1.00 = Face-to-Face Education 2.00 = Web-Based Instruction 3.00 = Digital Instruction	Instructional Delivery Method
Student Course Success	DV1	Ordinal Scales / Continuous Variable. 0-100 Points I.e. 1, 2, 3, 4, 5….	Students' Final Grade (Provided by School) (Details in Chapter 4)
Student Course Satisfaction	DV2	Ordinal Scales / Continuous : 1 = strongly disagree; 2 = disagree; 3 = neither agree/nor disagree; 4 = agree; 5 = strongly agree	Students' Survey Results by individual in each course. (Provided by School) (Details in Chapter 4)
Educational Level	CV	Ordinal Scales / 1.00 = Associate's 2.00 = Bachelor's 3.00 = Master's 4.00 = PhD	Students Demographic Data. (Details in Chapter 4)

Table 2. (Continued)

Branch of Service	CV/ Categorical	Nominal Scales / Discrete Variable 1.00 = Army 2.00 = Air Forces 3.00 = Navy 4.00 = Marines 5.00 = DOD Civilian	Students Demographic Data (Details in Chapter 4)
Gender	CV / Categorical	Nominal Scales / Dichotomous Variable 0.0 = Male 1.0 = Female	Students Demographic Data (Details in Chapter 4)
Instructor years of teaching experience. (This is the main instructor responsible for the execution of the course)	C V / Interval	Ordinal Scales 1.00 = 10 Years 2.00 = 15 Years 3.00 = 20 Years 4.00 = 25 Years 5.00 = 30 Years	Students Demographic Data (Details in Chapter 4)

Statistical Analyses

The data analysis for this project was described in four stages. The first three included univariate or descriptive analysis of the sample, bivariate relationships for preliminary analysis, and multivariate primary analysis of the data to address the research questions and hypotheses, and finally the quantitative analysis of survey results.

Univariate Analysis

For categorical variables, including dichotomized and ordinal variables, frequencies and percentages were expected for each level of response on all independent, dependent, and demographic variables. Univariate analysis of continuous variables included means and standard deviations. The purpose of univariate analysis was to gain a deeper understanding of the characteristics for each variable in the data. Univariate analysis was used as an aid in identifying

violations of assumptions for statistical tests (such as normality and linearity) and identifying other problematic characteristics such as extreme outliers in continuous variables. Violations to assumptions are addressed appropriately in the results chapter, and all recoding and data-management decisions are also explicitly stated.

Bivariate Analysis

Bivariate preliminary analysis also aided in identifying meaningful characteristics of the data but with a focus on the relationships among all the variables in the data, rather than on the independent characteristics of each variable. Relationships among all variables were explored using the appropriate statistical test, which included Pearson correlation, chi-square test of association, and ANOVA. For example, a chi square statistic was used to determine the relationship between two categorical variables (such as gender and ethnicity).

For the bivariate relationship between a dichotomous variable (such as gender) and a continuous variable (such as age), independent t-tests were used. For relationships between continuous variables (such as age and student's grade), Pearson correlations were used. Again, all analyses were chosen based upon appropriateness, and adjustments were made for assumption violations. For instance, if a continuous variable does not display a normal distribution, a non-parametric Mann-Whitney U analysis could be used in place of an independent sample t-test.

Primary Analysis

Multivariate Analysis of covariance was utilized for the primary analyses to address the two parts of the research question. Multivariate analyses were appropriate for the primary analysis because they allow the researcher to control for the effects of all variables of interest within the same model. This allowed for insight into conditional relationships between the independent variables and the outcome of interest while assessing the effects of covariates.

Table 3.

Statistical analysis for research question or hypotheses.

Research question (Hypotheses)	Independent variable	Dependent variable(s)	Statistical analyses
H_0: There is not a statistically significant difference between students' use of the three instructional delivery methods and student course success and course satisfaction.	Instructional Delivery Type: 1. Digital Instruction 2. Face-to-Face Education 3. Web-Based Instruction	1. Course Success 2. Student Satisfaction	Analysis of covariance (MANCOVA)
H1: Alt Hypothesis There is a statistically significant difference between students' use of the three instructional delivery methods and student course success and course satisfaction.	Instructional Delivery Type: 1. Digital Instruction 2. Face-to-Face Education 3. Web-Based Instruction	1. Course Success 2. Student Satisfaction	Analysis of covariance (MANCOVA)

Research Benefits

This research intended to identify the best instructional method for training and educating military personnel and the DSCA level II course used to measure level of success and satisfaction. The results of this study might provide the benefit of enhancing the military training and education system by identifying the best instructional methods that could be applied at military training facilities incorporating new technology and best practices for optimal results. Nevertheless, there was a lack of prior research on this topic, which limited the basis for an extensive literature review that could support to lay the foundation for understanding the research problem.

This research could be considered as an important priority for the national preparedness planning effort in the next several years in relation to military education and homeland security to further improve their training programs. Our national system of training military and DOD personnel to provide support to civil authorities is critical for preparedness and readiness because it requires interagency communication and coordination at all levels of government: local, state, tribal, and federal. Each agency must have a mandate to assign interagency liaisons both vertically and horizontally amongst all levels of response. At the federal level, this includes the Department of Homeland Security (DHS), DOD, CDC, and FEMA.

Finally, this research study was designed considering also the risk of confounding variables such as a third variable or a mediator variable, which could adversely affect the relation between the independent variable and dependent variable; an example could be the variable "gender" as confounds the relation between instructional method and students' success. This may cause the results to be analyzed incorrectly. The results might had shown a false correlation between the dependent and independent variable leading to an incorrect rejection of the null hypothesis, and as result could affect the causal story told in a research project; however, every attempt was made to control for these effects as well as for multicolinearity and other potential sources of bias. Additionally, large amounts of missing data could led to biased results as well, thus a maximum of available data were used to preclude it. The data were investigated, and if a significantly large portion of the data was or appeared to be missing, methods such as multiple imputations were also considered in the design.

Assumptions

In regards to the research design for this study, the MANCOVA might violate normality assumptions, or although the results from the MANCOVA might provide a significant result, it

still could violated several assumptions tests; then, different types of nonparametric follow-up tests had to be conducted to analyze results or possible significant effects of type of instruction on both DVs.

In addition, claiming equivalency or superiority of one type of the DSCA course delivery method prior to conducting this study was subject to criticism and misinterpretation such as a pre-evaluation biases existed. In previous studies, critics of online or face to face education had questioned the academic integrity and rigor of courses and the diminished role of the instructor (Maeroff, 2003), just as there were critics of any process that challenges tradition. Rather than focus on identifying one method as being "better" than the other, then, some researchers have focused on ensuring that the rigor and quality were the same for the student regardless of delivery mode (Turner & Crews, 2005), thereby putting emphasis on student needs and meeting intended course learning outcomes (Carnevale, 2001).

Then again, the results of this particular study could aid USARNORTH to identify the level of effectiveness of one particular delivery method, which is important to its mission of providing training and readiness for DSCA missions which oversight 55 of the Nation's 57 authorized National Guard Weapons of Mass Destruction Civil Support Teams (WMD-CSTs) and training of the 17 chemical, biological, radiological, nuclear, and high-explosive (CBRNE) Enhanced Response Force Packages (CERFP). Civil Support Teams and CERFPs assist state and regional authorities in the event of a WMD attack on the American homeland.

Civil support teams also support civil authorities at a domestic CBRNE incident site by identifying agents and substances, assessing current and projected consequences, advising on response measures, and assisting with appropriate requests for state support. The CERFPs provide states with a regional task force capable of performing mass casualty decontamination,

triage, and emergency medical treatment, and of locating and extracting victims from the hot zone to support civil first responders or military authorities and the DSCA course delivers the required training for the federal forces to interact and support this mission.

Summary

The effectiveness and appropriateness of the design methodology to study student course success and satisfaction in the use of three different instructional methods was imperative in order to identify the best approach. The results of this research, as stated before, were meaningful and important for understanding that student course success and satisfaction impact motivation, completion rates, and the overall the quality of training programs. Understanding how external factors or variables impacted the results of a research study was important because any of them could enable to determine the reason for differences in course success and or satisfaction. The following chapter 4 presents the results of all statistical analyses conducted and an explanation from the researcher in the different and details of each approach that was necessary to effectively use all available data to measure course success and course satisfaction in accordance with the approved design.

CHAPTER 4

DATA ANALYSIS AND PRESENTATION OF RESULTS

The purpose of this study was to compare three different instructional delivery modalities (digital instruction, face-to-face instruction, and web-based instruction) in order to identify the best practices for training and education of military personnel from the DOD in preparation for supporting civilian authorities during emergencies, disasters, and catastrophic events. This chapter outlines the results of this study, starting with preliminary analyses and assumption testing and continuing with primary analyses to empirically examine the research question. The research question was as follows: Is there a statistically significant difference between students' use of the three modes of instructional delivery and student course success and course satisfaction?

Data from participants' demographics and completion of the DSCA II course were analyzed. Demographic data were used to define the population of graduate students from the U.S. Army North Training program who responded to the study (n = 900). Descriptive data obtained from students illustrated type of instruction, final grades, and student satisfaction. A MANCOVA was conducted on final grades for course success and survey results for satisfaction scores, and nonparametric analyses were conducted to confirm parametric findings that violated test assumptions.

Preliminary Analyses

Prior to conducting the primary analyses, preliminary analyses were used to describe the variables in the dataset that were used in statistical analyses. Crosstabulations, using Pearson's chi-square and Cramer's V tests, were used to test for relationships among sets of categorical variables. Also, independent sample t tests and one-way ANOVAs were used to test the

relationships between continuous variables and categorical variables, and Pearson's correlations were used for sets of continuous variables. Bonferroni corrections for Z tests of column proportions were conducted for all significant Pearson's chi-square tests to determine differences between levels of the variable. Analyses for this study were conducted using SPSS v. 21, and significance levels for all analyses were set at .05.

Descriptive Statistics

Frequencies and percentages for the categorical demographic variables are displayed in Table 4. The majority of participants were male (74.3%) and Caucasian (68.8%). For the analyses, participants who were Asian (n = 36) and Native American (n = 5) were labeled as missing, due to small sample sizes. In addition, the variable education level was recoded into two levels by collapsing participants who had Associate's or Bachelor's degrees and participants who had Master's or PhD degrees. The majority of participants had Associate's or Bachelor's degrees (74.6%). The variable "branch of service" was recoded into four groups by collapsing participants from the Navy or Marines. The most represented level was participants who were in the Army (43.8%). Finally, the largest percentage of participants had instructors with 30 years of experience (33.3%), and there were an equal number of participants in each of the three types of instruction groups (33.3%).

Table 4.

Frequencies and Percentages for Categorical Demographic Variables

	n	%
Gender		
Female	231	25.7
Male	669	74.3

Table 4. (Continued)

	n	%
Ethnicity		
Caucasian	591	68.8
Hispanic	124	14.4
African American	144	16.8
Asian	36	
Native American	5	
Education Level		
*Associate's	41	4.6
*Bachelor's	630	70.0
*Master's	188	20.9
*PhD	41	4.6
Branch of Service		
Army	394	43.8
Air Force	165	18.3
**Navy	135	15.0
**Marines	65	7.2
DOD Civilian	141	15.7
Instructor Teaching Experience		
15 Years	180	20.0
20 Years	180	20.0
25 Years	240	26.7
30 Years	300	33.3
Type of Instruction		
Digital Instruction	300	33.3
Face-to-Face Instruction	300	33.3
Web-Based Instruction	300	33.3

Note. Frequencies not summing to $n = 900$ and percentages not summing to 100 reflect missing data. * *Education level was recoded into two levels by collapsing Associate's and Bachelor's degrees and participants who had Master's and PhD degrees.*
** *Navy and Marines were collapsed and recoded into one group.*

Means and standard deviations for the continuous dependent variables are displayed in Table 5. Participants' final grades ranged from 80 to 100 (M = 92.54, SD = 5.22), and student satisfaction scores ranged from 1 to 5 (M = 4.07, SD = .81).

Table 5.

Means and Standard Deviations for Continuous Demographic Variables

	N	*M*	*SD*	Min	Max
Student Course Success	900	92.54	5.22	80	100
Student Course Satisfaction	900	4.07	.81	1	5

Bivariate Analysis

In addition to describing the sample and variables included in the study, separate analyses were conducted to examine the bivariate relationship across key variables of interest included in the study. Table 6 displays a summary of the correlations between all variables of interest. Correlations between continuous variables were calculated using Pearson's product–moment correlations (i.e., Course success/final grade and student course satisfaction). Values closer to 0 indicate a weaker relationship and values closer to 1 indicate a stronger relationship, regardless of direction (positive, negative).

Bivariate analysis is the simultaneous analysis of two variables (attributes). It explores the concept of relationship between two variables, whether there exists an association and the strength of this association, or whether there are differences between two variables and the

significance of these differences (Creswell, 2002). This study tested hypotheses of "association" and causality. In its simplest form, association simply refers to the extent to which it becomes easier to know/predict a value for the dependent variables where the value on the independent variable is known. Therefore, a measure of association helps to understand this relationship. These measures of association relate to how much better this prediction becomes with knowledge of the IV or how well an independent variable relates to the dependent variable. A measure of association often ranges between –1 and 1. Where the sign of the integer represents the "direction" of correlation (negative or positive relationships) and as stated above the distance away from 0 represents the degree or extent of correlation – the farther the number away from 0, the higher or "more perfect" the relationship is between the IV and DV.

To examine correlations between categorical variables, Phi and Cramer's *V* statistics were calculated, such that values closer to 0 indicate a weaker relationship and values closer to 1 indicate a stronger relationship. Phi calculates the strength of the relationship between two dichotomous variables, and Cramer's *V* calculates the strength of the relationship between two categorical variables where one variable has more than two groups. Significance testing for Phi and Cramer's *V* tests was conducted through a Pearson's chi-square test. To examine the correlations between categorical and continuous variables, *r* was calculated by taking the square root of η^2. Significant testing for these values was conducted through one-way ANOVA tests. As shown in Table 6, there are several significant relationships across the variables. These results are discussed in more detail throughout the preliminary analysis section and are displayed in Tables 7–18.

Table 6.

Correlations among Key Study Variables

		1	2	3	4	5	6	7
1.	Gender							
2.	Ethnicity	.06						
3.	Educational Level	.05	.06					
4.	Branch of Service	.05	.10	.07				
5.	Instructor Teaching Experience	.06	.06	.05	.17**			
6.	Type of Instruction	.01	.07	.13**	.32***	.50***		
7.	Final Grade	.02	.01	.08*	.10*	.19***	.46***	
8.	Student Satisfaction	.02	.04	.07	.07	.06	.45***	.13**

Note. Correlations between continuous variables are displayed as Pearson's *r* coefficients. Correlations between categorical variables are displayed as Cramer's *V* values calculated from chi-square tests. Correlations between continuous and categorical variables are displayed as *r* coefficients calculated from one-way ANOVA tests.

To examine the relationship between the two dependent variables, Pearson's product–moment correlations were conducted between course success and course satisfaction. As displayed in Table 7, final grades were significantly related to student satisfaction scores, $p <$ .01. Higher scores on final grades were associated with higher student satisfaction scores, $r =$ .13. Results were confirmed with nonparametric analysis.

Table 7.

Pearson's Product Moment Correlation between Course Success and Course Satisfaction

	Course Satisfaction
Course Success /final grade	.13**

Note. **$p < .01$.

To examine the bivariate relationships between all demographic variables, several crosstabulations using Pearson's chi-square and Cramer's *V* tests were conducted. First, crosstabulations using Pearson's chi-square and Cramer's *V* tests were conducted to examine the relationships between educational level and branch of service, ethnicity, gender, and instructor teaching experience. As displayed in Table 8, the relationships between educational level and the other demographic variables were not significant, *p*s > .05.

Table 8.

Frequencies and Percentages for Branch of Service, Ethnicity, Gender, and Instructor Teaching Experience by Educational Level

	Educational Level					
	Associate's/ Bachelor's		Master's/PhD			
	N	%	*N*	%	χ^2	*p*
Branch of Service					4.16	.245
Army	295	44.0	99	43.2		
Air Force	122	18.2	43	18.8		
Navy/Marines	157	23.4	43	18.8		
DOD Civilian	97	14.5	44	19.2		

Table 8. (Continued)

Ethnicity					2.57	.277
Hispanic	87	13.5	37	17.2		
African American	105	16.3	39	18.1		
Gender					2.37	.124
Female	181	27.0	50	21.8		
Male	490	73.0	179	78.2		
Instructor Teaching Experience					1.95	.584
15 Years	135	20.1	45	19.7		
20 Years	129	19.2	51	22.3		
25 Years	176	26.2	64	27.9		
30 Years	231	34.4	69	30.1		

	Educational Level					
	Associate's/ Bachelor's		Master's/PhD			
	N	%	*N*	%	χ^2	*p*
Ethnicity					2.57	.277
Caucasian	452	70.2	139	64.7		
Hispanic	87	13.5	37	17.2		
African American	105	16.3	39	18.1		
Gender					2.37	.124
Female	181	27.0	50	21.8		
Male	490	73.0	179	78.2		
Instructor Teaching Experience					1.95	.584
15 Years	135	20.1	45	19.7		
20 Years	129	19.2	51	22.3		
25 Years	176	26.2	64	27.9		
30 Years	231	34.4	69	30.1		

Crosstabulations using Pearson's chi-square and Cramer's V tests were conducted to examine the relationships between branch of service and educational level, ethnicity, gender, and instructor teaching experience. As displayed in Table 9, the relationship between branch of service and instructor teaching experience was significant, $\chi 2$ (9) = 25.43, p = .003, Cramer's V = .097. Of participants who had instructors with 25 years of experience, a significantly smaller proportion were in the Army (19.3%) compared to participants in the Air Force (27.3%), Navy/Marines (32.5%), and DOD civilian (38.3%), ps < .05. The relationships between branch of service and the other variables displayed in Table 9 were not significant, ps > .05.

Table 9.

Frequencies and Percentages for Educational Level, Ethnicity, Gender, and Instructor Teaching Experience by Branch of Service

	Branch of Service							
	Army		Air Force		Navy/Marines		DOD Civilian	
	N	%	*N*	%	*N*	%	*N*	%
Educational Level								
Associate's/Bachelor's	295	74.9	122	73.9	157	78.5	97	68.8
Master's/PhD	99	25.1	43	26.1	43	21.5	44	31.2
Ethnicity								
Caucasian	264	69.7	104	65.0	136	73.5	87	64.4
Hispanic	60	15.8	21	13.1	21	11.4	22	16.3
African American	55	14.5	35	21.9	28	15.1	26	19.3
Gender								
Female	97	24.6	45	27.3	57	28.5	32	22.7
Male	297	75.4	120	72.7	143	71.5	109	77.3
Instructor Teaching Experience								
15 Years	89	22.6	30	18.2	36	18.0	25	17.7
20 Years	85	21.6	31	18.8	39	19.5	25	17.7
25 Years	76	19.3	45	27.3	65	32.5	54	38.3
30 Years	144	36.5	59	35.8	60	30.0	37	26.2

Note. Educational Level χ^2 (3) = 4.16, p = .245. Ethnicity χ^2 (6) = 8.03, p = .236. Gender χ^2 (3) = 1.94, p = .584. Instructor Teaching Experience χ^2 (9) = 25.43, p = .003.

Crosstabulations using Pearson's chi-square and Cramer's *V* tests were conducted to examine the relationships between ethnicity and educational level, branch of service, gender, and instructor teaching experience. As displayed in Table 10, the relationships between ethnicity and the other demographic variables were not significant, *p*s > .05.

Table 10.

Frequencies and Percentages for Educational Level, Branch of Service, Gender, and Instructor Teaching Experience by Ethnicity

	Ethnicity					
	Caucasian		Hispanic		African American	
	N	%	*N*	%	*N*	%
Educational Level						
Associate's/Bachelor's	452	76.5	87	70.2	105	72.9
Master's/PhD	139	23.5	37	29.8	39	27.1
Branch of Service						
Army	264	44.7	60	48.4	55	38.2
Air Force	104	17.6	21	16.9	35	24.3
Navy/Marines	136	23.0	21	16.9	28	19.4
DOD Civilian	87	14.7	22	17.7	26	18.1
Gender						
Female	145	24.5	28	22.6	46	31.9
Male	446	75.5	96	77.4	98	68.1
Instructor Teaching Experience						
15 Years	112	19.0	22	17.7	33	22.9
20 Years	117	19.8	25	20.2	28	19.4
25 Years	163	27.6	36	29.0	32	22.2
30 Years	199	33.7	41	33.1	51	35.4

Note. Educational Level χ^2 (2) = 2.57, p = .277. Branch of Service χ^2 (6) = 8.03, p = .236. Gender χ^2 (2) = 4.00, p = .136. Instructor Teaching Experience χ^2 (6) = 2.79, p = .835.

Crosstabulations using Pearson's chi-square and Cramer's *V* tests were conducted to examine the relationships between gender and educational level, branch of service, ethnicity, and instructor teaching experience. As displayed in Table 11, the relationships between gender and the other demographic variables were not significant, *p*s > .05.

Table 11.

Frequencies and Percentages for Educational Level, Branch of Service, Ethnicity, and Instructor Teaching Experience by Gender

	Gender					
	Female		Male			
	N	%	*N*	%	χ^2	*p*
Educational Level					2.37	.124
Associate's/Bachelor's	181	78.4	490	73.2		
Master's/PhD	50	21.6	179	26.8		
Branch of Service					1.94	.584
Army	97	42.0	297	44.4		
Air Force	45	19.5	120	17.9		
Navy/Marines	57	24.7	143	21.4		
DOD Civilian	32	13.9	109	16.3		
Ethnicity					4.00	.136
Caucasian	145	66.2	446	69.7		
Hispanic	28	12.8	96	15.0		
African American	46	21.0	98	15.3		
Instructor Teaching Experience					2.74	.433
15 Years	42	18.2	138	20.6		
20 Years	53	22.9	127	19.0		
25 Years	65	28.1	175	26.2		
30 Years	71	30.7	229	34.2		

Crosstabulations using Pearson's chi-square and Cramer's V tests were conducted to examine the relationships between instructor teaching experience and educational level, branch of service, ethnicity, and gender. As displayed in Table 12, the relationship between instructor teaching experience and branch of service was significant, $\chi 2$ (9) = 25.43, p = .003, Cramer's V = .097. A significantly smaller proportion of participants in the Army had instructors with 25 years of experience (31.7%) compared to participants who had instructors with 15 years (49.4%), 20 years (47.2%), and 30 years (48.0%) of experience, ps < .05. There were no significant proportion differences between Army participants who had instructors with 15 years, 20 years, or 30 years of experience, ps = ns. In contrast, a greater proportion of DOD civilian participants had instructors with 25 years of experience (22.5%) compared to participants who had instructors with 30 years of experience (12.3%), ps < .05. The proportion differences between DOD Civilians with instructors who had 15 years of experience were statistically equivalent to DOD Civilians with instructors who had 20 years or 30 years of experience, ps = ns. Similarly, the proportion differences were not statistically significant between levels of instructor teaching experience for participants in the Air Force or the Navy/Marines, ps = ns. The relationships between instructor teaching experience and educational level, ethnicity, and gender were not significant, ps > .05.

Table 12.

Frequencies and Percentages for Educational Level, Branch of Service, Ethnicity, and Gender by Instructor Teaching Experience

	Instructor Teaching Experience							
	15 Years		20 Years		25 Years		30 Years	
	N	%	*N*	%	*N*	%	*N*	%
Educational Level								
Associate's/Bachelor's	135	75.0	129	71.7	176	73.3	231	77.0
Master's/PhD	45	25.0	51	28.3	64	26.7	69	23.0
Branch of Service								
Army	89	49.4	85	47.2	76	31.7	144	48.0
Air Force	30	16.7	31	17.2	45	18.8	59	19.7
Navy/Marines	36	20.0	39	21.7	65	27.1	60	20.0
DOD Civilian	25	13.9	25	13.9	54	22.5	37	12.3
Ethnicity								
Caucasian	112	67.1	117	68.8	163	70.6	199	68.4
Hispanic	22	13.2	25	14.7	36	15.6	41	14.1
African American	33	19.8	28	16.5	32	13.9	51	17.5
Gender								
Female	42	23.3	53	29.4	65	27.1	71	23.7
Male	138	76.7	127	70.6	175	72.9	229	76.3

Note. Educational Level χ^2 (3) = 1.95, p = .584. Branch of Service χ^2 (9) = 25.43, p = .003. Ethnicity χ^2 (6) = 2.79, p = .835. Gender χ^2 (3) = 2.74, p = .433.

To examine the relationships between demographic variables and the independent variable, crosstabulations using Pearson's chi-square and Cramer's *V* tests were conducted to between the type of instruction and educational level, branch of service, ethnicity, gender, and instructor teaching experience. As displayed in Table 13, the relationship between type of instruction and educational level was significant, χ^2 (2) = 11.40, p = .003, Cramer's V = .113. A significantly smaller proportion of participants with Associate's or Bachelor's degrees received face-to-face instruction (67.7%) compared to participants who received digital instruction (77.3%) and web-based instruction (78.7%), ps < .05. In contrast, a significantly greater proportion of participants with Master's or PhD degrees received face-to-face instruction (32.3%) compared to participants who received digital instruction (22.7%) and web-based instruction (21.3%), ps < .05.

Digital instruction. Digital instruction is instruction delivered via technology, such as video and smart software, which offers students a personalized sequence of learning experiences and does not include live interaction with a teacher, asynchronous (Dede, Richards, 2012).

Face-to-face instruction. Face-to-face instruction is defined as occurring in a class setting with direct interaction among instructor, students, and content, and involves real-time teaching and learning. It is the lecture and textbook method of instructional delivery where the instructor and a group of learners are physically present in the same classroom.

Web-based instruction. Web-based instruction (sometimes called e-learning), is anywhere, anytime instruction delivered using the Internet or a corporate intranet to browser-equipped learners. There are two primary models of web-based instruction: synchronous (instructor-facilitated) and asynchronous (self-directed, self-paced).

As shown in Table 13, the relationship between type of instruction and branch of service was also significant, χ^2 (6) = 90.19, $p < .001$, Cramer's $V = .224$. A significantly greater proportion of participants in the Army received web-based instruction (64.0%) compared to participants who received digital instruction (34.0%) and face-to-face instruction (33.3%), ps < .05. In contrast, a significantly smaller proportion of participants in the Navy/Marines received web-based instruction (12.0%) compared to participants who received digital instruction (25.7%) and face-to-face instruction (29.0%), ps < .05. Finally, a significantly smaller proportion of DOD civilians received web-based instruction (6.3%) compared to participants who received digital instruction (22.0%) and face-to-face instruction (18.7%), ps < .05.

As also shown in Table 13, the relationship between type of instruction and instructor teaching experience was significant, χ^2 (6) = 216.00, $p < .001$, Cramer's $V = .346$. A significantly smaller proportion of participants who had instructors with 25 years of experience received web-based instruction (0.0%) compared to participants who received digital instruction (40.0%) and face-to-face instruction (40.0%), ps < .05. In contrast, a greater proportion of participants who had instructors with 30 years of experience received web-based instruction (60.0%) compared to participants who received digital instruction (20.0%) and face-to-face instruction (20.0%), ps < .05. The relationships between type of instruction and gender and ethnicity were not significant, ps > .05.

Table 13.

Frequencies and Percentages for Educational Level, Branch of Service, Ethnicity, Gender, and Instructor Teaching by Type of Instruction

	Type of Instruction					
	Digital Instruction		Face-to-Face Instruction		Web-Based Instruction	
	N	%	*N*	%	*N*	%
Educational Level						
Associate's/Bachelor's	232	77.3	203	67.7	236	78.7
Master's/PhD	68	22.7	97	32.3	64	21.3
Branch of Service						
Army	102	34.0	100	33.3	192	64.0
Air Force	55	18.3	57	19.0	53	17.7
Navy/Marines	77	25.7	87	29.0	36	12.0
DOD Civilian	66	22.0	56	18.7	19	6.3
Ethnicity						
Caucasian	199	68.6	202	70.4	190	67.4
Hispanic	38	13.1	46	16.0	40	14.2
African American	53	18.3	39	13.6	52	18.4
Gender						
Female	77	25.7	79	26.3	75	25.0
Male	223	74.3	221	73.7	225	75.0

Note. Educational Level χ^2 (2) = 11.40, p = .003. Branch of Service χ^2 (6) = 90.19, p < .001. Ethnicity χ^2 (4) = 3.66, p = .455. Gender χ^2 (2) = .14, p = .933. Instructor Teaching Experience χ^2 (6) = 216.00, p < .001.

To examine the relationships between demographic variables and dependent variables, several univariate tests were conducted examining all possible bivariate relationships. Independent sample *t*-tests were conducted to compare the means scores of participants' final grades who had Associate's or Bachelor's degrees and participants with Master's or PhD degrees

on final grades and student satisfaction scores. As displayed in Table 14, independent sample *t*-tests revealed that participants who had Master's or PhD degrees had significantly higher final grades ($M = 93.24$, $SD = 5.19$) than did participants who had Associate's or Bachelor's degrees ($M = 92.29$, $SD = 5.21$), $t\ (898) = -2.39$, $p = .017$. Educational level did not significantly affect student satisfaction scores, $p > .05$.

Table 14.

Means and Standard Deviations for Course Success and Student Satisfaction by Educational Level

	N	*M*	*SD*	*t*	*p*
Final Grade				2.39	.017
Associate's/Bachelor's	671	92.29	5.21		
Master's/PhD	229	93.24	5.19		
Student Satisfaction				1.87	.062
Associate's/Bachelor's	671	4.04	.81		
Master's/PhD	229	4.16	.79		

Independent sample *t* tests were conducted to compare the means of female participants and male participants on final grades and student satisfaction scores. As displayed in Table 15, gender did not significantly affect final grades or student satisfaction scores, ps $> .05$.

Table 15.

Means and Standard Deviations for Course Success and Course Satisfaction by Gender

	N	*M*	*SD*	*t*	*p*
Course Success/Final Grade				.57	.566
Female	231	92.71	5.43		
Male	669	92.48	5.15		
Student Course Satisfaction				.53	.599
Female	231	4.10	.78		
Male	669	4.06	.82		

One-way ANOVA tests were conducted to determine if course success and student satisfaction scores differed by branch of service. Table 16 displays the means from the ANOVA tests. Although branch service significantly affected participants' final grades, F (3, 896) = 3.09, p = .027, η^2 = .010, a Levene's test of equality of error variance found that the error variance of final grades significantly differed across branch service category, F (3, 896) = 3.50, p = .015. Because of the test assumption violation, a nonparametric Kruskal-Wallis test was conducted on final grade (course success) by branch service and was found to be nonsignificant, χ^2 (3) = 6.59, p = .086. Therefore, nonparametric findings did not confirm the mean differences found in final grades across branch service. In addition, no significant differences were found in student satisfaction across branch service, $p > .05$ (see Table 16).

Table 16.

Means and Standard Deviations for Course Success and Course Satisfaction by Branch of Service

	N	*M*	*SD*	*F*	*p*
Course Success				3.09	.027
Army	394	92.22	5.17		
Air Force	165	91.94	5.96		
Navy/Marines	200	93.06	4.91		
DOD Civilian	141	93.37	4.72		
Course Satisfaction				1.44	.231
Army	394	4.04	.77		
Air Force	165	4.05	.85		
Navy/Marines	200	4.18	.81		
DOD Civilian	141	4.04	.87		

Note. Levene's test of equality of error variances was significant, F (3, 896) = 3.50, p = .015. Nonparametric Kruskal–Wallis test was not significant, χ^2 (3) = 6.59, p = .086.

One-way ANOVA tests were conducted to determine if course success and student satisfaction scores differed by ethnicity. As displayed in Table 17, results did not reveal a significant effect of ethnicity on final grades or student satisfaction scores, ps > .05, indicating relevantly equivalent course success and student satisfaction scores across differing levels of ethnicity.

Table 17.

Means and Standard Deviations for Course Success and Course Satisfaction by Ethnicity

	N	*M*	*SD*	*F*	*P*
Course Success				.07	.933
Caucasian	591	92.58	5.17		
Hispanic	124	92.76	5.18		
African American	144	92.56	5.31		
Course Satisfaction				.81	.445
Caucasian	591	4.08	.82		
Hispanic	124	4.10	.80		
African American	144	3.99	.77		

One-way ANOVA tests were conducted to determine if course success and student satisfaction scores differed by instructor teaching experience. As displayed in Table 18, results revealed a significant effect of instructor teaching experience on final grades, F (3, 896) = 11.09, $p < .001$, $\eta^2 = .036$. Tukey's post-hoc analyses revealed that participants who had instructors with 25 years of experience had significantly higher final grades (M = 94.10, SD = 4.72) than did participants who had instructors with 15 years (M = 92.34, SD = 5.38), 20 years (M = 92.20, SD = 5.26), and 30 years of experience (M = 91.60, SD = 5.22), ps < .01. However, instructor teaching experience did not significantly affect student satisfaction, $p > .05$, indicating relevantly equivalent satisfaction scores across differing levels of instructor teaching experience.

Table 18.

Means and Standard Deviations for Course Success and Course Satisfaction by Instructor Teaching Experience

	n	*M*	*SD*	*F*	*p*
Course Success				11.09	< .001
15 Years	180	92.34 [a]	5.38		
20 Years	180	92.20 [a]	5.26		
25 Years	240	94.10 [b]	4.72		
30 Years	300	91.60 [a]	5.22		
Course Satisfaction				1.08	.355
15 Years	180	4.13	.77		
20 Years	180	4.13	.80		
25 Years	240	4.03	.88		
30 Years	300	4.03	.78		

Note. Means with different superscripts differ, $p < .05$.

Primary Analyses

The analyses of the main hypothesis results show a statistically significant difference among students' use of the three instructional delivery methods in both students' course success and their course satisfaction. To test for differences among the mean scores for final grades and student satisfaction scores, a MANCOVA was conducted; the independent variable was type of instruction, and the covariates were education level, branch of service, ethnicity, gender, and instructor teaching experiences. Because education level, branch of service, ethnicity, and gender were nominal categorical variables, they were first dummy-coded before being entered in the model. Covariates with two levels were dummy-coded as 0 and 1, such that the value coded as 1 was the indicator group and the value coded as 0 was the reference group. For covariates

with more than two groups, $k - 1$ dummy variables were created with k equaling the number of total group categories for the variable. For each dummy variable, the value coded as 1 was the indicator group, whereas the value coded as 0 across all dummy variables was the reference group. The reference groups for education level, branch of service, ethnicity, and gender were Master's or PhD, DOD civilian, Caucasian, and female, respectively.

Results yielded a significant multivariate effect, Wilk's Λ F (4, 1696) = 100.60, $p < .001$, $\eta^2_p = .192$ (see Table 19). Examining univariate effects revealed a significant effect of type of instruction on final grades, F (2, 848) = 100.72, $p < .001$, $\eta^2_p = .192$. Post-hoc pairwise comparisons showed that participants who received face-to-face instruction had significantly higher final grades ($M = 95.74$, $SD = 3.15$) than did participants who received digital instruction ($M = 91.83$, $SD = 5.01$) and web-based instruction ($M = 90.20$, $SD = 5.46$; Bonferroni-adjusted ps $< .001$). Also, participants who received digital instruction had higher final grades than did participants who received web-based instruction (Bonferroni-adjusted $p < .001$).

Table 19 also displays the univariate results from both dependent measures, as well as covariates. Examining univariate effects revealed a significant effect of type of instruction on student satisfaction scores, F (2, 848) = 107.56, $p < .001$, $\eta^2_p = .202$. Post-hoc pairwise comparisons revealed that participants who received face-to-face instruction had significantly higher student satisfaction scores ($M = 4.56$, $SD = .56$) than did participants who received digital instruction ($M = 3.67$, $SD = .87$) and web-based instruction ($M = 3.99$, $SD = .71$); Bonferroni-adjusted ps $< .001$). In addition, participants who received web-based instruction reported higher student satisfaction scores than did participants who received digital instruction (Bonferroni-adjusted $p < .001$). Univariate effects did not yield a significant effect of the covariates on final

grades and student satisfaction scores, *p*s > .05, indicating relevantly equivalent final grades and satisfaction scores across differing levels of the covariates.

Table 19.

MANCOVA Summary for Course Success and Course Satisfaction by Type of Instruction with Educational Level, Branch of Service, Ethnicity, Gender, and Instructor Teaching Experience as Covariates

	N	*M*	*SD*	*Mdn*	*F*	*p*
			Type of Instruction			
Course Success					100.72	< .001
Digital Instruction	290	91.83[a]	5.01	92.0		
Face-to-Face Instruction	287	95.74[b]	3.15	96.0		
Web-Based Instruction	282	90.20[c]	5.46	91.0		
Course Satisfaction					107.56	< .001
Digital Instruction	290	3.67[a]	.87	4.0		
Face-to-Face Instruction	287	4.56[b]	.56	5.0		
Web-Based Instruction	282	3.99[c]	.71	4.0		
			Covariates included in the Model			
Associate's/Bachelor's[†]						
Final Grade					1.44	.230
Student Satisfaction					.17	.683
Army[‡]						
Final Grade					.12	.731
Student Satisfaction					.02	.894
Air Force[‡]						
Final Grade					3.05	.081
Student Satisfaction					.00	.985

Note. Multivariate F (4, 1694) = 100.60, $p < .001$, $\eta^2_p = .192$. Means with different superscripts differ significantly, $p < .05$.
[†]Compared to Master's/PhD. [‡]Compared to DOD Civilian. [††]Compared to Caucasian.
[‡‡]Compared to Female.
Final Grade Kruskal–Wallis test χ^2 (2) = 197.634, $p < .001$. Student Satisfaction Kruskal–Wallis test χ^2 (2) = 183.65, $p < .001$.

Table 19. (Continued)

	N	*M*	*SD*	*Mdn*	*F*	*p*
Navy‡						
Final Grade					.14	.711
Student Satisfaction					.60	.438
Hispanic††						
Final Grade					.00	.962
Student Satisfaction					.02	.885
African American††						
Final Grade					.71	.401
Student Satisfaction					.45	.504
Male‡‡						
Final Grade					.47	.494
Student Satisfaction					.10	.756
Instructor Teaching Experience						
Final Grade					.57	.450
Student Satisfaction					3.03	.082

Note. Multivariate F (4, 1694) = 100.60, $p < .001$, $\eta^2_p = .192$. Means with different superscripts differ significantly, $p < .05$.
†Compared to Master's/PhD. ‡Compared to DOD Civilian. ††Compared to Caucasian.
‡‡Compared to Female.
Final Grade Kruskal–Wallis test χ^2 (2) = 197.634, $p < .001$. Student Satisfaction Kruskal–Wallis test χ^2 (2) = 183.65, $p < .001$.

Results from the MANCOVA suggest that type of instruction affects participants' course success and course satisfaction when controlling for education level, branch of service, ethnicity, gender, and instructor teaching experience, but the MANCOVA model violated Box's test of equality of covariance matrices, Box's $M = 144.09$, $p < .001$. In addition, the univariate models were found to violate Levene's test for equality of error variances, for both final grade, F (2, 856) = 33.91, $p < .001$, and for student satisfaction, F (2, 856) = 35.36, $p < .001$. Although

general linear models with large sample sizes have been shown to be robust against some deviations of normality and linearity (Tabachnick & Fidell, 2007), these assumption violations were extensive enough to warrant nonparametric, follow-up tests to confirm the findings. First, nonparametric Kruskal-Wallis tests confirmed the effect of type of instruction on final grade, χ^2 (2) = 197.64, $p < .001$, and student satisfaction, χ^2 (2) = 183.65, $p < .001$. Mann–Whitney *U* tests were conducted to assess the mean rank pairwise comparisons among type of instruction. Participants who had face-to-face instruction had significantly higher final grades than did participants who had digital and web-based instruction, *p*s < .001. Participants who had face-to-face instruction also had higher student satisfaction scores than did participants who had digital and web-based instruction, *p*s < .001. Participants who had digital instruction had higher final grades and lower student satisfaction scores than did participants who had web-based instruction, *p*s < .001.

Additional analyses

Because the original MANCOVA violated the assumptions for equality of error variances (i.e., Levene's test) and equality of covariance matrices (i.e., Box's *M* test), further nonparametric analyses were warranted in order to control for covariates. To control for covariates, two separate nonparametric regression analyses were conducted on each dependent measure. To examine whether type of instruction predicts student satisfaction scores while controlling for demographic covariates, a multinomial logistic regression was conducted on student satisfaction scores. Student satisfaction scores were treated as a categorical dependent variable, whereby participants who indicated "strongly disagree" (*n* = 1) and "disagree" (*n* = 21) were treated as missing values due to insufficient sample size. In the resulting dependent variable, the most represented level was the response "agree" (43.2%), followed by "strongly

agree" (33.8%), and "neither agree nor disagree" (21.7%). Participants who indicated "neither agree nor disagree" were coded as the reference group. Predictors in the model included the independent variable, type of instruction (reference group: face-to-face instruction), and the demographic covariates: educational level (reference group: Master's or PhD degrees), branch of service (reference group: DOD civilian), ethnicity (reference group: Caucasian) gender (reference group: male), and instructor teaching experience (reference group: 15 years).

As shown in Table 20, the overall model was significant, χ^2 (24) = 225.26, $p < .001$, Cox and Snell's $R^2 = .236$. Examining the likelihood ratio tests, the type of instruction significantly contributed to model fit, χ^2 (4) = 186.46, $p < .001$. Compared to those who received web-based instruction, participants who received face-to-face instruction were 5.15 times more likely to respond "agree" and were 18.87 times more likely to respond "strongly agree" than they were to respond "neither agree nor disagree," *p*s < .001. Compared to digital instruction, participants who received face-to-face instruction were 14.92 times more likely to respond "agree" and 38.46 times more likely to respond "strongly agree" than they were to respond "neither agree nor disagree," *p*s < .001. When using web-based instruction as the reference group, the results revealed that participants who received web-based instruction were 2.91 times more likely to respond "agree" and 2.08 times more likely to respond "strongly agree" than they were to respond "neither agree nor disagree" compared to participants who received digital instruction *p* < .001. Based on the likelihood ratio tests, no covariates, however, significantly contributed to overall model fit, *p*s > .05 (see Table 20).

Table 20.

Summary of Multinomial Regression Predicting Student Course Satisfaction by Type of Instruction, Educational Level, Branch of Service, Ethnicity, Gender, and Instructor Teaching Experience

	B	*SE*	*Wald*	*OR*	*p*
Agree (reference group: Neither Agree nor Disagree)					
Digital Instruction (reference group: Face-to-Face Instruction)	-2.704	.38	51.65	.067	< .001
Web-Based Instruction (reference group: Face-to-Face Instruction)	-1.638	.41	15.72	.194	< .001
Associate's/Bachelor's (reference group: Master's/PhD)	-.193	.24	.67	.824	.414
Army (reference group: DOD Civilian)	.339	.29	1.35	1.403	.246
Air Force (reference group: DOD Civilian)	.013	.33	.00	1.013	.969
Navy/Marines (reference group: DOD Civilian)	.151	.33	.22	1.163	.641
Hispanic (reference group: Caucasian)	.059	.29	.04	1.061	.837
African American (reference group: Caucasian)	.118	.26	.21	1.125	.645
Female (reference group: Male)	.393	.23	2.91	1.482	.088
20 Years (reference group: 15 Years)	-.320	.32	.99	.726	.321
25 Years (reference group: 15 Years)	-.677	.31	4.70	.508	.030
30 Years (reference group: 15 Years)	-.421	.29	2.11	.657	.147

Note. χ^2 (24) = 225.26, $p < .001$, Cox and Snell's $R^2 = .236$. Type of instruction likelihood ratio test χ^2 (4) = 186.46, $p < .001$. Because no covariates significantly contributed to model fit (ps > .05), significant odds ratios from covariate predictors are not discussed in-text.

Table 20. (Continued)

	B	*SE*	*Wald*	*OR*	*p*
Strongly Agree (reference group: Neither Agree nor Disagree)					
Digital Instruction (reference group: Face-to-Face Instruction)	-3.667	.38	92.66	.026	< .001
Web-Based Instruction (reference group: Face-to-Face Instruction)	-2.934	.42	47.92	.053	< .001
Associate's/Bachelor's (reference group: Master's/PhD)	-.128	.26	.25	.880	.618
Army (reference group: DOD Civilian)	.051	.32	.03	1.052	.873
Air Force (reference group: DOD Civilian)	.113	.36	.10	1.119	.752
Navy/Marines (reference group: DOD Civilian)	.235	.35	.46	1.265	.498
Hispanic (reference group: Caucasian)	-.031	.31	.01	.969	.920
African American (reference group: Caucasian)	-.234	.29	.64	.791	.424
Female (reference group: Male)	.186	.25	.54	1.204	.465
20 Years (reference group: 15 Years)	-.137	.35	.16	.872	.692
25 Years (reference group: 15 Years)	-.738	.34	4.83	.478	.028
30 Years (reference group: 15 Years)	-.428	.32	1.80	.652	.180

Note. χ^2 (24) = 225.26, $p < .001$, Cox and Snell's $R^2 = .236$. Type of instruction likelihood ratio test χ^2 (4) = 186.46, $p < .001$. Because no covariates significantly contributed to model fit (ps > .05), significant odds ratios from covariate predictors are not discussed in-text.

The second nonparametric analysis was conducted to confirm the original MANCOVA results for final grade when covariates were included in the model. To examine the effect type of instruction has on final grade while controlling for demographic covariates, it was determined that a poisson regression would be the most appropriate nonparametric regression analysis given the skew of final grade and continuous property of the variable. Because a poisson regression assumes a positively skewed distribution and final grade was negatively skewed, final grade was inversely transformed by multiplying values by -1 and adding 100 to each score. A negative binomial regression was selected as the probability distribution of the final model because the variance (27.25) of the inverse of final grade was higher than the mean (7.46). Negative binomial regression is similar to poisson regression but includes a dispersion parameter that accounts for overdispersion (Agresti, 2002). In the final model, predictors included the independent variable, type of instruction (reference group: face-to-face instruction), and the demographic covariates: educational level (reference group: Master's or PhD degrees), branch of service (reference group: DOD civilian), ethnicity (reference group: Caucasian), gender (reference group: male), and instructor teaching experience (reference group: 15 years). Because final grade was inversely transformed, odds ratios over 1 indicated an increase in the likelihood of receiving *lower* final grades, whereas odds ratios under 1 indicated a decrease in the likelihood of receiving *lower* final grades.

As shown in Table 21, the overall model was significant, likelihood ratio χ^2 (12) = 91.68, $p < .001$, and established adequate goodness of fit, Pearson's χ^2 (846) = 301.51, $p > .05$, Akaike information criterion = 5202.39. Examining the model effects tests revealed that type of instruction significantly accounted for variance found in final grade, Wald χ^2 (2) = 76.38, $p < .001$. Participants who had face-to-face instruction were more likely to report higher final grades

in the course than were participants who had web-based instruction (odds ratio = 2.21) and participants who had digital instruction (odds ratios = 1.93), *p*s < .001. The odds ratio between web-based and digital instruction was not significant when web-based instruction was used as the reference group, $p > .05$. In examining the model effect tests, none of the covariates significantly predicted course success /final grade when each covariate was included as the only predictor in the model, *p*s > .05.

Table 21.

Summary of Negative Binomial Regression Predicting Course Success by Type of Instruction, Educational Level, Branch of Service, Ethnicity, Gender, and Instructor Teaching Experience

			95% CI		
	B	*OR*	*LL*	*UL*	*p*
Digital Instruction (reference group: Face-to-Face Instruction)	.657	1.929	1.612	2.309	< .001
Web-Based Instruction (reference group: Face-to-Face Instruction)	.792	2.207	1.804	2.700	< .001
Associate's/Bachelor's (reference group: Master's/PhD)	.047	1.048	.884	1.243	.586
Army (reference group: DOD Civilian)	.016	1.016	.815	1.267	.886
Air Force (reference group: DOD Civilian)	.132	1.141	.889	1.465	.301
Navy/Marines (reference group: DOD Civilian)	.048	1.049	.824	1.335	.699
Hispanic (reference group: Caucasian)	-.009	.991	.805	1.221	.934

Note. Likelihood ratio χ^2 (12) = 91.69, $p < .001$, Pearson χ^2 (846) = 301.51, $p > .05$, Akaike information criterion = 5202.39.

Table 21 (Continued)

	B	*OR*	95% CI *LL*	95% CI *UL*	*p*
African American (reference group: Caucasian)	-.037	.963	.791	1.174	.711
Female (reference group: Male)	-.061	.941	.797	1.111	.474
20 Years (reference group: 15 Years)	.046	1.047	.833	1.317	.693
25 Years (reference group: 15 Years)	-.103	.902	.720	1.130	.370
30 Years (reference group: 15 Years)	.005	1.005	.816	1.237	.964

Note. Likelihood ratio χ^2 (12) = 91.69, $p < .001$, Pearson χ^2 (846) = 301.51, $p > .05$, Akaike information criterion = 5202.39.

To summarize the primary analyses, Table 22 displays the finding that the null hypothesis was rejected. Not only did the original MANCOVA report a significant overall multivariate *F* value, but the nonparametric analyses reported significant models as well.

Table 22.

Summary of Null Hypothesis Testing Outcomes

Hypotheses	Results of the Test		Decision
H_0: There is not a statistically significant difference between students' use of the three instructional delivery methods and student course success and course satisfaction.	F (4, 1694) = 100.60	$p < .001$	Reject the H_0

Summary of findings

Overall, type of instruction significantly affected participants' reported course satisfaction and course success, even when controlling for educational level, branch of service, gender, and instructor teaching experience. Parametric and nonparametric tests confirmed this finding with and without controlling for covariates. Based upon the findings, participants who had face-to-face instruction had higher course success (final grades) than did participants who had web-based and digital instruction. Participants who had face-to-face instruction also reported higher course satisfaction than did participants who had web-based and digital instruction. When examining the differences between digital and web-based instruction, parametric and nonparametric findings suggest that when controlling for demographic covariates, participants who had web-based instruction were more likely to report higher satisfaction responses than were participants who had digital instruction. However, the results were mixed between web-based and digital instruction for final grade. When controlling for demographic covariates, nonparametric findings did not confirm the parametric result that participants who had digital instruction had higher final grades than did participants who had web-based instruction. The implications of these findings are further discussed in chapter 5.

CHAPTER 5

DISCUSSION AND IMPLICATIONS OF THE RESEARCH

This chapter concludes the research study and contains a summary and discussion of the findings in relation to the response to the research question, students' success and satisfaction, implications of the research, a description of the implications for theory, and the addition to the body of knowledge in the area of education delivery methods. Limitations, delimitations, Human Subject issues, and recommendations for further research are also presented.

The purpose of the study was to determine if there was a statistically significant differences between and among students' use of the three modes of instructional delivery methods (digital, face-to-face, and web-based instruction), and student course success and course satisfaction. The varied studies that preceded this one took place in different settings, such as academic institutions (secondary and post-secondary education), and included participants of diverse backgrounds, gender, ages, ethnicity, as well as other variables that were considered to evaluate success and satisfaction.

In this study, both student course success and course satisfaction rates were found to be valid metrics of institutional effectiveness for face to face, digital instruction, and web based online courses in the related literature (Bocchi, et al., 2004; Ludwig-Hardman & Dunlap, 2003; Moore, 1989), corroborating the delivery methods used as dependent variables in the study. Furthermore, this research answers the research question and demonstrated that there were statistically significant differences in the use of the three modes of instructional delivery.

Significance of the Research

The Research Question was based on the premise that students' course success and course satisfaction within an academic program could be a direct result of a particular instructional

method and academic environment. Prior research indicated that students' motivational perceptions about a learning task and their perceptions of instructional quality are related to positive academic outcomes, including course success and course satisfaction.

Research Question (RQ)

RQ: Is there a statistically significant difference between students' use of the three modes of instructional delivery (digital, face-to-face, and web-based instruction) and student course success and course satisfaction?

The purpose of posing this question was to determine if a there was a statistically significant difference between students' use of the three instructional delivery methods and student course success and course satisfaction.

In an effort to answer this question, the researcher conducted statistical analyses using MANCOVA and nonparametric follow-up tests.

The sample of this study consisted of data collected from a group of 900 graduated students from the US Army North Training program, for DSCA course level II, from 2012 to 2014. The sample was divided into three subgroups of 300 students: 5 courses of 60 students for each of the instructional delivery methods. The sample data were divided into three groups, which were composed of personnel that have completed all pre-requisite courses, such DOD Defense Support of Civil Authorities DSCA I and DSCA II. Moreover, the main sample for this study was selected from the DSCA II courses only.

Findings from the present study support prior research results indicating that students' success and satisfaction in particular fields of traditional classrooms setting as face to face and online education provide a level of success and satisfaction. This research presents evidence confirming that these relationships extend to face to face, self-paced, and online learning

programs, and that these education delivery modes facilitate knowledge in the context of an authentic military training course.

Hypotheses

Two core hypotheses were statistically tested:

- H_0: Null Hypothesis: There is not a statistically significant difference between students' use of the three instructional delivery methods and student course success and course satisfaction.
- H_1: Alternative Hypothesis: There is a statistically significant difference between students' use of the three instructional delivery methods and student course success and course satisfaction.

Quantitative Data

Multiple pieces of data provided by the United States Army Northern Command were analyzed during this study. One component of this quantitative data was the academic results from each student and the final survey results from the survey that was developed and administered to students that participated in the DSCA course (see Appendix 2). The survey included demographic questions and questions specific to personal satisfaction during and after completing the course instruction.

The results from MANCOVA revealed a significant multivariate effect; however, additional nonparametric follow-up tests were conducted to confirm the findings. The nonparametric results revealed statistically significant effects for type of instruction on course success/final grades and student satisfaction without controlling for covariates, which provides a preliminary answer to the main research question as follows:

- Students who received face-to-face instruction had higher course success/final grades and satisfaction compared to participants who received digital or web-based instruction.
- Students who received digital instruction had higher course success/final grades than students who received web-based instruction.
- Students who received web-based instruction had higher student satisfaction than students who received digital instruction.

In order to conduct nonparametric analyses while controlling for covariates, two separate nonparametric regressions models were run on each dependent variable.

For Student Satisfaction, a multinomial logistic regression was conducted to predict student satisfaction scores from all the predictors. The 22 people who indicated *Strongly Disagree or Disagree* were counted as missing due to insufficient sample size. The overall model was significant, and type of instruction significantly predicted student satisfaction after controlling for all the covariates. None of the covariates significantly predicted student satisfaction.

Face-to-face students were statistically significantly more likely than were web-based students to "agree" or "strongly agree" than they were to "neither agree nor disagree" that "I am satisfied with the knowledge that I gained from the course."

Additionally, face-to-face students were statistically significantly more likely than were web-based students to respond "agree" or "strongly agree" than they were to respond "neither agree nor disagree" that they are satisfied with the quality of the instruction in the course.

Web-based students were twice as likely as digital students to "agree" or "strongly agree" than they were to "neither agree nor disagree" that they are satisfied with the content of the

course. In addition, web-based students were twice as likely as digital students to "strongly agree" than they were to respond "neither agree nor disagree" that their goals of the training course were met.

For Course Success using final grade, a poisson regression was conducted to predict the number of final grades from all the predictors. Given that the model poorly fit the data, a model using the negative binomial probability distribution was conducted instead. The overall model was significant, and type of instruction significantly predicted final grades after controlling for all the covariates. None of the covariates significantly predicted final grade. Finally, web-based students were twice as likely to have lower final grades as were face-to-face students.

Demographics

The population for this study included 900 adult students graduated from the Defense Support to Civil Authorities (DSCA) courses presented via face to face, digital instruction, or web based instruction during a period of two years over 2012 and 2014. The number of participants was sufficient to conduct this research and provided an excellent sample for statistical analyses.

Variables

Covariates

1. Gender: The majority of participants were male.
2. Ethnicity: For the analyses, Asian and Native American were set to missing due to small sample size. The majority of participants were Caucasian.
3. Education Level: The original variable was recoded into 2 groups: Associate's/Bachelor's and Master's/PhD. The majority of participants had an associate or bachelor's degree.

4. Branch Service: The original variable was recoded into 4 groups: Army, Air Force, Navy/Marine, and DOD Civilian. The largest percentage of participants was in the Army.
5. Instructor Teaching Experience: The largest percentage of participants had instructors with 30 years of teaching experience.

Independent Variables

Type of Instruction: The three types of instructions (digital, face-to-face, and web-based) had equal groups, and 33.3% of the sample was in each group.

Dependent Variables

1. Student Satisfaction: Participants' satisfaction scores ranged from 1 to 5 with a mean of 5.
2. Course Success: Participants' final grades ranged from 80 to a 100 with a mean of 93.

Relationships among demographics

Crosstabs

1. Education Level

   The relationships between Education Level and Branch of Service, Ethnicity, Gender, and Instructor Teaching Experience were not significant.

2. Branch of Service
   a. Instructor Teaching Experience: A smaller proportion of participants with instructors who had 25 years of experience were in the army compared to participants in other branches of service.
   b. The relationships between Branch of Service and Education Level, Ethnicity, and Gender were not significant.

3. Ethnicity
    a. The relationships between Ethnicity and Education Level, Branch of Service, Gender, and Instructor Teaching Experience were not significant.
4. Gender
    a. The relationships between Gender and Educational Level, Branch of Service, Ethnicity, and Instructor Teaching Experience were not significant.
5. Instructor Teaching Experience
    a. Branch of Service
        i. A smaller proportion of participants in the Army had instructors with 25 years of experience compared to participants with instructors at other levels of experience.
        ii. A greater proportion of DOD Civilian participants had instructors with 25 years of experience compared to participants who had instructors with 30 years of experience.
    b. The relationships between Instructor Teaching Experience and Education Level, Ethnicity, and Gender were not significant.

Relationships among DVs

Correlations

1. Higher scores on final grades were associated with higher student satisfaction scores.

Results were confirmed with nonparametric analyses.

Relationships among Demographics and Independent Variables (IV)

Crosstabs

2. Type of Instruction

a. Education Level
    i. A smaller proportion of participants with an associate's/bachelor's degree received face-to-face instruction compared to participants who received other types of instruction.
    ii. In addition, a greater proportion of participants with a master's/PhD received face-to-face instruction compared to participants who received other types of instruction.
b. Branch of Service
    i. A greater proportion of participants in the army received web based instruction compared to participants who received other types of instruction.
    ii. In addition, a smaller proportion of participants in the Navy/Marines received web-based instruction compared to other types of instruction.
    iii. Finally, a smaller proportion of DOD Civilians received web-based instruction compared to other types of instruction.
c. Instructor Teaching Experience
    i. A smaller proportion of participants with instructors who had 25 years of experience received web-based instruction compared to participants who had instructors with other levels of experience.
    ii. A greater proportion of participants who had instructors with 30 years of experience received web-based instruction compared to participants who received other types of instruction.
d. The relationships between Type of Instruction and Ethnicity and Gender were not significant.

Relationships between Demographics and DVs

T-Tests/ANOVAs

3. Course Success
    a. Education Level: Participants with a master's degree/PhD had significantly higher final grades than participants with an associate's/bachelor's degree.
    b. Branch of Service: Participants' Final Grade significantly differed across Branch of Service. However, the error variance of Final Grade significantly differed across levels of Branch of Service. Nonparametric follow-up tests were not significant, suggesting that nonparametric tests did not confirm the original results.
    c. Instructor Teaching Experience: Participants who had instructors with 25 years of experience had significantly higher final grades than participants who had instructors at other levels of experience.
    d. The relationships between Final Grade and Gender and Ethnicity were not significant.
4. Student Satisfaction
    a. The relationship between Student Satisfaction and Education Level, Gender, Branch of Service, Ethnicity, and Instructor Teaching Experience were not significant.

Discussion of Findings and Review of Literature

The review of the literature was focused on accomplishing several objectives related to this study. The first objective was to identify previous studies conducted to recognize students' success and satisfaction in different educational setting, including face to face and distance

learning education. This information amplified the importance of conducting this study and the contribution that results could provide to the academic and military education system.

The second objective was to fully explore the research about course success and satisfaction using the exact same curriculum but implemented in three different instructional methods. The goal was to look at the factors that impact these aspects of success and satisfaction while including several covariates in the statistical analysis.

The third objective was to identify the research that explored the impact on student success and student satisfaction by identifying the modality that offers the most interaction and flexibility. Finally, the conceptual framework was identified and fully researched in the context of its relevance in underpinning students' results from the use of one of the three instructional methods individually; therefore, this study did not evaluate distance education from a blended perspective. The criteria of interaction and flexibility to produce the highest level of course success and course satisfaction for students was shown in the comparison table as is indicated in Table 1 of Chapter 1.

The findings of the study are consistent with the study conducted by Weber and Lennon (2007), which measured the effectiveness of online versus face-to-face course delivery. They investigated learning outcomes and satisfaction level of students in the same course being offered in the two formats. Learning outcomes were measured by the final exam, course projects, and final course grade. Overall satisfaction included two variables measured with course content and with interaction with the instructor. The researchers found no difference in the achievement of course objectives or learning outcomes but a slightly lower satisfaction level with students in the online course which could be attributed to the lack of personal interaction noted by students.

According to Maeroff (2003), it is understood that claiming equivalency or superiority of one type of course delivery can be subject to criticism if the quality of the evaluation and statistical analyses is questionable. In previous studies critics of online education have questioned the academic integrity and rigor of courses and the diminished role of the instructor just as there are critics of any process that challenges tradition (Maeroff, 2003).

Rather than focus on identifying one method as being better than the other, some researchers have focused on ensuring that the rigor and quality is the same for students regardless of delivery mode (Turner & Crews, 2005), thereby putting emphasis on student needs and meeting intended course learning outcomes (Carnevale, 2001).

The argument in the study is supported by comparison studies involving distance education and face-to-face instruction has paralleled the changes of delivery modes for defining distance education. Studies in the years prior to the web technology compared traditional face-to-face instruction format with distance education modes, such as correspondence and video (Meyer, 2002). In the past decade there have been numerous studies using online instruction as the distance education comparison with face-to-face in an attempt to identify variables such as motivation, self-efficacy, self-motivation, self-control, and self-discipline that could predict online student success (Irizarry, 2002; Parker, 2003; Waschull, 2005; Williams, 2008). In other studies, researchers have evaluated the status of students identified as traditional or nontraditional as a predictor of success level in comparisons of educational delivery modes (McGivney, 2004; Wojciechowski & Palmer, 2005).

Peterson and Bond (2004) studied students' achievement and satisfaction by researching a group of postgraduate students seeking a certificate in secondary education at a public university, who took either a course on the teaching of secondary reading or a course on the

secondary curriculum. For each course, students chose to enroll in either a face-to-face or online section, with approximately 20 students in each of the four sections. Both types of classes included discussion; online courses accomplished this through an asynchronous discussion board. Student withdrawal rates were not discussed. Performance was assessed based on the quality of a course project. As the study did not randomize students, the researchers attempted to control for potential pre-existing differences between groups by administering a pre-assessment of students' general understanding of the principles underlying the project. However, the pre-assessment was taken well into the first half of the semester. Online students scored statistically significantly higher on the pre-assessment; after controlling for this difference, the two groups scored equivalently on the final project. Given the tardiness of the pre-test assessment, it is difficult to interpret this result. It was not clear if more-prepared students chose the online course, which was reflected in the pre-test scores or whether the early weeks of the course prepared online students significantly better in terms of underlying project principles. Even without controlling for their pre-test advantage, however, the online group still scored similarly to the face-to-face group on the post-test, indicating that the online students did not retain their advantage over time. In addition, eight students who had taken both an online and a face-to-face teacher education course from the two participating instructors were interviewed, and all eight felt that the face-to-face course had better prepared them for teaching.

In addition the finding of this study in contrast with the studies conducted by Schoenfeld-Tacher, McConnell, and Graham (2001) that examined students in an upper-division tissue biology course at a state university and did not reflect differences between students the online versus face-to-face course. Here we find the researcher took students that chose to enroll in either an online or face-to-face version of the course; subsequently, 11 students from the online

course and 33 from the face-to-face course agreed to participate in the study. It was not clear whether these volunteers represented a majority of each classroom, a small subset of each classroom, or (given the unequal n) a majority of the face-to-face enrollees and a small subset of the online enrollees. The face-to-face course included traditional lecture and laboratory sessions; the online course included web-based versions of these materials as well as instructor-led synchronous discussions and voluntary learner-led online review sessions. Student withdrawal rates were not discussed. Learning outcomes were assessed using multiple-choice pre- and post-tests. In an attempt to remove potential selection effects due to the non-randomized design, student pre-test scores were treated as a control in the comparison of the group post-tests. Curiously, however, the pre- and post-test scores were not related (with n2 = 0.000). Pre-test scores were also extremely low, with group averages of 10–15 on a scale that seemed to range to 100 (given that post-test group averages were in the 70-80 range with standard deviations above 10). Accordingly, it seems likely that the multiple-choice pre-test scores represented student random guessing and thus did not capture pre-existing differences between the groups in any substantive way. After controlling for the pre-test, online students showed significantly higher adjusted post-test scores; however, given the ineffectiveness of the pre-test, this result might simply reflect differences between students who chose to enroll in the online versus face-to-face course.

The results of the review of literature for the present study suggested that there are some consistent differences in outcomes between online and face-to-face, thus this research further explored these outcomes by incorporating continuous variables into the analyses. Across several studies conducted to compare differences between online and face-to-face, the review of literature revealed that only three showed no statistically significant differences in learning

outcomes between the two types of courses (Caldwell, 2006; Davis et al., 1999; La Rose et al., 1998). Another study showed no quantitative differences but noted that qualitatively, students felt they were better prepared by the face-to-face course (Peterson & Bond, 2004). It could be argued that the studies showing no statistically significant effects did so only due to small sample sizes; however, effect sizes in these studies were also quite small, and descriptively the direction of effects was mixed. For example, in Caldwell (2006), face-to-face students performed slightly better on three learning outcomes, while online students' performance was lower.

Limitations

This study concentrates on the courses offered during two years of education and training for military and DOD personnel to support civil authorities, 2012 thru 2014. Generally, the study focused on the Military's non-warfighting assistance to civil authorities in support of emergency response in time of disaster. The Defense Support to Civil Authorities Course, prepares the military personnel to performs duties during the consequence management after a catastrophic incident, and contributes in the development of the modern system of emergency management, as promulgated by the Federal Response Plan (FRP) and the National Response Framework NRF (DHS, 2008), FEMA's use of the four principles or phases of emergency management (Preparedness, Response, Recovery, and Mitigation), and modern incident management, [the Incident Management System (IMS)].

This study also used the concept of interaction as very important criteria for comparing the three instructional methods within this research analyses. Interaction within the purview of this study was defined as form of communication between students and the educational content, which is the relationship that exist between the instructor the learner and educational material. This relationship between the learner and the educational content provide additional possibilities

for the learners to deepen the understanding of the content, such as: tests in questions and answers format, simulators, and interactive objects (e.g., images and shapes require actions and reactions). For the military, interactivity is not only providing a tool to help deepen the learner's understanding of the learning content, but it is also considered a fundamental and vital issue in establishing the concept for learning within this environment in order to be able to perform certain hands on tasks. However, is important to understand that there are some tasks that do not require hands on or practical application; therefore, the level of interaction between leaners and instructor is not as critical, thus distance learning is appropriate for this type of training.

Delimitations

The research considers only domestic military response personnel for this study which included military personnel in Active Duty status, and federal DOD Civilian personnel. The DSCA course and training provides preparation for personnel to operate in the 50 plus States, Territories, Possessions, Protectorates, and Trusts. DSCA course program falls under the DOD doctrinal and operational domain of Military Operations Other Than War (MOOTW). MOOTW focuses on "deterring war, resolving conflict, promoting peace, and supporting civil authorities in response to domestic crises." Although the research concentrates on the operational arena of MOOTW, it does not consider Peace Operations (Peacekeeping, Peace Enforcement, Counterterrorism, etc.) or Civil Affairs because they relate to non-domestic operations and to warfighting; moreover, obtaining the information required for this study was possible due to the cooperation of USARNORTH training department. As a result of the use of secondary data as a primary source of information, this study did not present any issues regarding the study design, sampling technique, sample size, measurement and instruments, data collection, human subject

issues, or any potential biases or confounding variables, because the information was used exactly as provided by the owner authority in order to maintain its entire validity.

Human Subjects

There was minimum risk in relation to participants' identity, personal information, their responses, and final course standing. The anonymity of participants was protected by numerically coding each returned questionnaire and keeping the responses confidential. During the individual surveys with the selected respondents, respondents were assigned a number as participant (P1) for use in descriptions and the reporting of results. All study data, including the course final grades, survey electronic files, and transcripts, were kept in a secured file cabinet in the researcher's office and will be destroyed after a reasonable period of time. A summary of this study could be disseminated to the professional community, and it will not be possible to trace responses to the individuals' identities.

Implications

Scholarly research facilitated the identification of best practices, which led to a theoretical framework that helped to design and shape this study. Information and analyses from several investigations that preceded this study were used to theorize and formulate the null hypothesis and whether it would be rejected or accepted. As stated in the previous chapter, the results presented statistical evidence that supported the rejection of the null hypothesis.

Specifically, the H_0 - Null Hypothesis - was rejected, which stated that there was not a statistically significant difference between students' use of the three instructional delivery methods and student course success and course satisfaction. The H_1 - Alternative Hypothesis was accepted, which stated that there was a statistically significant difference between students'

use of the three instructional delivery methods and student course success and course satisfaction.

Regarding the original design for using MANCOVA to conduct the statistical analyses, it was identified during the first analysis that MANCOVA in fact violated two important error variance assumptions: Box's test tests for error covariance matrices, which is the assumption that the spread of participants' scores is the same across the two dependent measures for the three type of instruction groups. Levene's Test examines the assumption that the spread of participants' scores is the same across the three types of instructions for just one dependent variable.

The reason for choosing the nonparametric follow up for the multinomial regression was that Student Satisfaction was a good candidate dependent variable for multinomial regression. Given that the *disagree* and *strongly disagree* responses from the survey were counted as missing, there were only 3 categories for Student Satisfaction to predict: neither agree nor disagree, agree, and strongly agree. This 3-category dependent variable was well-suited for multinomial logistic regression, because it is the same as logistic regression but with a nominal categorical dependent variable (as opposed to a strictly dichotomous variable).

The negative binomial regression was chosen for Course Success variable (final grade). Originally, a poisson regression was chosen, because Course Success (final grade) had a skewed distribution. Poisson regression assumed a positively skewed distribution. In order to make course success positively skewed, additional steps were taken: first the final grade scores were multiplied by -1, then 100 was added. This essentially flipped the variable's distribution from being negatively skewed to being positively skewed. The only difference between negative binomial and poisson regression is one important assumption: poisson assumed that the error

variance equals the mean. Negative binomial accounted for what is called overdispersion, meaning the error variance was greater than the mean. When the final grade scores were transformed then the error variance was indeed higher than the mean, and this was the justification for the selection of a negative binomial regression for analyzing course success.

Future Research

The topic of student success and perceptions of course satisfaction within military training and educational courses at various levels warrants further research. Recommendation for future research includes comparing web based education and digital instruction with more direct behavioral measures that could help clarify how students' motivational attitudes and perceptions that impact their actual academic performance and satisfaction with distance learning education.

Additionally, the present study could be replicated using a different population from the military community; perhaps, a younger population with less than five years of military service could generate different results considering the level of experience with the use of technology. Furthermore, the present study could be also continued in the future to measure the effects of specific instructional modalities using a different curriculum. Besides, the study could be further expanded to include specific characteristics of student performance and retention, such as examining whether the use of portable devises for distance education within the military provides the students a high level of success and satisfaction. Another study might consider comparing several course programs delivered in a blended modality in order to further explore the effect of the same variables considered during this study, but with a wider diversity of variety in training and education programs within all branches of the military. The information resulted from the recommended future research might benefit the Department of Defense and assist in the

consolidation of training and educational programs in order to maximize current resources at hand. Furthermore, the researcher recommends that while distance learning may not always be able to provide the same experiences as face to face instruction, educators need to keep in mind that not all learning requires hands on experiences. Therefore, the use of distance learning within the context of maximizing resources is a great alternative for those courses or program within DOD that are suitable for this type of instructional modality.

Summary

Critical Analysis of Findings and Conclusions

This research was conducted to examine whether there were differences between students' course success and course satisfaction. Moreover, this study attempted to determine if there was a statistically significant difference between students' use of the three instructional delivery methods and student course success and course satisfaction. Finding of this study and the results of the analyses demonstrated that face to face was the instructional method that produced higher level of success and satisfaction, while digital instruction produced higher final grades than students who received web-based instruction, and web-based instruction had higher level of student satisfaction over digital instruction.

Conclusions

In conclusion, identifying the significant difference between students' use of the three instructional delivery methods and student course success and course satisfaction was very important because these two factors impact motivation and, therefore, student completion rates and program effectiveness. Measurement of success and satisfaction is also valuable to institutions because this information can be used to evaluate courses and programs and to predict student attrition rates, which is very important during times of limited budget. In this research,

the results from the statistical analyses conducted show that students who received face-to-face instruction had higher course success and course satisfaction compared to participants who received digital or web-based instruction. Students who received digital instruction had higher final grades than students who received web-based instruction. Then, it was found that students who received web-based instruction had higher student satisfaction than students who received digital instruction.

This study similarly supported the argument that Interaction in the Educational Process serves as a critical component of the educational development and context" (Anderson, 2004). Wagner (1994) defines interactions as "reciprocal events that require at least two objects and two actions. As result, interactions occur when these objects and events mutually influence one another". Interactions serve a variety of functions in the educational transaction (Sims, 1999). These functions allow for learner control, facilitating program adaptation based on learner input, allowing various forms of participation and communication, and acting as an aid to meaningful learning. Constructivist learning theorists (Jonassen, 1991) especially emphasize the role of interaction in gaining other people's perspective during the learning process.

Interaction has always been an important factor in distance education. Holmberg (1989) argued for the superiority of individualized student-teacher interaction and introduced the concept of "guided didactic interaction" (the idea of simulated interaction). Garrison and Shale (1990) defined education essentially as the interactions between contents, students, and teachers and this concept was also adopted by the military. The results of this study also revealed that the level of interaction for the DSCA courses delivered via web based and digital instruction was not integrated as enough or was limited in comparison to the face to face instructional method. Therefore, for the DSCA program the lack of interaction in the online courses provided via web

based and digital instruction might have caused and contributed to the results of the statistical findings in this study.

The overall finding of this valuable study are also newsworthy and support broader levels theoretical and practice by identifying that in-person (face to face) type of instruction significantly affected participants' reported course satisfaction and course success, even when using multivariate analysis of covariance (MANCOVA), and controlling for educational level, branch of service, gender, and instructor teaching experience. Parametric and nonparametric tests confirmed this finding with and without controlling for covariates, supporting the finding that face to face instruction produced the most positive results. Understanding the use of multiple variables as were applied in this study is very important because any of them could also help to determine the reason for differences in course success and/or satisfaction, and suggest recommendations for improving overall learning outcomes.

Considering the budget limitations for the Department of Defense in FY 2015, in a period of increasing fiscal constraints as stated in the Quadrennial Defense Review 2014, the approved budget proposal for the Fiscal Year 2015 reduced the budgetary allocation by $35 billion from the previous year, which required DOD to maximize the use of funds while improving the quality of training and education effectiveness. Beginning with the Fiscal Year 2012 funds appropriations, DOD began absorbing significant impacts from the $487 billion, ten-year cut in spending due to caps instituted by the Budget Control Act (BCA) of 2011 (QDR 2014). For that reason, in response to the problem statement the results presented in this study can be used to prevent reductions of funds for face to face programs and justify the financial requirement for it, while maintaining current educational resources, or even to warrant an increase of funds for military educational programs, such as the DSCA course or any other formal military training

program. DOD may act on the contribution and the value added to the body of knowledge that this study provides to education by supporting face to face education as the primary effective instructional method of choice, while considering online education as an alternative instructional method.

Finally, after conducting statistical analyses which included multiple variables, this research supports the finding that face to face education provides more benefits to military training and education. Prior to this research, other researchers have found that online training and education have been perceived to be less effective than the traditional face-to-face method of learning (Weber and Lennon, 2007). Face to face education and online distance education (web based and digital instruction) each have unique advantages; however, due to the nature and requirements of most military training as it is for the DSCA course, distance education may complement face to face education. Yet, the use of only online instruction method for military training and education could affect the quality of the training by limiting teacher-student interaction, thus making some learning objectives more difficult to achieve.

Based on the results of this research, it is very important for the DSCA program to incorporate more curriculum developments integrating more active interaction functions into the web based and digital instruction for both modalities in order to improve the online courses. The outcome of this study, which used data collected during the years 2012 and 2014, provides a better understanding of the most effective instructional approach and practical contributions that can help to continue to improve current military education modalities of the 21st century, while enhancing instruction delivery by focusing on face to face instruction in education as the primary delivery method and online instruction as a reliable alternative to ensure that resources dedicated for education programs are well justified by statistical analysis and research.

REFERENCES

Allen, M., Bourhis, J., Burrell, N., & Mabry, E. (2002). Comparing student satisfaction with distance education to traditional classrooms in higher education: A meta-analysis. The American Journal of Distance Education.

Allen, I. E., & Seaman, J. (2008). Staying the course: Online education in the United States, 2008. Retrieved April 24, 2009 from http://www.sloan-c.org/publications/survey/pdf/staying_the_course.pdf.

Allen, I. E., & Seaman, J. (2010). *Learning on Demand: Online Education in the United States, 2009*. Sloan Consortium. PO Box 1238, Newburyport, MA.

Anderson, T. (2003). Modes of interaction in distance education: Recent developments and research questions. In M. G. Moore & W. G. Anderson (Eds.), Handbook of distance education (pp. 129-144). Mahwah, NJ: Erlbaum.

Anderson, W. A. (1969). Social structure and the role of the military in natural disaster. *Sociology and Social Research,* (53), 242-253.

Arbaugh, J. B., Bangert, A., & Cleveland-Innes, M. (2010). Subject matter effects and the community of inquiry framework: An exploratory study. The Internet and Higher Education.

Artino, A. R. (2007). Online Military training: Using a social cognitive view of motivation and Self-regulation to understand students' satisfaction, perceived learning, and choice. Quarterly Review of Distance Education.

Blanchard, W. (2007) Emergency Management-Related Terms & Definitions Guide.

Bohan, C. (2005). Bush mulls lead role for military in disasters. *Reuters*. Retrieved from www.redorbit.com/news/general/lead_role_for_military_in_disasters/index.html.

Bolliger, D. U., & Martindale, T. (2004). Key factors for determining student satisfaction in online courses. International Journal on E-Learning.

Bolliger, D. U. (2004). Key factors for determining student satisfaction in online courses. International Journal on E-learning.

Block, R., & Fields, G. (2004, March 9). Is military creeping into domestic spying and enforcement? *The Wall Street Journal.* . pp. B1.

Bradley, L. M., Stephens, L. S., & Shaw, M. (2007). The Posse Comitatus Act: Does it impact the DOD during Consequence Management Operations? *The Army Lawyer*, DA Pam *27-50-413* 413), 68-74.

Bray, E., Aoki, K., & Dlugosh, L. (2008). Predictors of learning satisfaction in Japanese online distance learners. International Review of Research in Open & Distance Learning.

Brown, B. W., & Liedholm, C. E. (2002). Can web Courses replace the classroom in principles of microeconomics? American Economics Review.

Biner, P. M., Bink, M. L., Huffman, M. L., & Dean, R. S. (1997). The impact of remote-site group size on student satisfaction and relative performance in interactive tele courses. The American Journal of Distance Education.

Cao, Q., Griffing, T.E., & Bai, X. (2009). The Importance of Synchronous Interaction for Student Satisfaction with Course Web Sites. *Journal of Information Systems Education, 20*(3), 331-338.

Carnevale, D. (2001). Union offers standards for distance education. *The Chronicle of Higher Education*, A23.Casey, J. & Wilson, P. (2005). A practical guide to providing flexible learning in further and higher education. Retrieved from http://www.enhancementthemes.

Charles, C., & Mertler, C. (2002). *Introduction to educational research* (4th Ed.). Boston: Allyn

Chejlyk, S. (2006). The effects of online course format and three components of student Perceived interactions on overall course satisfaction.

Creswell, John W. (2002) Educational research: planning, conducting, and evaluating Quantitative and qualitative research. Upper Research, N.J.: Merrill.

Cohen, J. (1992). A power primer. Psychological bulletin, 112(1), 155.

Dale, C. 2014, the Quadrennial Defense Review (QDR) and Defense Strategy Issues for Congress. Retrieved July 2014 from http://fas.org/sgp/crs/natsec/R43403.pdf

Daniels, J. August 2013. Hurricane Katrina Research Paper. International Emergency Managers Association (IAEM). (2014). Retrieved from http: www. Iaemcom/certification/ general info /intro.htm.

Dede, C. & Richards, J. 2012. 'Digital Teaching Platforms: Customizing Classroom Learning For Each Student. Retrieved August 2014 from http://elearnmag.acm.org/ archive. cfm? aid=2336716

DeShields, O.W., Jr., Kara, A.,& Kaynak. E. (2005). Determinants of Business Student Satisfaction and Retention in Higher Education: Applying Herzberg's two-factor theory. *International Journal of Educational Management, 19*(2), 128-139

Defense Budget Priorities and Choices-Fiscal Year 2014. Retrieved July 2014 from http://www.defense.gov/pubs/DefenseBudgetPrioritiesChoicesFiscalYear2014.pdf

Department of the Army. (2009). Army Regulation (AR) 350-1, *Army training and leader development.* Washington, DC: Government Printing Office.

Department of the Army. (2009). U.S Army Training and Doctrine Command. TRADOC Regulation 10-5, *Organization and functions.* Ft Monroe, VA: Government Printing Office.

Department of Defense. (2005, June). *Strategy for homeland defense and civil support.* Washington, D.C. Government Printing Office.

Department of Homeland Security. (2004, December). *National response plan.* Washington, D.C. Government Printing Office.

DOD Joint Publications. (2013).

a. JP 1-0, *Joint Personnel Support*.

b. JP 1-02, *DOD Dictionary of Military and Associated Terms*.

c. JP 1-05, *Religious Affairs in Joint Operations*.

d. JP 1-06, *Financial Management Support in Joint Operations*.

e. JP 2-0, *Joint Intelligence*.

f. JP 2-01.3, *Joint Intelligence Preparation of the Operational Environment.*

g. JP 3-0, *Joint Operations*.

h. JP 3-07.2, *Antiterrorism*.

i. JP 3-07.4, *Counterdrug Operations*.

j. JP 3-08, *Interorganizational Coordination during Joint Operations*.

k. JP 3-11, *Operations in Chemical, Biological, Radiological, and Nuclear (CBRN) Environments.* Retrieved, from DOD Library Joint Publications http://www.dtic.mil/doctrine/

Doyle, Charles. (n.d.). *The Posse Comitatus Act and related matters: The use of the military to execute civilian law*. Washington D.C.: Congressional Research Service, Library of Congress.

Drennan, J. A., Kennedy, J., & Pisarski, A. (2006). Factors affecting student attitudes toward Flexible online learning in management education. Journal of Educational Research.

Durlach, P., & Ray, J. (2011). *Designing adaptive instructional environments: ALC 2015, Insights from empirical evidence.* U.S. Army Research Institute, Arlington, VA.

Dziuban, C. D. (2001). "Technology: Servant or master of the online teacher?" *Library Trends*, *50*(1): 130-144.

Eastin, M. & LaRose, R. (2000). Internet self-efficacy and the psychology of the digital divide. Retrieved January 14, 2009 from http://jcmc.indiana.edu/vol6/issue1/eastin.html

Erwin, Sandra L. (2003). Army grappling with homeland security training requirements. *National Defense.*

Fein, Geoff S. (2012) NORTHCOM urged to set priorities. *National Defense*, (88), 601.

FEMA Independent Study (IS) Courses. (2014). Retrieved from http://www.training. fema.gov/IS/.

Garrison, D. R., & Shale, D. (1990). A new framework and perspective. In D. R. Garrison & D. Shale (Eds.) Education at a distance: From issues to practice (pp. 123-133). Malabar, FL.

Graham, R., & Smith, D. T. (2012). An empirical examination of technology use and Internet activity among African-Americans. Information, Communication & Society, 13(6).

General Accounting Office. (2003). *Homeland defense: DOD needs to assess the structure of U.S. forces for domestic military missions*. Washington, D.C Government Printing Office.

George, R. & Luke, R. (1995). 'The critical place of information literacy in the trend towards Flexible delivery in higher education contexts', *Paper presented at the Learning for Life Conference*, Adelaide, and 30 November – 1 December, 1995. Retrieved 3 December, 2007 from http://www.city.londonmet.ac.uk/delibrations/flex.learning/rigmor_fr.html

Goby, V. P., & Lewis, J. H. (2000). Using experiential learning theory and the Myers-Briggs type indicator in teaching business communication.

Harwell, M. (2003). Summarizing Monte Carlo results in methodological research: The single factor, fixed-effects ANCOVA case. *Journal of Educational and Behavioral Statistics,* 28(1), 45-70.

Hillman, D., Willis, D., & Gunawardena, C. (1994). Learner-interface interaction in distance education: An extension of contemporary models and strategies for practitioners. *American Journal of Distance Education, 8*(2), 30–42.

Hirumi, A. (2005). Grounded instructional strategies. The Joint ADL Co-Lab (JADL). http://www.itesm.mx/va/dide/docs_internos/docs_enc/hirumi/h01strategies.pdf

Imel, S. (1998). Distance learning: Myths and realities. Retrieved from ERIC database. (ED426213).

Irizarry, R. (2002). Self-efficacy and motivation effects on online psychology student retention. *United States Distance Learning Administration (USDLA) Journal, 16(12)*, 55-64.

Janzen, J. (2001). Strategic reading on a sustained content theme. In J. Murphy & P. Byrd (Eds.), Understanding the courses we teach: Local perspectives on English language teaching (pp. 369-389).

Kaminski, K., Switzer, J., & Gloeckner, G. (2009). Workforce readiness: A study of university students' fluency with information technology. Computers & Education, 53(2), 228-233.

Keeler, L. C. (2006). Student satisfaction and types of interaction in distance education courses. Dissertation Abstracts International, 67(09). (UMI No. 3233345).

Keller, J. M. (1983). Motivational design of instruction. In C. Reigeluth (Ed.), Instructional design theories and models: An overview of their current status (pp. 386-434). Hillsdale, NJ: Erlbaum.

Kelsey, K., & D'Souza, A. (2004). Student motivation for learning at a distance: Does Interaction matter? Online Journal of Distance Learning Administration, 7(2). Retrieved October 16, 2014 from http://www.westga.edu/~distance/ojdla/ summer72/kelsey72 .html

Kember et al., (1999). Determining the level of reflective thinking from students' written Journals using a coding scheme based on the work of Mezirow. International Journal of Lifelong Education, 18(1), 18-30.

Kirkpatrick, D. (2001). Staff development for flexible learning. *International Journal for Academic Development, 6*(2), 168-176.

Kuo, Y. C. (2010). Interaction, Internet self-efficacy, and self-regulated learning as predictors of student satisfaction in distance education courses. Available from ProQuest Dissertations and theses database. (UMI No. 3419203).

Knowledge Online Learning Content Management System (JKO LCMS). (2014). Course number J3ST-US010. Retrieved from www.jko.jfcom.mil.

Koziol, & Arthur. (2011). *An introduction to secondary data analysis*. CYFS Statistics and Measurement Consultant. Research Methodology Series. Retrieved from http://r2ed.unl.edu/presentations/2011/RMS/120911_Koziol/120911_Koziol.pdf.

Kuo, Y. C., Walker, A. E., Belland, B. R., & Schroder, K. E. (2013). A predictive study of student satisfaction in online education programs. The International Review of Research in Open and Distance Learning, 14(1), 16-39.

Kuo, Y. C., Walker, A. E., Schroder, K. E., & Belland, B. R. (2014). Interaction, Internet self-efficacy and self-regulated learning as predictors of student satisfaction in online education courses. *The Internet and Higher Education*, *20*, 35-50.

Lee, J., & Dziuban, C. (2002). Using Quality Assurance Strategies for Online Programs. *Educational Technology Review, 10*(2). Available online [http://www.aace.org/ pubs/ etr/issue3/lee.cfm].

Maeroff, G (2004) *Studies in Art Education.* A Classroom of One: How Online Learning Is Changing our Schools and Colleges Paperback. National Art Education Association. Vol. 46, No. 1.

Maeroff, G. (2003). *A classroom of one*. New York: McMillan.

Moore, M. G., & Kearsley, G. (1996). Distance education: A systems view. New York, NY: Wadsworth.

Moore, M. G. (1989). Three types of interaction. American Journal of Distance Education, 3(2), 1-7.

Morris, W. (2014) DSCA Course Senior Instructor, USARNORTH, G7 Training and Education.

Moskal, P., Dziuban, C.D., Upchurch, R., Hartman, J., Truman, B. (2006) Assessing Online Learning: What One University Learned about Student Success, Persistence, and Satisfaction.

Noel-Levitz. (2011). National online learners priorities report. Retrieved from https://www.noellevitz.com/upload/Papers_and_Research/2011/PSOL_report%202011.pdfMills (Ed.), the convergence of distance and conventional education: Patterns of flexibility for the individual learner London and New York: Routledge.

Nunan, D. (1996). Towards autonomous learning: some theoretical, empirical and practical issues. In R. Pemberton, S.L. Edward, W.W.F. Or, and H.D. Pierson (Eds.), Taking Control: Autonomy in Language Learning. Hong Kong: Hong Kong University Press. 13-26.

Olmstead, J. (2007). Program development, implementation and evaluation: Lessons learned at the University of Wisconsin-Stout. Techniques, 82(6), 22-23.

O'Malley, J. (1999). Students' perceptions of distance learning, online learning and the traditional classroom. Online Journal of Distance Learning Administration, 2(4). Retrieved June 14, 2014, from http://www.westga.edu/~distance/omalley24.html

Parayitam, S., Desai, K., & Phelps, L.D. (2007). The Effect of Teacher Communication and Course Content on Student Satisfaction and Effectiveness. *Academy of Educational Leadership Journal, 11*(3), 91-105.

Paskey, J. (2001). A survey compares two Canadian MBA programs, one online and one traditional. The Chronicle of Higher Education. Retrieved June 20, 2014, from http://chronicle.com/free/2001/04/2001042601u.html

Reigeluth, C. M. (2012). Instructional Theory and technology for the new paradigm of education. RED, Revista de Educación a distancia, (32), 30.

Rosenberg MJ. (2001). *e-Learning: Strategies for delivering knowledge in the digital age.* New York: McGraw Hill.

Schoenfeld-Tacher, R., McConnell, S., & Graham, M. (2001). Do no harm – A comparison of the effects of online vs. traditional delivery media on a science course. Journal of Science Education and Technology, 10, 257-265.

Shuford, et al., (2007). Joint Force Quarterly Issue 47, 4th Quarter 2007. Published for the Chairman of the Joint Chiefs of Staff by National Defense University.

Shuttleworth, M. (2008). Quantitative Research Design. Retrieved August 03, 2014 from Explorable.com: https://explorable.com/quantitative-research-design.

Sloan Consortium (2010). Retrieved October 26, 2012 from http://www.sloansconsortium.org.

Smith, G.G., Ferguson, D., & Caris, M. (2001, April). Teaching college courses online vs. Face-to-face. The Journal. Retrieved June 4, 2004, from http://www.thejournal.com/magazine/vault/a3407.cfm

TRADOC Regulation 350-70 (2011). Department of the Army Headquarters, United States Army Training and Doctrine Command Fort Eustis, Virginia 23604-5700 Pyle, R. C.

Vogt, W.P. (1999). Dictionary of statistics and methodology (2nd ed.). Newbury Park, CA: Sage

Weber, J. M. & Lennon, R. (2007). Multi-course comparisons of traditional versus web-based course delivery systems. The Journal of Educators Online, 4(2). Retrieved June 1, 2011, from www.thejeo.com/Archives/Volume4Number2/Weber%20Final.pdf

Wojciechowski, A., & Palmer, L. (2005). Individual student characteristics: Can any be predictors of success in online classes? Online Journal of Distance Learning Administration, 8(2). Retrieved June 1, 2011, from http://www.westga.edu/distance/ojdla/summer82/wojciechowski82.htm

APPENDICES

APPENDIX 1. LIST OF TERMS AND DEFINITIONS

Asynchronous- Online courses in which the information is accessible any time, any day by students through the internet (Oram, 2006)

Attrition- The decrease in the number of students attending a course, a program, or an institution (Boyles, 2000)

Course completion- Refers to when a student completes all of the requirements of a given course and receives a final grade (Bangurah, 2004)

Face-to-face delivery- Also referred to as traditional, in-class delivery, this format involves regular class meetings between an instructor and students according to a fixed schedule and physical location (Oram, 2006).

Hybrid (blended) ED- A combination of online components and face-to-face instruction within a given course (Means, Toyama, Murphy, Bakia, & Jones, 2010).

Teacher quality- Essential attributes such as educational background, certification and training, attitudes and professional development that allow the teachers to meet a high degree of excellence in their work.

Student achievement: Learning outcomes, determined based on quality education standards, expressed as passing scores obtained by students in citywide and Statewide tests in mathematics and English language arts (ELA).

Educational background- Academic degrees and major field of study awarded by teachers.

Training: A series of connected practices and instruction activities to achieve proficiency in a related field.

Professional development- Specific activities to improve knowledge, skills and attitudes in order to improve performance.

Synchronous Learning- A schedule of class meetings and/or assignments in which the Students and the instructor participate as a group (Oram, 2006).

APPENDIX 2. SURVEY QUESTIONNAIRE FOR DSCA COURSE USED BY USARNORTH

Question 1: "Quantitative" Students' Satisfaction.

Which instructional delivery method did you attend during the DSCA level II course?

1 = Face-to-Face Instruction

2= Web-Based Instruction

3= Digital Instruction

The rationality by making it a numerical value, it is a quantitative variable. This is INDEPENDENT variable since this study is looking for whether the dependent variable(s) change based on which instructional method.

Answer #1: (_____)

For the following questions 2 thru 10: Please use the assigned number to indicate the extent to which you agree or disagree with the following statements using the scale below:

Question 2: I am satisfied with the knowledge I gained from the course.

Answer #2: (_____)

1 = strongly disagree; 2 = disagree; 3 = neither agree/nor disagree; 4 = agree; 5 = strongly agree.

Question 3: I am satisfied with the quality of instruction in the course.

Answer #3: (_____)

1 = strongly disagree; 2 = disagree; 3 = neither agree/nor disagree; 4 = agree; 5 = strongly agree.

Question 4: I am satisfied with the course length.

Answer #4: (_____)

1 = strongly disagree; 2 = disagree; 3 = neither agree/nor disagree; 4 = agree; 5 = strongly agree.

Question 5: I am satisfied with the content of the course.

Answer #5: (_____)

1 = strongly disagree; 2 = disagree; 3 = neither agree/nor disagree; 4 = agree; 5 = strongly agree.

Question 6: Were your goals for the training addressed during the course?

Answer #6: (_____)

1 = strongly disagree; 2 = disagree; 3 = neither agree/nor disagree; 4 = agree; 5 = strongly agree.

Question 7: Were your goals for the training met during the course

Answer #7: (_____)

1 = strongly disagree; 2 = disagree; 3 = neither agree/nor disagree; 4 = agree; 5 = strongly agree.

Question 8: In your opinion, the instructors of the course displayed a high level of proficiency as a Subject Matter Expert in DSCA.

Answer #8: (_____)

1 = strongly disagree; 2 = disagree; 3 = neither agree/nor disagree; 4 = agree; 5 = strongly agree.

Question 9: After completing the DSCA course I feel more competent and prepared to perform my duties in Support of Civil Authorities in the event of an emergency.

Answer #9: (_____)

1 = strongly disagree; 2 = disagree; 3 = neither agree/nor disagree; 4 = agree; 5 = strongly agree.

Question 10: The DSCA course content covers all aspects and areas required for DOD personnel to Support of Civil Authorities in the event of an emergency.

Answer #10: (_____).

1 = strongly disagree; 2 = disagree; 3 = neither agree/nor disagree; 4 = agree; 5 = strongly agree.

APPENDIX 3. LETTER OF CONSENT FOR RESEARCHER TO CONDUCT STUDY USING DATA COLLECTED BY USARNORTH

DEPARTMENT OF DEFENSE
HEADQUARTERS, JOINT FORCES LAND COMPONENT COMMAND (JFLCC)
UNITED STATES NORTHERN COMMAND
2108 WILSON WAY
FORT SAM HOUSTON, TEXAS 78234-7800

ARNO-OPT-TR

May 09, 2014

MEMORANDUM FOR TRIDENT UNIVERSITY INTERNATIONAL

SUBJECT: LETTER OF CONSENT FOR DANIEL MANRIQUE

1. The purpose of this memorandum is to inform Trident University International, that Daniel R. Manrique is authorized by this office to use students' surveys information/data and students' grades/data from the Department of Defense, Defense Support of Civil Authorities (DSCA) Course to conduct a research study. This information has been collected and is provided by the United States Army North (USARNORTH) DSCA Course Proponent and Administrator Authority.

2. The DOD DSCA Course educates staff personnel from the United States military and other federal agencies in planning, coordinating, executing and supporting DSCA operations. The course is administered in three distinct phases: Phase I: distance learning preparatory course; Phase II: resident course; and Phase III consists of social media elements including a Homeland Defense and Civil Support newsletter, a Facebook page, and email updates. The course is sponsored for the Department of Defense by United States Northern Command and conducted by United States Army North.

3. The information provided to Daniel R. Manrique for his study does not represent or involves any risks of any kind to any participants enrolled in this study. There will be no access to personal identifiers; therefore, Privacy and Confidentiality is maintained. There is not Financial Conflict of Interest of any type by using existing data already collected for course assessment and quality control. The anticipated benefits of this study to society and/or academic knowledge may represent a direct improvement to the military educational system by identifying better instructional educational and training practices.

4. Points of Contact for this memorandum is: Mr. Morris Walton, Building 44, 1400 E. Grayson Street, Fort Sam Houston, Texas 78234-7000; office hours by appointment; phone: (210) 295-0774 or (210) 295-1073; email: morris.a.walton.civ@mail.mil.

MORRIS A. WALTON
Senior Instructor, DSCA Course
USARNORTH (G7) Training and Education

APPENDIX 4. TUI INSTITUTIONAL REVIEW BOARD APPROVAL LETTER

TRIDENT UNIVERSITY
INTERNATIONAL

Institutional Review Board - IRB
5757 Plaza Dr., Suite 100 Cypress, California 90630 • Tel: (714) 816-0366 • Fax: (714) 226-9844

Date: 10/29/2014

Dear Daniel Manrique,

Thank you for submitting your application to the Institutional Review Board. We reviewed your application for your proposed study, 'Evaluation of the Effectiveness of three Instructional Modalities for Best Practices of Military Training and Education' Per federal guidelines, we have determined that your study is exempt from further IRB review for the following reason(s):

• Research involves collection or study of existing data, which does not contain identifiers linked to human subjects (CFR 46.0101(b)(4))

This approval is is contingent upon receiving all required permissions and is valid for one year from the date of this notice. The research must be conducted according to the proposal submitted to the Trident IRB. In order to preserve the anonymity of participants, data may not be reported without a minimum of ten subjects in a subgroup. If changes to the approved protocol need to be made, a revised protocol must be submitted both to your Dissertation Chair and IRB for review and approval.

Sincerely,

Heidi Sato

Heidi Sato, Ph.D., MPH
Chair - Institutional Review Board (IRB)
Director of Institutional Research

APPENDIX 5. CERTIFICATE OF COMPLETION OF INSTITUTIONAL REVIEW BOARD REQUIRED TRAINING.

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Daniel Manrique** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 05/25/2014

Certification Number: 1473971