

DISSERTATION

STUDENT PARTICIPATION AND GRADE PERFORMANCE IN AN UNDERGRADUATE
ONLINE LEARNING ENVIRONMENT

Submitted by

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ABSTRACT

STUDENT PARTICIPATION AND GRADE PERFORMANCE IN AN UNDERGRADUATE ONLINE LEARNING ENVIRONMENT

This study explored learning and teaching of online classes. Examining the relationship between undergraduate students' participation and their final grades in five selected courses in an online learning environment and exploring differences between the demographics characteristics of age, race, and gender to students' participation (total number of messages posted and total access) and grade performance were the important focus of the study. The population of this study was undergraduate students enrolled at Colorado State University-Global Campus (CSU-GC) in the years 2010 and 2011. Specifically, it was determined that the appropriate population for this study included all undergraduate students enrolled in one or more of the five core courses.

This study took a quantitative, non-experimental approach to the collection and analysis of data. The study employed an associational research design (association questions) and between-groups or within subjects design (difference questions). Statistical analyses used were Spearman Rho correlation, Kruskal-Wallis tests and Mann-Whitney *U* tests.

Students who posted more messages on the discussion forums tended to have higher course grades, $r_s(1,027) = .32, p = .001$; there was a positive correlation between the variables, with a medium or typical effect size or correlation. The more a student accessed the discussion board over the eight weeks of the course the higher the final grade, $r_s(1,027) = .35, p = .001$; thus $r = .35$ and the effect size was medium or typical. Age was positively correlated with total number of messages posted, $r_s(1,011) = .27, p = .001$ and total access $r_s(1,011) = .27, p = .001$;

these are small effect sizes. The positive correlation between age and grade was $r_s(1,011) = .15$, $p = .001$; this is a small effect size. As students' ages increased, they had a correlation with earning higher grades compared to younger students. Older students more frequently posted comments on discussion boards.

There were no significant differences among the three race groups, White, Black or African American, and Asian on total number of messages posted, $\chi^2(2, 842) = 2.09$, $p = .351$; on total access, $\chi^2(2, 842) = 1.57$, $p = .455$; and on grade performance, $\chi^2(2, 842) = 3.50$, $p = .174$. There was a significant difference in the mean ranks of males (437.84) and females (505.85) on total number of messages posted, $U = 95,552$, $p = .001$, $r = .12$, a small effect size. Also, the 496 female students had a little higher mean ranks (493.37) than the 450 males (451.59) on Total Access, $U = 101,742.5$, $p = .019$, $r = -.076$, with a very small or smaller than typical effect size. There were no statistically differences in mean of males (485.37) and females (462.73) with respect to final grades, $U = 106,257$, $p = .180$, $r = .044$. Significant differences were found among the five core courses on total number of messages posted, $\chi^2(2, 1029) = 96.76$, $p = .001$; and on total access, $\chi^2(2, 1029) = 104.23$, $p = .001$. Yet, there was no significant difference between the five core courses on grade performance, $\chi^2(2, 1029) = 4.05$, $p = .399$.

This study would benefit online institutions, online/distance instructors, decision makers at all levels of higher education, and online students. The implications for practices, barriers to e-learning, on-going support by government, limitations of the study, and recommendations for research were discussed.

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DEDICATION

I dedicate this dissertation to my late (arwah) *Uppa*, V. KunhiMohamed Bappu Haji and to a wonderful woman in my life, *Umma*, Aranikkal Pathummu Mythien Kutty. Both of you encouraged me to work hard, showed me strong determination, gave me confidence to blaze a trail through any hardship to reach my dreams, and assisted me till the end of my destiny. The sayings that I never forget and will keep them as an encouragement for my whole life:

“We don’t have any precious property to give to you but we are providing you with an education for your future”, “Education is a valuable treasure”, and “Education takes you everywhere and without it, you are nowhere”.

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Endless love...

Balkeese

a.k.a. Bal, Kees, *Ummi* or Dr. Balkeese

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CHAPTER 1: INTRODUCTION

e-Learning is the most recent evolution of distance learning that creates, fosters, delivers, and facilitates learning, anytime and anywhere, with the use of interactive network technologies (Chai & Poh, 2009, p. 237).

Technology is evolving rapidly, becoming a more flexible and interactive part of the classroom. Specifically, there is more utilization of learning management systems (LMS) in institutions of higher education. Many researchers and learners believe the Internet is essential technology for distance learning, e-learning through technology can be seen as one of the valuable tools for teaching and learning. To deliver distance education through the Internet, ample attention and research to examine the factors that affect learning outcomes of students enrolled in courses are essential (Moore & Kearsley, 1996). Instructors and students play equally important roles in achieving the primary goal “to teach and to learn”, especially in this technology driven era. hooks (2003) asserted “educators who challenge themselves to teach beyond the classroom setting, to move into the world of sharing knowledge, learn a diversity of styles to convey information” (p. 43). “A challenge for. . .instructors of online management courses is to be able to achieve a level of student participation that supports a learning environment where students play a central role” (Bento, Brownstein, Kemery, & Zacur, 2005, p. 79). Thus, students should take hold of the opportunities and access offered via online courses by higher educational institutions in embracing their interests in pursuing education.

National studies suggest that the number of institutions offering distance education courses is increasing (National Center for Education Statistics [NCES], 2011). This has initiated interest in academia specifically in pedagogy as it applies to the online environment. It is critical for researchers to have a clear understanding of what online education offers students. Further, as many higher education institutions employ distance education as one of the instructional delivery

methods, it is imperative to explore e-learning and how students engage in online courses. Bento and Schuster (2003) affirmed:

With the increasing popularity of student-centered. . .education, student participation in class discussions is being considered not just something “nice to have”, but an essential part of the teaching and learning process. As we move from traditional to virtual classrooms, the challenge of understanding and nurturing such participation becomes even greater (p. 156).

In particular, there is widespread consensus that participation in online asynchronous discussions can improve student learning (Palmer, Holt, & Bray, 2008). As significant work has been done characterizing and theorizing the nature of student communications in online discussions, there is a need to investigate the impact of participation in online discussions on student course performance (Hara, Bonk, & Angeli, 2000; Palmer et al., 2008). With the assumption that student participation might influence final course grade, it is arguable that the nature of student participation has an impact on student learning (Coldwell, Craig, Paterson, & Mustard, 2008). It does not necessarily follow that students with higher grades have mastered the learning process and vice versa.

Such an investigation requires tracking students’ online class activities and examining correlations with final course grades. By tracking students’ online activities, Wang and Newlin (2002) found the activities provide early indicators of student performance in virtual classrooms. Moreover, their research shows that discussion forum activity had a direct relationship with final grades as the total number of forum postings read and written by students was predictive of their final grades (Wang & Newlin, 2002). In view of that, one of the main attributes in online learning that cultivates interaction is the discussion forum (Bento et al., 2005). Wang, Newlin, and Tucker (2001) conducted a discourse analysis (DA) of a 16-week web-based psychology

course and discovered the total number and frequency of students' postings and comments in the forum discussions correlated with the final grades.

While researchers use a variety of variables to represent student performance such as demonstration of learning outcomes, grade point average (GPA), graduation rate, and employment placement, this study uses final course grade to represent achievement. According to Pascarella and Terenzini (2005), final grade performance has been used frequently to describe academic success, has attracted most attention compared to these other measures, and is the most readily available variable. Hence, final course grades are used as the dependent variable in this study. All study variables will be discussed further in chapter 3.

As more students are enrolling in online courses and with many higher education institutions expanding their realm of influence to greater numbers of students, a better understanding of online learning environments becomes more relevant. Findings from a meta-analysis of 232 studies of the comparative distance education literature between 1985 and 2002 led by Bernard et al. (2004) ascertained that "many applications of distance education outperformed their classroom counterparts" (p. 379). With regards to above mentioned studies, investigating students' online participation in association to their final course grade is imperative.

Statement of Problem

As a field of study, performance of students in online distance learning courses is still in its infancy. . . (Alstete & Beutell, 2004, p. 7).

With the advancement of technology, online learning is evolving rapidly as an alternative mode of delivering teaching and learning as more higher education institutions are embracing and offering distance education. In 2007-2008, approximately 20% of the 4.3 million undergraduate students in the United States took at least one distance education course and

approximately 4% of all undergraduates took an entire program through distance education (NCES, 2011). The Institute of Education Sciences (IES) from the NCES (2011) reported data on the academic year 2007-2008, from which 61% of 2-year and 4-year United States institutions offered online courses. Thirty-one percent of these institutions offered courses using synchronous Internet-based technologies, known as online courses. An estimated 12.2 million students were recorded in college-level, credit-granting distance or online education courses in the same year.

Dell, Low, and Walker (2010) expressed the importance of continuing to study the issue of student achievement online. While the literature suggests a correlation between increased interaction and increased learning (Cotton & Yorke, 2006; Yukselturk, 2010), research needs to be conducted to ascertain whether students who participate more earn higher grades than their peers who participate less.

The increasing demand for online courses based on the growing population of online students can be seen in many higher education institutions such as Colorado State University-Global Campus (CSU-GC), a new institution offering solely online education. The students' enrollment in the academic year 2010 saw an increase of 148 students, a 14.6% increase from previous year. These numbers were projected to increase to 2,620 online students or enrollments in the year 2011 (Takeda-Tinker, 2011).

As an institution of online learning, officially started in September, 2008, offering only online degree programs to adult learners and experiencing rapid enrollment growth, CSU-GC was particularly well suited for a study of this type. Because this institution states it is "the premier provider of innovative, higher learning opportunities for non-traditional students (CSU-GC, 2012, para. 2), research is needed to better understand the participation of undergraduate

students who utilize online learning and to examine relationships to their final grades. Beaudoin (2002) suggested participation and interaction are highly recommended, and discussion board performance was one of the strongest indicators of online courses (Alstete & Beutell, 2004).

Purpose of the Study

The online learning environment is a phenomenon that facilitates participation and interaction among students and instructors through the use of discussion boards, bringing all students into a ‘virtual classroom’. Coldwell, Craig, Paterson, and Mustard (2008) alleged:

Online learning environments (OLEs) facilitate learning by utilizing software that enables the design, delivery, and management of online teaching and learning. The notion of providing courses wholly online is relatively new and allows students of diverse backgrounds and geographically dispersed locations to have access to and participate in the same courses (p. 19).

Many studies investigated various aspects of online learning and proposed students perceive technology to be a useful learning tool. This purpose of this study was to explore learning and teaching of online classes. Investigating the relationship between undergraduate students’ participation and their final grades in five selected courses in an online learning environment and to examine the differences between the demographics characteristics of age, race, and gender on the students’ participation (total number of messages posted and total access) and grade performance were the focus of the study. This study utilizes the learning management system of eight-week courses in CSU-GC. Total number of discussion board posts and total log-ins to the LMS would measure participation, as these have been found in studies to facilitate participation and interaction among students and instructors. These past studies will be discussed further in chapter 2.

Research Questions

The following research questions provided the focus for this study of student participation in undergraduate online courses:

1. What is the association between student participation and grade performance?
 - (a) Is there an association between total number of messages posted and grade performance?
 - (b) Is there an association between total access and grade performance?

Total access refers to the total number of times the forums/files (unique views of discussion threads) were visited over the eight-weeks of the course.

2. Is there an association between age and (a) total number of messages posted; (b) total access; and (c) grade performance.
3. Is there a difference between race and (a) total number of messages posted; (b) total access; and (c) grade performance.
4. Is there a difference between gender and (a) total number of messages posted; (b) total access; and (c) grade performance.
5. Is there a difference between courses and (a) total number of messages posted; (b) total access; and (c) grade performance.

Conceptual Framework

Two particular studies on student participation in online learning inform the current research. Coldwell et al. (2008) conducted a study to determine whether there are relationships between the participation, demographics, and academic performance of students in an online learning environment (OLE) and academic results. Their study examined approximately 500 students enrolled in a fully online information technology course at Deakin University, Australia.

The data were collected using a detailed analysis of tracking data of students' participation via discussion board on a weekly basis over a period of 16 weeks. Their study found a positive relationship between students' participation in the course and their performance as measured by final grades in the course. The components used for the student participation in online learning were (a) total time spent online, (b) number of discussion messages read, (c) number of discussions posted, and (d) number of content files viewed.

In addition to these elements of student participation, Palmer, Holt, and Bray (2008) conducted a case study of a course with 86 students also from Deakin University. However, the focus of the study was based on (a) total number of discussion messages read (or at least opened) by the students, (b) total number of new/initial discussion postings, and (c) total number of follow-up/reply discussion postings, while not including content files viewed as a variable as in the Coldwell et al. (2008) study.

For the purpose of this study, data were compiled based on students' participation in terms of total number of messages posted and total access over the eight-week courses. Figure 1 illustrates the conceptual framework and component interactions pertaining to this study.

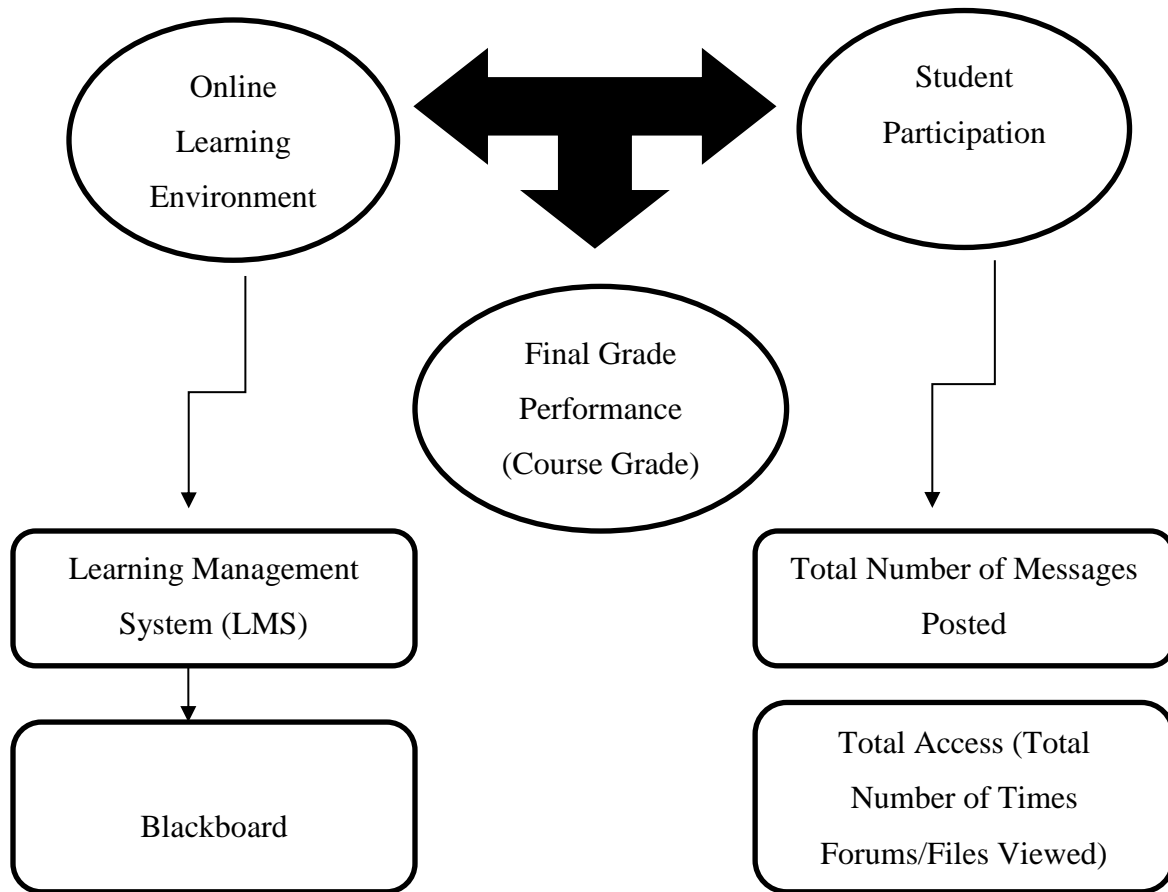


Figure 1. Conceptual Framework of Study

Definition of Terms

For clarity and consistency, the following term definitions are used throughout this study.

Distance Education

The term distance education grew out of the need for a concept that would encompass changing communication technology providing courses and programs to students geographically separated from the instructor utilizing technology to engage in the instructional process (Schwitzer, Ancis, & Brown, 2001; Willis, 1994). For this study, distance education referred to the online learning instruction that is delivered through Blackboard™ learning system (BLS). Distance education, distance learning, e-learning, online learning, and virtual learning

environment (VLE) are synonymous in this manuscript, but online learning will be used the most for simplicity.

Fully Online

“Students must have access to a computer and the Internet to do the course, can take the course without having to attend any face-to-face classes” (Bates, 2005, p. 8).

Learning Management System

LMS is a term widely used interchangeably with course management system (CMS) and virtual learning environment (VLE) in this technology driven era. LMS is a secure, server-side software application used to deliver instruction. In the context of this study, BLS is the specific LMS used. Some features of BLS are course content, announcements, assessments, assignments, calendar, chat, discussions, goals, learning modules, local content, mail, media library, roster, syllabus, web links, who is online, my grades, my progress, and notes.

Discussion Board/Forums

In the context of this study, a blackboard, discussion board, or discussion forum is a communication tool that allows students to post comments, reply to comments, and post questions and answers online. Simultaneously, other members of the same discussion board may read, reply to, and respond to comments or questions with their own remarks. Messages on blackboard or a discussion board are not shown in real time. In this study, discussion board is used synonymously with blackboard and discussion forum.

Student Participation

In this study, student participation refers to the level of student involvement in a variety of activities such as total number of messages posted and total access over the eight-week courses.

Grade Performance

Grade performance is a measurement of academic success based upon students' test and assignment scores. In this study, the accumulations of the test and assignment score results were used to calculate the final course grades. Thus, the final course grades were determined by the course instructor.

Total Access

Total access for this study refers to the total number of times the forums/files (unique views of discussion threads) were visited over the eight-week courses by a student.

Significance of Study

This study of student performance, which used students' final grades as an indicator of effectiveness of online learning at higher education institutions, can benefit online institutions, distance instructors, and students. As an addition to the body of research that explicitly addresses the association between student participation and final course grades in online courses, this study and the insight gained are intended to benefit Malaysia's fledgling online institutions overall and CSU-GC specifically. By understanding the connection between participation and course grades, institutional leaders can design more effective interaction opportunities for students thereby further impacting academic success.

Another benefit to online instructors is an examination of study results in comparison to findings at their own institutions, which would allow them to look at possibilities for best practices for utilizing online learning systems. Additionally, the findings have the potential to inform instructors by helping them understand the relationship of participation and performance in terms of grades in an online learning environment. Instructors must take into consideration the needs of all students and be aware of how to optimize students' participation in online courses. If

demographics differences are found, it may show the need for changes in structure and delivery of online courses to ensure suitability for diverse student populations.

This study may benefit students by helping them gain knowledge about how to be successful in an online environment. From a policy standpoint, results of this study may help decision makers at all levels of higher education make determinations about construction, delivery, and assessment of online learning courses. Finally, Dell et al. (2010) suggested on-going research of online student achievement is necessary as more online content is delivered.

Delimitation of Study

The scope of this study is delimited to students in the five undergraduate core courses of the Bachelor of Science (BS) in Organizational Leadership at CSU-GC. These courses were delivered fully online. The study was delimited to courses being offered over three 8-week terms from July 2010 through June 2011. The study was delimited to students who completed at least one of the courses and whose participation and final course grades were available from the institution's student information system.

Assumptions

One assumption informing this study was that students' final course grades were accurately entered into the institution's student information system. It is assumed there may be students who participated more or less than the standard set by the instructor. It is also assumed that instructors might specify student participation in online discussions either as optional or mandatory, as requirements vary by course, and this could impact the 'sincere' participation, although 25% of participation and students' grade was required in the courses throughout the term.

While participation may be connected to students' final course grades, an assumption cannot be made that the nature of the students' online participation impacted students' actual learning (Coldwell et al., 2008). It is not necessarily true that students with higher grades have mastered the course content or that students with lower grades have not mastered the course. Yet, Alstete and Beutell (2004) argued "learning to learn in an online environment may have a 'learning curve' that interacts with various personal, academic, technological, and instructor characteristics that have direct and indirect influences on participation, learning, and grades" (p. 11). This will, in part, be addressed by the demographics characteristics in this study, age, gender, and race that discussed further in chapter 4 and 5. It is further assumed that there was relative fairness in the grading process across courses and sections (see Appendix A).

Researcher's Perspective

The researcher has 11 years of teaching experience as a public school teacher at middle and high school levels and was a teacher education lecturer in Malaysia. The researcher saw that teachers and students were both hesitant to use LMS, therefore, the researcher hopes this study brings some knowledge and experience to improve and increase the effective use of LMS in Malaysian education. This would be of particular benefit to the many students in remote areas of Malaysia, whose geographical locations create issues travelling to academic institutions. The researcher believed distance students in fully online and hybrid courses could have benefitted greatly from more extensive use of LMS due to limited in-class discussion opportunities created by limited face-to-face institution. Use of LMS offers students the opportunity for connecting with the instructor during extended separations. The researcher believes use of online environments can benefit students in traditional classrooms, when classroom time is limited.

Students may spend time using LMS while they are away from institutions, instructors, and peers.

With a background in Teaching English to Speakers of Other Languages (TESOL) and Information Technology (IT) and having experience conducting theses using quantitative methods, the researcher is a post-positivist. Analyzing secondary (existing) data, the researcher employs a quantitative design to examine associations between the online students' participation and their grade performance in an undergraduate online learning environment.

Upon completion of her Ph.D. work, the researcher intends to return to work as a teacher education lecturer or as an officer at the Information Communication and Technology Division of the Ministry of Education in Malaysia. Further, the researcher is interested in revolutionizing online learning within the next five years, as one of the main means of delivering education in Malaysia.

CHAPTER 2: REVIEW OF LITERATURE

The purpose of this literature review is to explore and identify the relevant considerations in the history and development of distance education and online learning and their standing in the higher education environment. The review of studies looks at the interaction and participation patterns of learners in online learning environments. The review discusses the key model of interaction used to inform this study and looks at other studies of performance in online learning. Both theoretical and empirical studies are included within each section of the literature review. The chapter will conclude with a short summary of the review's relevance to this study. The framework for organizing, ordering, and setting the limiting boundaries for the scope and depth of review for these topics are represented in Figure 2.

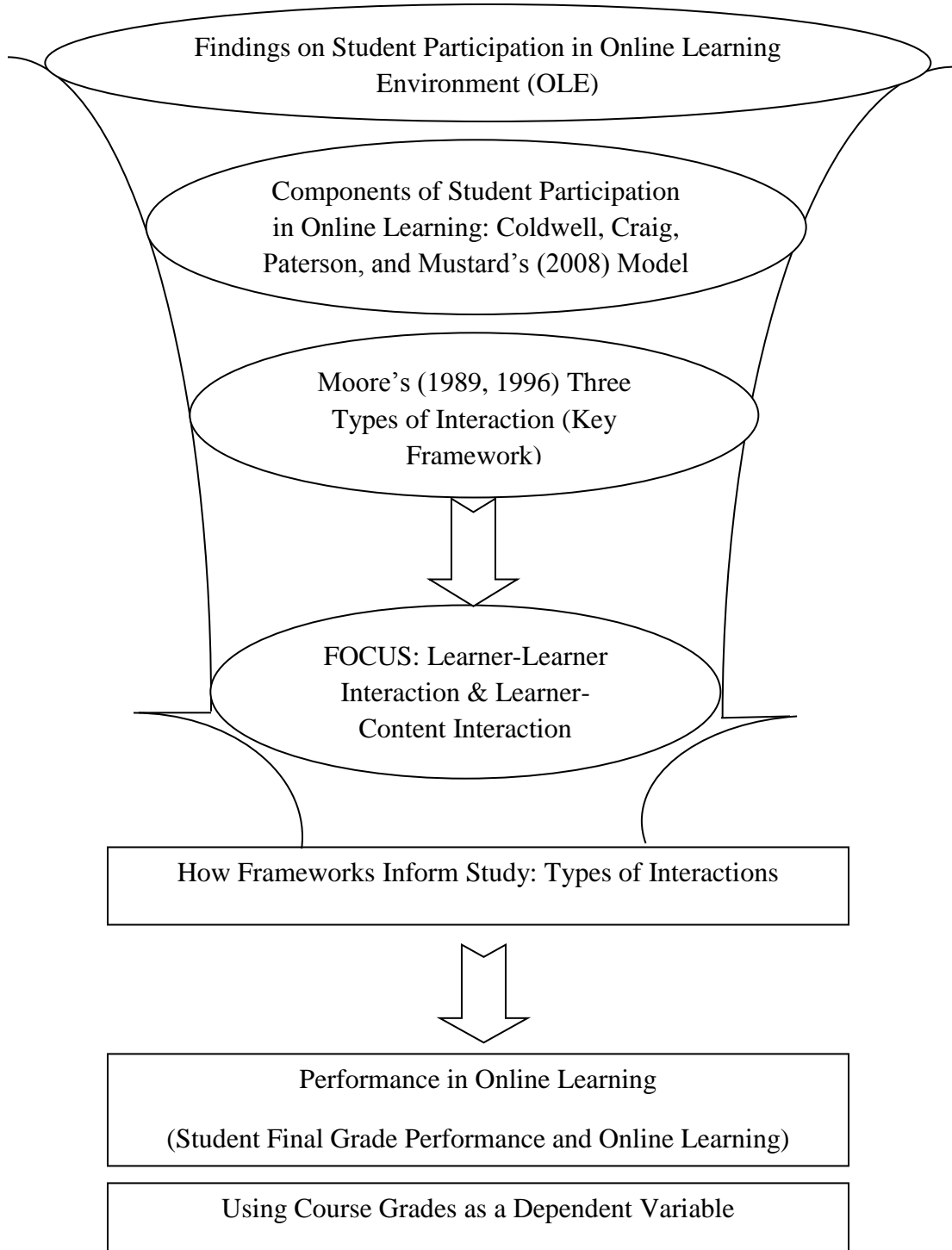
Distance Education: Overview

Distance education (of which online learning is a major subset) is a discipline that subsumes of knowledge and practice of pedagogy, of psychology and sociology, of economics and business, of production, and technology (Anderson, 2008, pp. 2-3).

Distance education has attracted the attention of educators as an instructional delivery model for well over 40 years (Berge & Mrozowski, 2001; Holmberg, 1986, 1997, 2003; Keegan, 1996, 2000; Saba, 2003). As the number of institutions offering distance education courses increases (NCES, 2011), it is critical for researchers to have a clear understanding of online education, including a comprehensive definition and recognition of the origins of the term 'distance education' and online education. As universities employ various instructional delivery methods, it is imperative to look at the history of distance education to move toward establishing standards specific to teaching and learning and to ensure the academic success of students.

I. Introduction / Distance Education: Overview / Online Learning (OLL) in Higher Education (HE)

II.



III.

IV.

Figure 2. Focus of the Literature Review - Funnel Diagram

Definition of Distance Education

There is no one distinct definition used throughout the field of education for defining the term distance education (DE) (Holmberg, 2003; Keegan, 2000; Saba, 2003). Being applied to a variety of programs serving numerous audiences via a wide variety of media has challenged the way DE has been defined (Keegan, 1996; Kovalchick & Dawson, 2004). Moore (1973) defined DE as:

A family of instructional methods in which the teaching behaviors are executed apart from the learning behaviors, including those that in a contiguous situation would be performed in the learner's presence, so that communication between the teacher and the learner must be facilitated by print, electronic, mechanical, or other devices. (p. 664)

According to Moore and Kearsley (1996), DE

[Is] planned learning that normally occurs in a different place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as well as special organizational and administrative arrangements. (p. 2)

Another comprehensive definition of distance education is “learning in which the student is separated physically, and sometimes in time, from an instructor” (Mariani, 2001), and, “technology is used to bridge the gap” (Willis, 1993, p. 4). This use of technology to bridge the gap is even truer today than when Willis made this statement immediately prior to the dawn of the modern Internet. Taking all of these definitions together, one should consider including components of content, design, communication, interaction, learner environment, and management into a full definition of DE (Moore & Kearsley, 1996).

For the purpose of this study DE is defined as “instructions or courses that may deliver from a different place and time without any face-to-face interactions”; and courses offered wholly online. As supported by Willis (1994), DE refers to the intended instructional outcome or the learning that occurs from instruction delivered at a difference place or time (Willis, 1994).

Introduction to Online Learning

This study will use the specific distance education modality of online learning as opposed to any other possible modalities such as correspondence courses and self-study courses. Online learning is increasing across the United States (Allen & Seaman, 2008). Allen and Seaman claimed more than 25% of all college students in the United States took at least one online course during the fall of 2008, a growth of nearly 17% from the previous year. That number had increased to 31% by 2011 school year (Lytle, 2011).

Various terminologies are used for online learning such as “e-learning, Internet learning, distributed learning, networked learning, tele-learning, virtual learning, computer-assisted learning, web-based learning, and distance learning” (Ally, 2008, p. 16). Thus, a clear, common, and precise definition is not an easy task. However, Ally (2008) asserted that in an online learning environment, the learner uses technology, usually a computer, to access the learning material and to communicate and interact with the instructor and other learners who are at a distance. Table 1 is a list of definitions of online learning by various authors.

Table 1

Definitions of Online Learning/E-learning

Definition
(1) “Online learning as [t]he use of Internet to access learning materials; to interact with the content, instructor, and other learners; and to obtain support during the learning process, in order to acquire knowledge, to construct personal meaning, and to grow from the learning experience” (Ally, 2002, p. 7).
(2) “E-learning as the delivery of content via all electronic media, including the Internet, intranets, extranets, satellite broadcast, audio/videotape, interactive TV, and CD-ROM” (Bachman, 2000, p. 8).
(3) “E-learning is the acquisition and use of knowledge distributed and facilitated primarily by electronic means. This form of learning currently depends on networks and computers but will likely evolve into systems consisting of a variety of channels (e.g., wireless, satellite), and technologies (e.g., cellular phones, PDAs) as they are developed and adopted. E-learning can take the form of courses as well as modules and smaller learning objects. E-learning may incorporate synchronous and asynchronous access and may be distributed geographically with varied limits of time” (Wentlin et al., 2000, p. 5).
(4) Online learning is seen as educational materials which are presented on a computer (Carliner, 1999).
(5) Online learning (instruction) as an innovative approach for delivering instruction to a remote audience and using the Web as the medium of instruction (Khan, 1997).

Common among these definitions is that online learning is characterized by students and teachers being separated physically, but connected through the use of technologies such as computers and the Internet. The changing focus of evolution in educational technology can be seen as the latest manifestation from 1975 to 2005 and how educational technology has evolved from its foundations in programming and computer-assisted learning (CAL) to its current stage of e-learning as shown in Table 2. The changing focus of evolution in educational technology is an ongoing process that continues to evolve with technological advances.

Enrollment for online learning is growing, offerings are increasing, and available topics for study are diverse. Figure 3 is an illustration of growth in the number of higher education students who are enrolled only in online courses. It shows dramatic increases starting in 2004, which are predicted to continue through 2014. In addition to an increase in students who only take online classes, a greater percentage of all students are taking at least one online class every year, as illustrated in Figure 4.

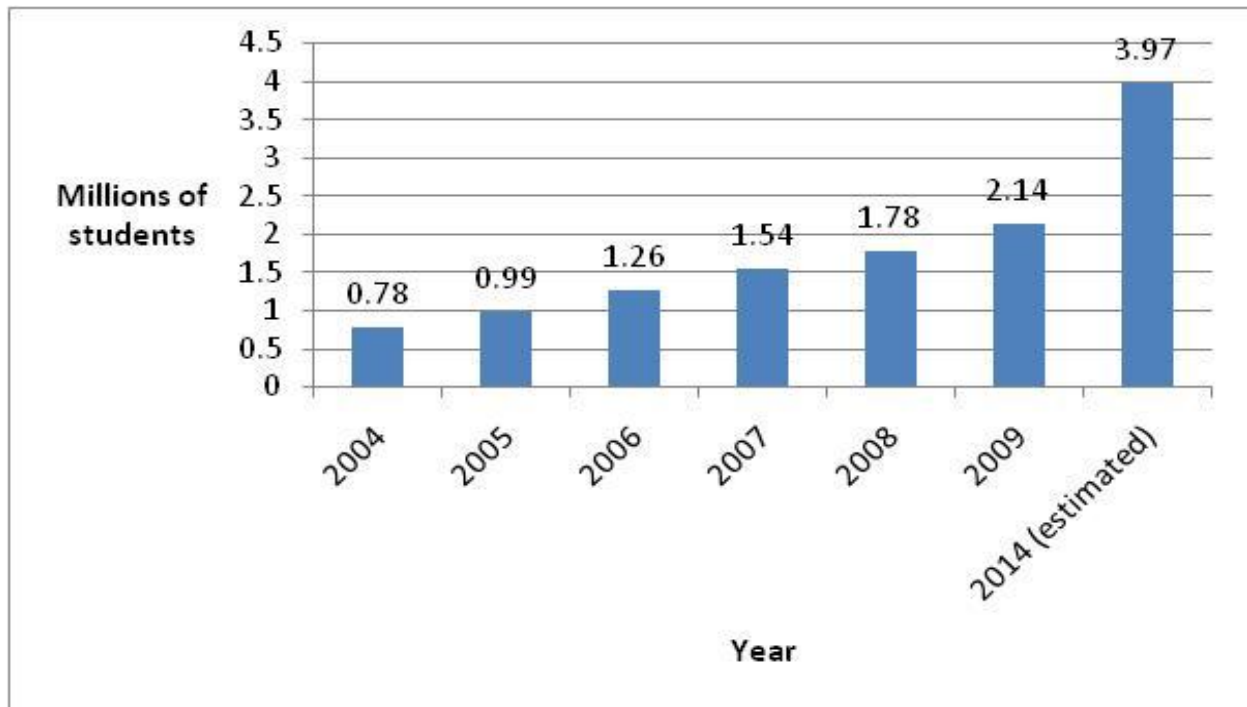


Figure 3. The growth and forecast for online-only enrollment in the United States, 2004-2014. Adapted from “Online Learning: By The Numbers” by EDUVENTURES, 2010, *The Chronicle of Higher Education*, Section B, p. 28.

Table 2

The Changing Focus of Educational Technology, 1975 - 2005

Era	Focus	Educational Characteristics
1975-1985	Programming; Drill and practice; Computer-assisted learning – CAL	Behaviorist approaches to learning and instruction; programming to build tools and solve problems; local user-computer interaction.
1983-1990	Computer-Based Training; Multimedia	Use of older CAL models with interactive multimedia courseware; passive learner models dominant; constructivist influences begin to appear in educational software design and use.
1990-1995	Web-based Training	Internet-based content delivery; active learner models developed; constructivist perspectives common; limited end-user interactions.
1995-2005	E-learning	Internet-based flexible courseware delivers; increased interactivity; online multimedia courseware; distributed constructivist and cognitivist models common; remote user-user interactions.

Note. Adapted from “A history of E-learning: Echoes of the pioneers”, by P. Nicholson, 2007. In B. Fernandez-Manjon, J. M. Sánchez-Pérez, J. A. Gómez-Pulido, M. A. Vega-Rodríguez, & J. Bravo-Rodríguez, (Eds.), *Computers and Education: E-learning, From Theory to Practice* (pp. 1-11).

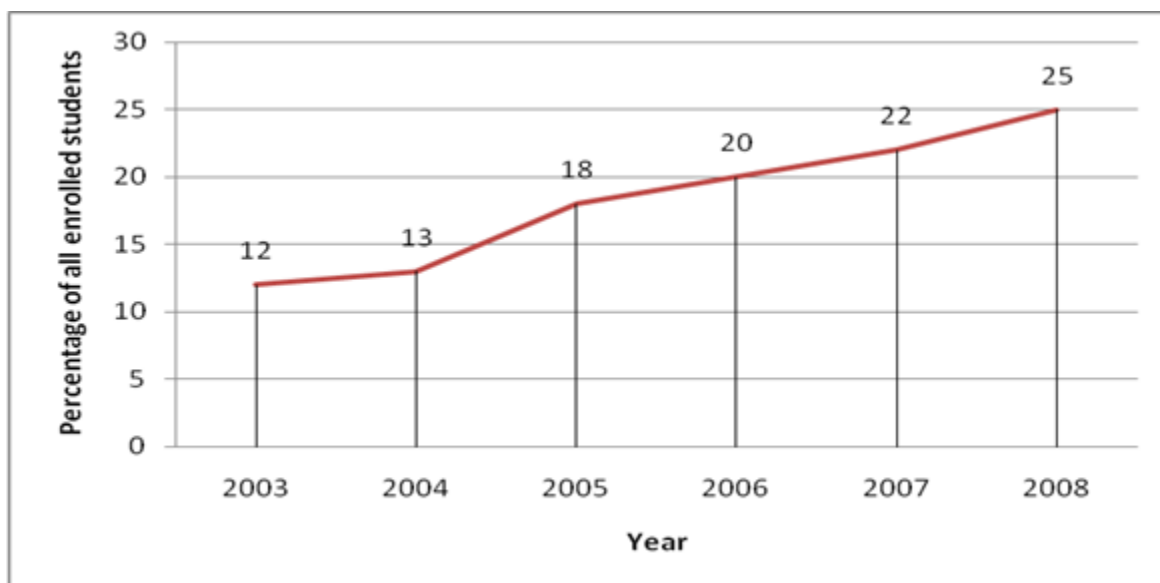


Figure 4. Percentage of all enrolled students taking at least one online course, 2003-2008. Adapted from “Online Learning: By The Numbers” Babson Survey Research Group, 2010, *The Chronicle of Higher Education*, Section B, p. 28.

Not only are students enrolling in ever greater numbers, they are enrolling in a wide variety of programs. As Table 3 illustrates, ten fields of studies accounted for 81 percent of all online enrollments in 2009.

Table 3

Percentages of Online-Only Students Pursuing Bachelor’s Degrees, by Field of Study - 2009

Field of Study	Percentage (%)
Criminal Justice	27
Computer and Information Technology	19
Health Care	16
Business	14
Nursing	13
Public Administration	12
Liberal Arts	9
Communication	8
Education	6
Psychology	6

Note. Adapted from “Online Learning: By The Numbers” by EDUVENTURES, 2010, *The Chronicle of Higher Education*, Section B, p. 28.

Educational researchers (Allen & Seaman, 2008; Ally, 2008; Khan, 2005) agreed that online learning enrollments will continue to grow in numbers in higher education over the next few years, making research to understand the online learning environment important during this time span. Educators and researchers need to understand the unique challenges and benefits of this evolving environment and adapt accordingly to continue to meet the needs of online learners.

Definition of Participation and Interaction in Online Learning

Drawing on research by Wenger (1998) and Vonderwell and Zachariah (2005) as well as a review of 36 publications by Hrastinski (2008) explicitly focusing on the participation of online learners, proposed the following definition: online learner participation is a process of learning by taking part and maintaining relations with others. It is a complex process comprising doing, communicating, thinking, feeling and belonging, which occurs both online and offline (p. 1761).

Interaction is another way researchers have conceptualized participation. According to So (2010), “in the context of distance learning, interaction refers to a reciprocal communication and learning process between two or more human actors (e.g., instructors, other learners) or between learner and non-human agents (e.g., computers)” (p. 256). Wagner (1994) attempted to functionally define interaction in a distance education context as “reciprocal events that require at least two objects and two actions. Interactions occur when these objects and events mutually influence one another” (p. 8). Similarly, in a study analyzing factors influencing interaction in an online course, Vrasidas and McIsaac (1999) defined interaction as “the process consisting of the reciprocal actions of two or more actors within a given context” (p. 25). Generally, interaction occurs when learners use technologies to access content, ideas, and information, as well as to communicate about course content with the instructor and their peer learners (Prammanee,

2005). Online learning interaction adds the use of computers and the Internet as the means of communication in this definition. For the context of this study, the Prammanee (2005) definition with the added online component will be used.

Studies on Student Participation and Interaction in Online Learning

The role of interaction in online learning has been a common subject in the educational process (Anderson, 2003), and online discussions have been analyzed critically by educational researchers (Masters & Oberprieler, 2004; So, 2010; Yukselturk, 2010). Participation is generally agreed to be critical to student success, particularly in online courses (Anderson, 2002). The success and utility of online context related discussions have been documented as well (Davidson-Shivers & Morris, 2001; Yilmaz & Tuzun, 2001). The current research aims to add to the existing body of literature by analyzing student-student interactions in a wholly online bachelor-completion program. Students in the CSU-GC courses are required to participate in online discussions to earn 25-30% of their final course grades.

For learning to be valuable, many researchers emphasize the necessity of interaction in distance education (Hamza & Alhalabi, 1999; Moore & Kearsley, 1997) and affirm that participation in online discussions are imperative to student learning (Stemwedel, 2005). Anderson (2002) found active student participation is essential to the success of online learning. So (2010) described what active student participation is: “Learners should take actions to utilize the affordances of technical interactivity for ongoing communication and engagement, and in turn this activation needs to affect the development of connected feelings with other human actors” (p. 259). At CSU-GC, the importance of online interaction among students is recognized by course developers and instructors and built into the grading structure for five required core

courses. Analyzing the impact of this required interaction on final course grades will help further development of sound educational practices for online instructors.

Stemwedel stressed, “Seeing online discussions as group labors rather than individual assignments helps participants in ways that enhance everyone’s learning - and that are more enjoyable to evaluate!” (p. 3). Khan (2005) supported this notion, confirming that student participation increased fourfold when online discussion became mandatory rather than optional. Khan asserted the average number of words contributed in online discussions tended to be considerably higher than average contributions in class discussions. He explored online participation and discourse in a science course for pre-service teachers. His findings showed an increase of 50 percent in the proportion of outside references cited and posted by students, thus, recommended instructors to make some listserv participation mandatory.

Issues related to the ways in which students participate, primarily based on the quality, number, and types of responses continue to be examined (Davidson-Shivers, Muilenburg, & Tanner, 2001; Durrington & Yu, 2004) as researchers try to understand the relationship between students’ online participation and success in terms of learning and grades. For example, Durrington and Yu (2004) investigated communication-based differences in education courses of both undergraduate and graduate students when the discussions were instructor-moderated versus peer-moderated. No significant differences were found between undergraduate or graduate level students; however, when discussion was moderated by the instructor all students were more or less active in discussion.

Researchers have identified two general types of interaction that support a virtual classroom: asynchronous and synchronous. Table 4, which illustrates characteristics of both

interaction types, highlights the pros and cons of each type and indicates the need for careful consideration of which types of interaction to require for students.

Soo and Bonk (1998) in their Delphi technique study examined instructors' opinions of interaction types considered vital in online learning. The findings deemed the asynchronous mode to be prominent for all types of interaction, particularly learner-learner interaction. It is the most convenient and flexible as learners can work anywhere and at any time they are connected to the Internet. However, there was a strong preference among instructors for the synchronous mode with teacher-learner interaction. Instructors felt asynchronous interactions offered better opportunities for learning, but the synchronous interaction was the essence of learning.

Roblyer and Wiencke (2004) deemed five elements vital for interaction in online courses: “(a) social and rapport-building designs for interaction, (b) instructional designs for interaction, (c) interactive capabilities of course technologies, (d) evidence of learner engagement, and (e) evidence of instructor engagement” (p. 26). The authors developed a rubric of concurrent validity and consistency of results across four distance courses and found five elements to be quality indicators for interaction in online courses. While literature concerning online interaction has been successful in showing instructor opinions, on-going research is critical to continue addressing technology advances and allowing a wider range of instruction and interaction.

Table 4

Descriptions of Asynchronous and Synchronous Types of Interactions

Asynchronous Interaction	Synchronous Interaction
<ul style="list-style-type: none"> • Does not occur in real time. 	<ul style="list-style-type: none"> • Occurs in real time.
<ul style="list-style-type: none"> • Learners do not have time restrictions for participation. They may participate when they have time. Thus, “learners can access online materials anytime” (Ally, 2008, p.17). 	<ul style="list-style-type: none"> • Time restrictions for participation. Learners need to be online simultaneously, although they are accessing from different locations (Davidson-Shivers, Tanner, & Muilenburg, 2000).
<ul style="list-style-type: none"> • Postings are physically captured on a computer and may be archived to allow participants to reread them at a later time (Kachel, Henry, & Keller, 2005) thus there is time for reflection and review (Davidson-Shiver et al., 2000). 	<ul style="list-style-type: none"> • Requires quick action, faster problem solving and decision-making, but provides the opportunity for immediate feedback. Learners can submit their thoughts or other work to their peers and receive an immediate critique.
<ul style="list-style-type: none"> • Offers greater level of flexibility as the participants do not have to be online simultaneously (Curtis, 2004; Ellis, 2003; Kachel, Henry, & Keller, 2005). 	<ul style="list-style-type: none"> • Synchronous online “chats” among students “has an advantage of promoting highly interactive discussions with a disadvantage for the group to digress from the topic to another” (Jeong, 1996, p. 62).
<ul style="list-style-type: none"> • Tools include Listserv -- an automated email discussion list, when e-mail is addressed to a listserv mailing list, it is automatically broadcast to everyone on the list, e-mail, discussion board, threaded discussions, chat rooms, and conferencing systems. 	<ul style="list-style-type: none"> • Tools include chat, video, audio, and computer conferencing.

Interaction Model - Moore’s Types of Interaction

Distance education has been profoundly influenced by the transformation paradigm and its emphasis on interaction. Moore and Kearsley (1996) stressed, “It seems that everybody in distance education talks about interaction” (p. 127). Talking about it, however, is not enough. In

analyzing student interactions in online learning, researchers have attempted to use many models of interaction. This current study uses the Moore's Types of Interaction model (1989, 1996). This model is considered one of the earliest models of interaction and is still one of the most widely used by researchers. It is the foundation from which other models of interaction have grown. Moore argued that to better understand and practice the concept of interaction, we need to differentiate between three basic types of interaction that take place in distance education: learner-content, learner-instructor, and learner-learner interaction (1989, 1996). Other studies have parallels to Moore's (1989) notion of these types of interaction and have concluded that three interactions types are vital in online education (Vrasidas & McIsaac, 1999; Yukselturk & Yildirim, 2008).

Moore (1989) described these different interactions as follows:

1. Learner-content interaction - The process of interacting intellectually with content that results in changes in the cognitive structures of the learner's mind, the subject of the study. This type of interaction enables students to obtain knowledge from the material.
2. Learner-instructor interaction - The two-way communication between the instructor and student through a program of curriculum, instructional presentations, and evaluations of learning. This type of interaction may include student feedback to the instructor, student-instructor dialogue, and instructor feedback to the students.
3. Learner-learner interaction - The communication that occurs among and between learners, within groups of learners, and with or without the real-time presence of an instructor. Exchanging and sharing of ideas, information, and dialogue among peers has an effect during this interaction.

Learner-content interaction has long been the touchstone of education. Moore (1996) said, “Knowledge construction happens when the learner interacts with the instructional content in order to accommodate new information into preexisting cognitive structures, which then results in changes in understanding” (pp. 128-129). In distance education, content may be offered to the learner in a variety of ways, such as textual materials in print or electronic formats, radio or TV broadcasts, audio or videotapes, computer software, and interactive multimedia. Regardless of the level of sophistication in the presentation of content, it is only when the student interacts with that content and incorporates it into a personal cognitive structure that learning takes place.

Learning is further reinforced through learner-instructor interaction (Moore, 1996), which involves activities such as seeking and offering explanations, analogies, examples, elaboration, discussion, and application of content. Those interactions are meant to accomplish multiple objectives:

Stimulate student interest and engagement in the learning process; foster the application of content through skill practice and manipulation of information and ideas; organize formal and informal ways to test and evaluate the extent to which learning is taking place and, if necessary, develop alternative pedagogical strategies; and provide support and encouragement. (Moore & Kearsley, 1996, p. 130)

While learner-content and learner-instructor interactions are common in DE environments, the third type of interaction, learner-learner interaction is necessary for online education to move beyond the diffusion paradigm and be truly revolutionized. Learner-learner interaction allows learners to explore new knowledge and build personal meaning around context, internalizing rather than memorizing context. Interaction among learners may occur when students relate directly with one another or in group settings, with or without the instructor being present in real time. Moore and Kearsley (1996) affirmed learner-learner interaction is an

extremely powerful way of “helping students to think out the content that has been presented and to test it in exchanges with their peers” (pp. 131-132).

Moore (1989, 1993) proposed there is a transactional distance in the learning environment when instructors and students do not interact in the same physical and temporal space (i.e., asynchronous Internet-based technologies) and activities are not simultaneous or in real time. Moore and Kearsley (2005) specifically define the concept of transactional distance as “the gap of understanding and communication between the teachers and learners caused by geographic distance that must be bridged through distinctive procedures in instructional design and the facilitation of interaction” (p. 223). The “transaction” that Moore and Kearsley speak to is “the interplay between people who are teachers and learners, in environments that have the special characteristic of being separate from one another” (p. 224).

Other studies and theoretical models have informed this study as well. Walther (1996) examined instruction and how computer-mediated communication (CMC) influences communications and interactions. Findings from Walther’s study revealed the importance of planning by instructors to create a climate in which students interact considerably with peers in online learning environments. Soo and Bonk’s (1998) study revealed that teachers view asynchronous learner-learner interaction as the most important type of interaction in an online course. With such importance placed on learner-learner interaction by instructors, it would seem critical that students be required to interact.

Students on the other hand want peer interaction to be an option rather than an obligation (Vrasidas and McIsaac, 1999). These authors found that peer interaction in an online course is not always a function of students’ voluntary volition or intellectual motivation; much of the activity is governed by the demands of the course structure, including the students’ drive for

good grades. Moreover, the study showed students are hesitant to participate in online interactions when the workload is heavy, when other interaction opportunities besides online are available, and when they lack a feeling of class community.

Table 5 provides an overview of other studies' perspectives underlying interactions in online learning environments and their relation to this study and includes discussion of other types of interactions such as Swenson's (1995) one-to-one, one-to-many, and many-to-many, and Hillman et al.'s (1994) fourth classification of learner-interface interaction.

Table 5

Frameworks and Synthesis Informing the Study: Types of Interactions

Framework	Description	Implications for study / How does framework inform study?
Astin's Theory of Involvement (1984)	<ul style="list-style-type: none"> • Student involvement has a positive impact on development and learning. • Astin's theory of involvement is basic in its foundation – “students learn by becoming involved” (Astin, 1985, p. 133). • The degree of involvement is determined by students' “learning, academic performance, and retention are positively associated with academic involvement, involvement with faculty, and involvement with student peer groups” (Astin, 1993, p. 394). <p>In short, Astin's theory emphasized the importance of students' participation in the learning process.</p>	<p>Astin's research provides a basis for the current study in promoting student awareness of their participation in a course.</p> <p>The amount of student involvement in the online course will reflect the learning outcome. Astin's (1984) theory of involvement states “the greater the student's involvement in college, the greater will be the amount of student learning and personal growth” (p. 307).</p>
Swenson (1995)	<ul style="list-style-type: none"> • Classifies interaction into three principal types, one-to-one, one-to-many, and many-to-many. 	<p>In distance education courses, students may communicate with other students within the group regardless of place and time, using asynchronous Internet-based technology. The category of many-to-many interaction plays an important role with online students by allowing interaction with all others in the group.</p>
Hillman, Willis, and Gunawardena (1994) - four types of interaction	<ul style="list-style-type: none"> • Supports Moore's (1989) notion on three types of interaction, added the fourth type of interaction, which is learner-interface interaction. They defined learner-interface as the interaction that occurs among learner, technology, and tools. 	<p>Students “cannot begin to deal with the content of the instruction if he or she is unable to first interact with the interface” (p. 36). In this study, students utilized the interface through LMS to interact with the content, instructor, and peers using the discussion board.</p>

Performance in Online Learning

While online class instructors feel intuitively that discussion participation and grade performance are related (Soo & Bonk, 1998), empirical evidence has been mixed. A study undertaken by Alstete and Beutell (2004) ascertained that the strongest indicator of student performance in online classes was the students' participation in discussion boards, measured by usage. This finding was supported by the fact that usage was positively and significantly related to overall course performance.

Similarly, students report more positive opinions of courses when they participate more in discussion style forums. A survey conducted by Shea, Fredericksen, Pickett, Pelz, and Swan (2001) of 3,800 students enrolled in 264 courses through the SUNY Learning Network (SLN), concluded "the greater the percentage of the course grade that was based on discussion, the more satisfied the students were, the more they thought they learned from the course, the more interaction they thought they had with the instructor and with their peers" (p. 23).

In a 2X4 quasi-experimental study, van Schaik and Barker (2003) compared two methods of course delivery (on campus delivery and Internet delivery) between subjects and times (four test scores) as within-subjects independent variables. Although there were no significant differences between the two modes of delivery in teaching and learning, the online students appreciated the flexibility of the online delivery mode of study more than did the on campus group.

In addition, levels of student participation (i.e., numbers of student postings) have been linked to greater depths and kinds of student learning (Mazzolini & Maddison, 2003). Student participation and the quality of student responses have been associated with increased learning as well (Althaus, 1997; Johnson, 2005; Wang & Newlin, 2000). Mazzolini and Maddison (2003)

studied 200 participants in an online astronomy course and examined the relationship between the number of instructors' posts, including the number of instructors initiated discussions, and correlated with these variables, students' posting rates, length of discussion threads, with survey responses concerning students' educational experience. They found the context, length, and frequency of instructors' posts to influence students' forum discussions and perceptions. There is research showing that online participation fosters student learning (Fredericksen, Pickett, Pelz, Swan, & Shea, 2000), perceived positive learning (Hrastinski, 2008), and increased grade performance (Fredericksen et al., 2000).

Several researchers looked at the link between participation and grades and have shown a positive correlation between participation in online courses and the grades students earned in a course. A study by Thompsen (1998) found students' grades were correlated to both the number ($r = 0.48, p < .001$) and the length of messages posted ($r = 0.52, p < .001$). These are large effect sizes according to Cohen (1988). Stemwedel (2005) maintained that incorporating participation into grades was fundamental to ensuring that students submitted high quality contributions to online discussions. Additionally, Khan (2005) suggested that mandatory assignments served as a catalyst for motivating students to participate in student-centered discussions. Althaus (1997), however, found that 90% of students reported participation in online discussion should be optional due to factors such as lack of time, tangible learning, and tangible rewards. Althaus' study investigated whether face-to-face discussion with computer-mediated discussion (CMD) enhanced the academic performance of undergraduate students in lecture courses and examined the characteristics of students who volunteer to take part in CMD groups when participation is optional or worth a small amount of credit. While some students seem to value online discussions, others feel their time and effort are not best spent in online discussions. Xie,

DeBacker, and Ferguson (2006) asserted that interaction and communication are the main reasons for participating in online discussion. Another area of research focus has compared use of discussions in online versus face-to-face classroom delivery. Participation and responses in classroom discussions are indicators of greater student success and learning in online courses and traditional classrooms (Althaus, 1997; Johnson, 2005). Similarly, Wang and Newlin (2000) found a correlation between students' participation in asynchronous online communications and learning; students who maintained a higher level of course activity had higher final grades. Kitsantas and Chow (2003) conducted research with 472 students at Florida State University and reported, "The help seeking tendencies amongst the online students were significantly (positive) correlated with students grades" (p. 391). Students, who took responsibility for their learning and sought additional help when needed, tended to do better than those who did not seek help. Student participation in online discussions became an essential ingredient of effective online instruction.

Finally, studies concerning factors to increase students' online participation have yielded interesting results. Bailey and Wright (2000) explored how faculty from various fields at one Southeastern university used the online (threaded) discussion group feature and found students who were less likely to participate in face-to-face classroom discussions were more likely to participate in online discussions. Instructors reported that the online discussion format encouraged students who did not participate in face-to-face interactions to express themselves online and encouraged all students to formulate their thoughts at a deeper level. One reason may have been that online discussions allowed students to participate anonymously and to choose when they participated giving them more time to reflect on their ideas before posting (Angeli, Valanides, & Bonk, 2003). Similarly, participation was greater when discussions were personally

relevant to students and when these had practical application to their lives (Jin, 2005). Mazzolini and Maddison (2003) recognized students participated differently when questions were posted by peers than when questions were posted by instructors; students responded more readily to peers' questions and more cautiously to instructors' questions. These findings indicate that online discussions must be thoughtfully constructed if meaningful learning is to occur.

Online discussions lead to increased student performance and facilitated learning outcomes in some ways superior to traditional classrooms (Althaus, 1997; Hsi & Hoadley, 1997). Students who participate in online discussions have been found to learn more and earn higher course grades than their counterparts who participate in face-to-face discussions (Althaus, 1997). Students in online discussions took more initiative to post questions about what they knew and needed to know than students in classroom discussions (Hsi & Hoadley, 1997). Factors such as time constraints in class and time for personal reflection may have contributed to these findings.

According to Coldwell, Craig, Paterson, and Mustard (2008), "Student performance can be measured by a number of indicators including: successful completion of a course, course withdrawals, grades, added knowledge, and skill building" (p. 20). Student performance is well understood to be a phenomenon affected by study habits, prior knowledge, communication skills, time available for study, and teacher effectiveness (Picciano, 2002). Picciano stated that uncertainty exists about the influence of the nature and extent of student interaction in online learning environments on student performance further indicating a need for research in this area.

Although research concerning online discussion is plentiful there is a need to continue to investigate the relationships between learner behavior and learning outcomes. As technology advances and both instructors and learners become more familiar with online learning, the dynamic between participation and grades or learning will continue to change.

Using Grade as a Dependent Variable

No evaluation efforts can be expected to be perfectly accurate, but there is merit in striving to assign course grades that most accurately indicated the level of competence of each student (Evaluation & Examination Service, 1996, p. 10).

What are grades? What do they really mean? Do student grades signify actual student learning? What are the factors instructors need to consider in assigning grades? These are questions most educators, students, parents, institutions, and learning communities perpetually ask themselves. As a student teacher, and lecturer, I always wondered about the impact of grades on students. Grades are important to determine class placement, scholarships, and college admissions (Randall & Engelhard, 2010). Grades are used in employment decisions, admission to graduate or professional schools, and by higher educational institutions in awarding distinction upon graduation (Gordon, Perrin, Sancar, & Stewart, 2007).

According to Brookhart (2004), the meaning of a grade is:

Closely related to the idea of student work; grades are pay students earn for activities they perform... grades are something students earn; they are compensation for a certain amount of work done at a certain level. . . achievement is part of the construct but not the whole of it. (p. 139)

Brookhart also reported that a teacher's meaning in grades is based on use and function, defined as why and how grades come into being. Additionally, grades are used as a way to communicate a student's ability, growth, attitude, effort, and achievement (Cross & Frary, 1999; Svinicki & McKeachie, 2011). The question remains however, what is being communicated and indicated.

Researchers have discussed at length what factors are used in assigning grades. Randall and Engelhard (2010) asserted four factors to address when assigning final grades, "student academic achievement, student ability, student effort, and student behavior" (p. 1373). Research has suggested educators embrace factors other than actual academic achievement when assigning

grades including, but not limited to homework, improvement, participation, ability, effort, and behavior (McMillan & Nash, 2000).

Gonnella, Erdmann, and Hojat (2004) reported there are grading schemes commonly used for assessing student performance although there is no standard procedure in doing so. The grading systems discussed in their article are as follows: (a) pass/fail, (b) honors/pass/fail, (c) letter grades A, B, C, D, F with or without +/- modifiers, and (d) number grades on a continuous scale.

Strengths, Weaknesses, and Recommendation for Using Grade(s) as a Dependent Variable

Grades allow students to track their performance throughout their degree programs. As Dalziel (1998) stated, outstanding students and low achievers are recognizable if grades are used in analyzing student performance. He added that grades are easily analyzed and their meaning easily inferred by students, instructors, or college departments. Linn and Miller (2005) said, "In the final analysis, letter grades should reflect the extent to which students have achieved the learning outcomes specified in the course objectives, and these should be weighted according to their relative importance" (p. 377). Moreover, Randall and Engelhard (2010) reported:

Grades, when assigned appropriately. . .(a) enable teachers to compare the knowledge and skills of current students, (b) allow teachers to ascertain accurately the preparedness/readiness of incoming students, and (c) provide parents and students with a clear picture of each child's knowledge and understanding of course content. (p. 1376)

Similarly, Dalziel (1998) stated, "there are many different kinds of problems that exist within educational assessment, and while not all problems apply to all types of assessment, no method of assessment are free of difficulties" (p. 352).

While no one evaluation can be seen as the best way to indicate student learning, final course grades and GPA are two commonly used in institutions. Limitations to these

measurements as a dependent variable include differences in course difficulty, differences in grading practices among courses, and differences among instructors' grading practices.

Dalziel (1998) argued that using student grades has limitations in terms of appropriateness (e.g., failure to use appropriate assessment tasks for the type of learning required); fairness (e.g., lack of consistency by an individual marker across assessment tasks to be marked); administrative errors (e.g., errors may arise where large numbers of students are measured using many different components); and results from adjustments to numerical scores (e.g., unsuitable weightings and inappropriate distributions of scores). These drawbacks are common problems that arise from any attempt to use numerical scores to represent student learning and performance. These problems are compounded when individual assignment grades are compiled in some form to produce final course grades, but they are also relevant for producing final course grades from numerical scores, and producing marks for individual items of work (Michlitsch & Sidle, 2002).

Despite these problems, Pascarella and Terenzini (2005) have said that final grade performance has been used frequently to describe academic success or has attracted the most attention when compared to other types of outcome measurements. Also, grades are the most readily available data. Finally, research has found that undergraduate course grades remain the single best predictor of actual student learning (Pascarella & Terenzini, 2005; Porter, 1990).

While some researchers question using grades as a dependent variable and as a valid measure of academic performance, this researcher strongly believes that using course grades is one way to determine student's academic performance. Studies by Wong, Day, Maxwell, and Meara (1995), Sternberg, Wagner, and Okagaki (1993), and Ransdell (2001) all successfully used course grade as an indicator or predictor of student's academic success or performance. It is

noted that grades, especially letter grades, differ greatly by course, instructor, institution, and so forth, this researcher considers grades to be a viable dependent variable.

This section of the review focuses on twelve empirical studies reported between the years 2000 and 2008. These studies vary in terms of the type of research method employed, type of learners, course duration, and outcomes measured. These studies were chosen based on the use of grades as dependent variables and the complete availability of information (data) stated in the studies.

Authors of the reviewed studies have different perspectives on what exactly online learning is. While most of the studies have OLL as a portion of a course from a distance, other authors more narrowly defined OLL to mean courses taught fully or wholly online in which there was no face-to-face interaction between students and instructors. Still others considered blended learning environments, where students attended a classroom and used some form of online discussion environment, such as Blackboard.

The purposes for the studies included: (a) comparing online and conventional students; (b) analyzing frequency, quality, and content of postings in online discussion boards; (c) finding correlations between student postings and grade performance; (d) comparing methods of course delivery using Bloom's taxonomy and other teaching methods; and (e) analyzing the social, teaching, and 'social presence' in OLL environments. A large portion of studies reviewed looked at relationships between different independent variables and grade performance, trying to identify performance indicators among online students. In addition to analyzing performance predictors, comparison studies analyzed differences in academic performance between conventional and online courses or students. None of the studies directly examined actual student learning or the use of an online learning environment in knowledge acquisition and retention.

Thus, it is not clear whether high performance reflects positive learning among students or simply high grade assignment.

Ten of the 12 authors of the studies reported ‘grade’ as the final course grade, whereby students were awarded a grade at the end of completing the course by the course instructor. As stated by Coldwell, Craig, Paterson, and Mustard (2008), “student performance can be measured by a number of indicators including: successful completion of a course, course withdrawals, grades, added knowledge, and skill building” (p. 20). Two of 12 studies looked at grade point average (GPA) as a dependent variable and gathered data from institutional records.

Olmsted’s (2008) longitudinal study compared distance-college learners to face-to-face learners’ performance based on the National Board of Dental Hygiene Examination (NBDHE). As part of an Allied Health Distance Education Program the study examined undergraduate online and face-to-face students in a freshmen level course and observed aggregate grade data from final grade reports, end of term reporting rates, and instructor evaluations to assist in determining the meaning of grades.

Similarly, Alstete and Beutell (2004) used the standardized tests scores from the Scholastic Aptitude Test (SAT) and the Graduate Management Admission Test (GMAT) to measure student performance. Final course grades for the business administration course (management and human resource management) in this study were based on a compilation of discussion board participation and thread initiation; individual assignments; midterm exam score; final exam score; final paper score; and pre-test and post-test scores.

As evidence in the studies examined, there are many ways grades can be used as a dependent variable. Until a more standard outcome variable is defined and widely available, however, researchers must rely on student grades as a proxy variable for student learning.

The outcomes of these studies were mixed. Some of the studies did show a positive relationship in student performance, but not all studies showed a statistically or practically significant relationship in student course grade to participation. Olmstead's (2008) longitudinal analysis of student performance between face-to-face learners and distance learners over a ten-year period demonstrated no statistically significant differences existed by using performance on the NBDHE, GPA, or course grades. Other demographic variables appeared not to affect student performance either, including: geographical distance students lived from campus, the number of hours per week they were employed, and number of children who lived in their household. However, using the gender demographic demonstrated that women performed better than men (Coldwell et al., 2008; Price, 2006).

Other studies did find relationships between student performance and postings by students in online discussions. For example, Wang, Newlin, and Tucker (2001) averred, "The total number and frequency of students' postings/comments in the forum discussions were correlated with the final grades" (p. 3). Moreover, the number of times a student was the first to respond to the instructor's question was also correlated strongly with final course grade.

The results of the Wang et al. (2001) study's quantitative analysis of online discussion postings indicated students achieving high or medium passing grades were significantly more active with the course, in terms of posting discussions measured by discussion access, compared to students achieving low passing grades. In turn, students achieving low passing grades were significantly more active than students who failed. These findings indicate students who interact in OLL discussions may learn more than their less interactive peers.

Finally, when researchers compared OLL students' performance with that of face-to-face students the results were mixed. Means, Toyama, Murphy, Bakia, and Jones (2009) found that

online students outperformed their face-to-face peers. Yukselturk and Bulut's (2007) study, however, found no difference in performance.

Table 6 illustrates a detailed summary of each of the individual research studies reviewed in this section according to author(s), type of research, duration, outcomes measured, and definition(s) of grade(s). As indicated throughout this section, definite answers to the questions concerning OLL participation and student learning have not been reached creating the need for continued research to inform best practices in a fast evolving online educational environment.

Table 6

Summary of Empirical Literature Using Grade(s) as Dependent Variable

Author(s)	Type of Research	Types of Learners	Duration	Outcomes/Variables Measured	Definition(s) of Grade(s)
Coldwell, Craig, Paterson, & Mustard (2008)	Quantitative; Analyzed data based on the student tracking and student demographic data	Bachelor of Information Technology students enrolled in a compulsory unit	16-week semester	Gender, age, nationality, participation, performance.	Overall grade ^a students awarded at the end of completing the online course (Final results in the course).
Olmsted (2008)	Longitudinal Analysis	Distance college learners and face-to-face learners in an Allied Health Distance Education Program	Ten-year period from 1997 -2006	Learner performance; face-to-face students vs. online students.	Student performance on academic benchmarks: NBDHE ^b , grade point averages (GPAs), course grades.
Palmer, Holt, & Bray (2008)	Mixed-method	Undergraduate engineering management (online)	One semester	Number of postings; length of postings; messages read; follow-up/reply discussion postings; cognitive/social/teaching presence; knowledge/comprehension/application/ analysis; posting on task/off task.	Final unit mark

^a The allocation of grades was as following:

80% or above - HD (High Distinction); 70% to 79% - D (Distinction); 60% to 69% - C (Credit); 50% to 59% - P (Pass); Below 50% - N (Fail)

^b National Board of Dental Hygiene Examination(NBDHE)

Table 6 continued

Urtel (2008)	Quantitative; Analyzed demographic data set	Undergraduate online and face-to- face students (freshmen) in a course	15-week semester	Demographic: gender, age, ethnicity, major or non-major.	Compilation of aggregate data found on final grade reports, reporting rates of end of term course and instructor evaluation, DFW ^c rates.
Cotton & Yorke (2006)	Mixed-method; 3 method of analyzing: a) Analyzing social, teaching, & cognitive ‘presence’; b) Content analysis based on Bloom’s taxonomy; and Quantitative analysis based on intended learning outcomes.	Students enrolled in General Teaching Associates course & tutors	20-week semester	Social, teaching, and cognitive ‘presence’; best method.	Final unit grade
Conaway, Easton, & Schmidt (2005)	Content Analysis – using a content- analytic framework (coding scheme) derived from Heckman and Annabi (2002); Method: Divided students into 10 groups of 5 1. Team (2, 3, 4, 6, 7,10) – used discussion board (DB) 2. Team (1, 5, 8, 9) – used traditional email & virtual chat to correspondence, however 1 & 9 begin using DB later & switched to their original method.	Online students enrolled in 48-hour MBA program	One semester	Interactivity; course outcomes (final course grade).	Final course grade

^c Grades earned DFW have either a negative effect or no effect toward credit hours earned and subsequent semester GPA (p. 323), D = 1, F = 0, or W = 0 on a four point scale.

Table 6 continued

Davies & Graff (2005)	Quantitative	122 first-year undergraduates	One year	Frequency (contribution) of online interaction.	Final course grade (end of the year).
Dutton, J. & Dutton, M. (2005)	Quantitative; Two Surveys; Descriptive statistics, regression analysis, standard hypothesis tests	Undergraduate online and traditional lecture sections of a business statistics class	One semester	Satisfaction, motivation, & readiness for online course.	Class grades (final exam score), registration records.
Alstete & Beutell (2004)	Quantitative	Undergraduate and graduate business (MBA ^d) students in 10 courses management and human resource management	One semester	Demographic characteristics: age, gender, work experience, organizational position level for MBA students.	Course performance (final course grade ^e , discussion board participation and thread initiation, individual assignment grades); Scholastic Aptitude Test (SAT) and the Graduate Management Admission Test.
van Schaik, Barker, & Beckstrand (2003)	Quantitative; Quasi-experimental design - two methods of course delivery (online and on-campus) - 2 questionnaires (at the end of week 2 & 4)	Community College of Southern Nevada (CCSN) students	One semester	Test performance, attrition, & attitudes.	Test performance (pre-test score and 4 tests score).

^d MBA - Master of Business Administration

^e Final grade assigned in the course on a five-point scale (A = 4, B = 3, C = 2, D = 1, F = 0), which is the major dependent variable in this study.

Table 6 continued

Wang, Newlin, & Tucker (2001)	Discourse Analysis: Chat room discussion	Internet-based class on statistical methods in psychology.	16-week course	Discourse Analysis Categories: Lecture problems, Homework-related remarks, Course administration remarks, and Social remarks.	Final course grade
Wang & Newlin (2000)	Quantitative; Prediction of performance	Students in web-based statistical methods in psychology and their counterparts in face-to-face sections of the same course.	Three academic semesters	Cognitive-motivational; demographic backgrounds; and predictors of performance: On-line course activity (e.g., homepage hit rate); cognition, and an internal locus of control.	Final course grade

For the purpose of this study, the accumulation of the tests, assignments and participation in the discussion board will serve as the final course grade, which is calculated and reported by the course instructor as a letter grade. This letter grade serves as the proxy variable for student learning in this study.

Summary

While many models of interaction have been presented, Moore's (1989, 1996) model of interaction with its three components of learner-content, learner-instructor, and learner-learner interactions is best suited to the purpose of the current research. Investigating frequency and quantity of interaction and the relationships to final course grades will add to body of literature by illustrating student online participation in course-required discussion and its association if any, with final course grades.

While the debate continues in research concerning the use of grades as a proxy variable for learning and academic achievement, until other data become available that are as accessible, researchers will continue to use grades from multiple assessments from discussions, projects, papers, and final course grades. The current research uses final course grades in five CSU-GC core courses as independent variables in the absence of other meaningful data related to student learning outcomes.

As technology and associated learning applications continue to evolve, researchers attempt to keep pace by investigating the relationships between students and academic outcomes. Because of the increasing number of courses offered as hybrid and fully online, ongoing research is necessary to determine what practices are most effective in maximizing positive student learning outcomes. The current study attempts to add meaningful discourse to this on-going conversation.

CHAPTER 3: METHODOLOGY

The purpose of this chapter is to outline the rationale for the methodological design of the current study. To this end, the chapter is structured around the following seven components: (a) research design; (b) description of the population and sample including a brief description of course format and content; (c) variables including independent and dependent variables; (d) description of the data collection procedures including instrumentation used to answer the research questions, protection of human subjects; (e) validity; (f) reliability; and (g) presentation and clarification of the statistical procedures, justification for their use, and organization of the data analyses.

This study explored learning and teaching of online classes. Investigating the relationship between undergraduate students' participation and their final grades in five selected core courses in an online learning environment and examined the differences between the demographics characteristics of age, race, and gender to students' participation (total number of messages posted and total access), and grade performance. A quantitative design was chosen for this study because a post-positivist theory has been employed to measure and explain relationships between variables.

Research Design

The quantitative approach of this study is guided by the epistemology philosophical framework of post-positivism. The notion of post-positivism embraces the epistemology of objectivism. Ontologically, the researcher believes there is only one truth, an objective and *correct* reality that exists independent of human perception. Lakoff (1987) argued that objectivism is "one version of basic realism" according to which reality exists independent of humans (p. 158). Using the epistemological position of the quantitative paradigm, the researcher

investigated the independent entities. Measuring and analyzing relationships between variables within a value-free framework is the ultimate goal of post-positivism. Phillips and Burbules (2000), however, cautioned that post-positivism should not be mistaken for looking for an “unchangeable, rock-solid foundation” (p. 26). While scientists look for grounds on which to base conjecture, the nature of research is “conjectural” (p. 26).

This study took a quantitative, non-experimental approach to the collection and analysis of data. A non-experimental approach allows the examination of relationships between independent variables (IV) and dependent variable (DV), in which the researcher does not manipulate or control the independent variable (Morgan, Gliner, & Leech, 2009). The approach is based on a postpositive worldview (Morgan et al., 2009) and is named logical positivism (Roberts, 2010). The research questions were based on the Moore (1989) interaction theory, which categorizes interaction into three types: (a) learner-content interaction, (b) learner-instructor interaction, and (c) learner-learner interaction. Learner-learner interaction, which Moore (1989) called “a challenge to our thinking and practice in the 1990s” (p. 4), is the main focus of the current research.

The study employed an associational research design (association questions) and between-groups or within subjects design (difference questions). Creswell (2008) defined “Correlational designs are procedures in quantitative research in which investigators measure the degree of association (or relation) between two or more variables using the statistical procedure of correlational analysis” (p. 60). The nature of the research questions in this study required employ correlational analysis such as Spearman correlations, a nonparametric equivalent of the Pearson correlation coefficient (when assumptions are markedly violated). The between-groups

subjects design requires Kruskal-Wallis tests (assumption of equal variances is violated) and Mann-Whitney *U* Tests.

In relation to using correlational design, there are some advantages as emphasized by Gall, Gall, and Borg (2005). These include (a) determining the extent of a relationship, (b) comparing relationships, and (c) determining relationships among more than two variables (p. 219). Considering these benefits, the researcher utilized the following six steps in the process conducting correlational research as detailed below (Creswell, 2008).

- (1) Determine if a correlational study best addresses the research problem,
- (2) Identify individuals to study,
- (3) Identify two or more measures for each individual in the study,
- (4) Collect data and monitor potential threats,
- (5) Analyze the data and represent the results, and
- (6) Interpret the results (pp. 371-372).

The steps were thoroughly examined and in line with the goals of the current study, so the design was adopted. Step 4, data collection, was the exception to the process as the researcher used an existing data set.

Within this study, the researcher examined the relationships between the independent variables of online student participation and its' related variables as discussed in the conceptual framework section as total number of messages posted, total access, and final course grade. Thus, the focus of this study is “more on examining the association or relation of one or more variables than testing the impact of activities or materials” (Creswell, 2008, p. 60); and a between-groups design. Data were from an existing data set pertaining to students' participation and final grades from CSU-Global Campus; data were analyzed using SPSS[®] version 20.0.

Sampling

The population was all undergraduate students enrolled at CSU-GC in the Fall 2010 and Spring 2011 semesters. Specifically, it was determined that the most appropriate population for

this study would include all undergraduate students enrolled in one or more of the five required core courses (see Table 7). These five courses were selected because they are the core courses and prerequisites for other coursework for all undergraduates at CSU-GC leading to a Bachelor of Science degree majoring in Applied Social Sciences, Business Management, Information Technology, Organizational Leadership, or Public Management. The five core courses are Effective Communication: Research and Writing (COM300); Dimensions of Ethical Leadership (HUM300); Principles and Practices of Effective Leadership (ORG405); Working in Modern Society (SOC300); and Technology and Tools for the Global Information Age (SOC305). Table 7 shows the five selected courses and their descriptions.

The sample consisted of 946 unique students enrolled in either one or more of the five core courses. A total of 450 male (47.6%) and 496 female (52.4%) comprised the sample. Student racial identities represented in this sample were: White, 76.4%; Black or African American, 3.6%; Asian, 1.8%; Two or more races 1.5%; Native American or Alaska Native, 0.7%; and Native Hawaiian or Other Pacific Islander, 0.4%.

Table 7

Five Selected Core Courses and Descriptions

Course Name/No.	Description
Effective Communication: Research and Writing (COM300)	Identify and examine formats, principles, and research tools necessary for effective written communication. A practical approach for leaders in managing the diversity and dynamics of communication needs to achieve desired results.
Dimensions of Ethical Leadership (HUM300)	Analyze the role that ethics plays in effective leadership. Understand and evaluate the ethical challenges that leaders face as they balance the demands of internal and external stakeholders. Explore ways to consider ethical issues in everyday decision-making and effective leadership.
Working in Modern Society (SOC300)	An analysis of the conditions and challenges faced by workers in contemporary society, including the meeting of both employer and individual expectations. Focus includes the balancing of numerous factors including personal life, job commitment, and career management.
Technology and Tools for the Global Information Age (SOC305)	Explore the vast and growing number of technology tools available to meet the organizational demands of a global world. Evaluate the impact of the technology on communication, skills development, and the role of leadership while learning to develop applicable strategies to meet organizational needs with optimal results.
Principles and Practices of Effective Leadership (ORG405)	Examine the role of leaders, explore leadership practices, and identify the attributes that determine leader success. Gain an understanding of leadership styles and their practical outcomes while learning how to incorporate study findings into effective leadership.

Note. Adapted from *2011 Academic Catalog: Semester I*. Colorado State University- Global Campus. Retrieved 02, 2011 from http://csuglobal.blackboard.com/bbcswebdav/xid-8823_4

Variables

Independent Variables

The learning management system (LMS) used by CSU-GC routinely collects individual student information from most tools and applications within the system. This study utilized some of the tracking elements from the LMS as independent variables. The variables were collected automatically by the system and were reported through the instructor's "student tracking" report or harvested across the courses within the institution through a database query. The independent variables collected in the learning management system are in Table 8.

Table 8

Perception of Independent Variables and Level of Measurement

Variable	Description	Type
Messages Posted	Total number of messages posted by the student within the course.	Continuous
Total Access	Total number of content files opened by the student. If a student opens the same content file multiple times, the system records each entry.	Continuous
Age	Students' ages ranged from 19 to 69.	Continuous
Race	The identities are White, Black or African American, Asian, Two or more races, Native American or Alaska Native, Native Hawaiian or Other Pacific Islander.	Nominal
Gender	Students' identified as either male or female.	Dichotomous
Courses	The courses analyzed in this study were explained in Table 7.	Nominal

Dependent Variable

The final course grade was the dependent variable and was selected since grades have the most influence on student persistence (Coldwell et al., 2008; Pascarella & Terenzini, 2005; Picciano, 2002; Porter, 1990). Final grades can be entered as A, A-, B+, B, B-, C+, C, D, and F. If the student drops the course within the official drop/add window, the course grade field will be null. The final grade variable can be seen as discrete and ordinal. In this study, final course grade was determined based on the institution's course grading scale using percentages (see Appendix A). Additionally, total number of messages posted and total access were both utilized as dependent variables for research questions 2 to 5.

Description of Courses

Based on the CSU-GC Academic Catalog (2011), "The academic year is divided into two consecutive six-month semesters that follow the calendar year: Semester I (Spring) and Semester II (Fall). Within each semester are three 8-week non-overlapping terms, referred to as Term A, B, and C. There are a total of six terms per year" (p. 15).

There are currently five undergraduate academic programs (majors) being offered at CSU-GC, leading to a Bachelor of Science degree completion. The majors are Applied Social Sciences, Business Management, Information Technology, Organizational Leadership, and Public Management.

All undergraduates are required to enroll in the five core courses, which were used for data collection and listed in Table 7. Each core course is 3-credits offered in an 8-weeks term. In addition to the 15 credit hours from these core courses, all students must complete 30 credits from one of the majors and 15 credits from a specialization for a total of 60 credits to complete a bachelor's degree. The exact number of hours per week a student can expect to spend on each

course varies based upon the weekly coursework, personal study style, and personal preferences. Each student is expected to spend 10-25 hours per week in each course reading material, interacting on the discussion boards, writing papers, completing projects, and doing research. The discussion participation of each of the core course is 25% - 30% of the final grade depending on the course (CSU-GC Catalogue, 2011).

Data Collection Procedures

In this study, student participation in courses was measured based on their usage of the LMS. To gather the data the researcher contacted a representative from CSU-GC after approval from Colorado State University's Human Subjects Institutional Review Board (IRB), Office of Regulatory Compliance (see Appendix A).

Data such as final course grade(s), age, gender, and race were inputted from the CSU-GC students' admission records and instructors' final grade rosters. Course section data were exported from students' registration and information systems with the help of a CSU-GC representative. The representative of the institution extracted, converted, and formatted data from the LMS and electronic student information system into a Microsoft Excel spreadsheet for the researcher's use. All identifying student information was removed from the data file before the file was delivered to the researcher. Each participant was identified by a unique number. This number was not tied to students' Social Security or institutional identification numbers. The final course grades were coded in Table 9. CSU-GC reports letter grades *A*, *B*, with +/-, *C*, and *D* qualifies as passing grades and *F* without +/- qualifies as a failing grades. No *A+* grades were reported in the data for this study.

Table 9

<i>Grade Coding</i>	
Grade	Coding
A	9
A-	8
B+	7
B	6
B-	5
C+	4
C	3
D	2
F	1

The courses were retrieved by a common central server that is using a learning management system (LMS) called ‘Blackboard’. Due to the nature of this system, all data collected by the blackboard were assumed reliable as the data were collected automatically and cannot be changed by the researcher or the system users. Further detail on the course grading scale is illustrated in Appendix B.

Validity and Reliability

Validity

A study’s validity is related to the strength of the study’s conclusions based on the available data and analysis of those data. Validity is synonymous with the term ‘accuracy’ (Huck, 2008). According to Agresti and Finlay (2009), “A measure should have validity, describing what it is intended to measure and accurately reflecting the concept” (p. 11). In brief, validity relates to both design and methods within the study (Morgan, Gliner, & Harmon, 2006).

A question remains concerning the extent to which using student grades is a valid measure of academic performance. Using course grade is one of the ways of determining

students' academic performance. Studies by Wong et al. (1995), Sternberg et al. (1993), and Ransdell (2001) used course grades as indicators to measure students' academic success/performance. Further discussion of the use of grades as a proxy variable for academic performance is included in chapter 2.

Validity can be categorized as either internal or external. Both classifications and how they might affect the outcome in this study are discussed. First, internal validity "depends on the strength of soundness of the design and influences whether one can conclude that the independent variable or intervention *caused* the dependent variable to change" (Morgan et al., 2009, p. 103). For this study using a non-experimental design and associational research approach means there is one group, undergraduate students enrolled in either one or more of five courses. Internal validity thus is discussed based on equivalence in associational studies type. According to Morgan et al. (2009), "it is important to emphasize that the associational approach does not provide evidence of causation no matter how strong the statistical association" (p. 104).

One way of achieving a higher degree of internal validity is by looking at the independent variable (student participation) and the dependent variable (final course grade). The researcher does not assume there is a high correlation if students participate more in the discussion forum and achieve a higher final grade or vice versa. There may be other possible factors contributing to high levels of participation with higher grades such as availability of time (part-time and full time students), intelligent quotient (IQ), etc.

External validity refers to whether the study's results can be generalized to other populations, settings, or time periods (Morgan et al., 2009). "External validity asks the question of generalizability: to what populations, settings, treatment variables, and measurement variables can this effect be generalized?" (Morgan et al., 2009, p. 357). Among the factors that may

influence external validity are population characteristics, interaction of subject selection in research, research environment, time, and data collection method (Seliger & Shohamy, 1989). According to Seliger and Shohamy (1989), “Findings can be said to be externally invalid because they cannot be extended or applied to contexts outside these in which the research took place” (p. 95). Therefore, the findings of this study may generalize to other students taking the five required core courses at CSU-GC and to grade performance for other courses for the CSU-GC students involved in this study.

In addition, the researcher took into consideration the issue of using large samples by using the courses from two semesters to increase the external validity. Creswell (2008) asserted “The larger the sample, the less the potential error that the sample will be different from the population” (p. 156). Among the reasons for using large sample are:

- (1) Outliers might have limited effect on large samples (Jamshidian & Mata, 2008),
- (2) Small sample size limits the findings of the study (Froehlich-Grobe, Andreson, Caburnay, & White, 2008), and
- (3) Large sample sizes reduce error associated with variables (Anderson & Laake, 1998).

The researcher felt by having a large sample ($N = 946$) the external validity was strengthened. Moreover, the issue of population external validity was addressed by including participants from one or more of the five core courses.

To conclude, as this study is non-speculative in nature, utilizing secondary data, the researcher took several steps to reduce the threats to validity. The study assumed the data in the course management system were accurate and consistent. The researcher used a data dictionary to reduce overall misinterpretations of the data.

Reliability

Reliability is the consistency of measurement within the study and can be used interchangeably with the word ‘consistency’ (Huck, 2008). According to Agresti and Finlay (2009), reliability is the degree to which “being consistent in the sense that a subject will give the same response when asked again” (p. 11). For this study, the reliability for the discussion board postings through LMS and the course grade were discussed.

All course management data, either student participation in the forum discussion or course grade, were collected by a common central server using LMS. Due to the nature of the system, all data collected by the LMS were assumed to be reliable as the data were collected automatically and cannot be changed by the researcher or the system users. To ensure the reliability of the data, the data were inputted into Microsoft Excel data spreadsheet and were received by the researcher in this format.

Data Analysis and Forms of Results

Data Analysis

From the perspective of post-positivism, traditional statistical approaches were used to validate the study using secondary data. Parry, Ginch, and Platt (2001) affirmed post-positivism epistemology consists of statistical methods customized to social science approaches to answering research questions.

Analyses and interpretations of the data for these procedures followed the principles outlined in “IBM SPSS for Introductory Statistics: Use and Interpretation” (Morgan, Leech, Gloeckner, & Barrett, 2010). Upon data analysis, the researcher found the distributions of the dependent variables were not normal, with the variances not equal for each of the independent variables, and most of independent variables were not normally distributed. Based on the skewed

nature of the data, the researcher chose nonparametric Spearman Rho correlation as the most appropriate statistical analyses to address the research questions (see Table 10).

Two of the research questions (RQ 1 and 2) were associational questions, which relate variables and find the strength of relationships. By looking at the research questions, the researcher employed explanatory research design. “An explanatory research design is a correlational in which the researcher is interested in the extent to which two variables (or more) co-vary, that is, where changes in one variable are reflected in changes in the other” (Creswell, 2008, p. 358). Further, one of the characteristics of explanatory correlational design is “The researcher analyzes all participants as a single group” (Creswell, 2008, p. 358). In view of this, the analyses were conducted as ‘a single group’ for the five courses.

Additionally, Creswell (2008) indicated “in a correlational research designs, investigators use the correlation statistical test to describe and measure the degree of association (or relationship) between two or more variables or sets of scores” (p. 356). This method was well suited to the goals of this study as there was more than one independent variable; student participation measured by total number of messages posted and total access; and one dependent variable, students’ final course grade. Here, the researcher used the nonparametric correlation Spearman Rho as the first analysis to determine the strength of the relationships. “Pearson correlation is expressed as a coefficient, r , which indicates the strength of the association and relationship between two variables” (Morgan et al., 2006, p. 196); similarly, Spearman Rho “is based on ranking the scores...rather than using the actual raw scores” (Morgan et al., 2006, p. 125). Spearman Rho was used as assumptions of the Pearson correlation (such as the normality of the scores) are markedly violated.

If there is a positive relationship between the variables, it is an indication that as values on one variable increase, values on the other variable also increase. If r is 0.50 or greater, it is usually considered a strong positive relationship and r values that are below -0.50 are considered to have a strong negative or an inverse relationship. “An inverse relationship means a high score on one variable is associated with a low score for the same person on the other variable and vice versa” (Morgan et al., 2006, p. 196). If the value of r is near zero, it indicates there is little relationship between the two variables; in this case, high scores on the independent variable may be associated with medium scores on the dependent variable. Hence, a zero or a low correlation means that one cannot determine the dependent variable knowing the scores on the independent variable or there is little explanatory value.

In brief, another important output was observed in relation to correlation analysis was coefficient of determination, “To get a better feel for the strength of the relationship between two variables, many researchers will square the value of the correlation coefficient... r^2 ” (Huck, 2008, p. 68). “Coefficient of determination indicates the proportion of variability in one variable that is associated with (or explained by) variability in the other variable” (p. 69). The correlation matrix (for usage of variables) and scatterplot to check assumptions between the variables were taken into account in analyzing and interpreting the data. Questions defining the analysis of the research questions, the variables (measurement) and statistical analyses (techniques) are shown in Table 10.

Summary

Secondary data, using an associational, non-experimental design to measure relationships between the independent variables primarily participation measured as number of messages posted and number of total access, and the dependent variable, final course grades of

undergraduate students in five selected courses utilizing the Blackboard Learning System, were used in this study. This study also looked at the differences between age, race, gender, and courses on the total number of messages posted, total access, and grade performance. Statistical analyses used were Spearman Rho correlation, Kruskal-Wallis tests, and Mann-Whitney *U* tests. Some descriptive analyses, including percentages, means, and standard deviations are presented in chapter 4.

Table 10

Research Questions, Variables (Measurement) and Statistical Analyses

Research Questions	Variables (Measurement)	Statistical Analyses
1. What is the association between student participation and grade performance?	Participation grade	
(a) Is there an association between total number of messages posted and grade performance?	messages posted grade	Spearman Rho Correlation
(b) Is there an association between total access and grade performance?	total access grade	Spearman Rho Correlation
2. Is there an association between age and	age	Spearman Rho Correlation
(a) total number of messages posted	messages posted	
(b) total access	total access	
(c) grade performance	grade	
3. Is there a difference between race and	race	Kruskal-Wallis Test
(a) total number of messages posted	messages posted	(Analysis of Variance)
(b) total access	total access	
(c) grade performance	grade	
4. Is there a difference between gender and	gender	Mann-Whitney <i>U</i> Test
(a) total number of messages posted	messages posted	
(b) total access	total access	
(c) grade performance	grade	
5. Is there a difference between courses and	courses	Kruskal-Wallis Test (Analysis of Variance)
(a) total number of messages posted	messages posted	
(b) total access	total access	
(c) grade performance	grade	Mann-Whitney <i>U</i> Test

CHAPTER 4: FINDINGS

This quantitative method study examined the relationship between students' participation and their final grades in five selected courses in an undergraduate online learning environment. This study involved online undergraduate students who were enrolled during Fall 2010 and Spring 2011. The secondary dataset for two semesters with all identifying student information removed was delivered through email to the researcher in Microsoft Excel format as prepared by the representative of the institution. The demographic variables analyzed included gender, age, and race. Discussion on the relationships between student participation and grade and differences between courses on student participation and grade performance (final course grade) were considered.

This chapter is organized by participant characteristics, descriptive analysis of the data, and followed by research questions. Quantitative analysis (non-experimental approach) was used to evaluate the research questions. Research question 1 has two sub questions which are 1a and 1b. Each of the sub questions was analyzed to answer the research question 1. In relation to research question 1, it is important to emphasize that student participation comprises both total number of messages posted and total access by students over the eight weeks of the courses. Next, research questions 2, 3, and 4 focused on demographic characteristics -- age, race, and gender -- were analyzed. Analysis of the final research question was directed to the five selected courses.

Participants' Characteristics

The study population consisted of 1,029 undergraduate online students enrolled in five selected courses. Due to missing data on some of the variables on race (161) and gender (83), a total number of 946 online students at CSU Global Campus were examined. The sample was of

47.6% male and 52.4% female. In terms of race, the majority of the students were White (76.4%), followed by Black or African American (3.6%), 1.8% were Asian, two or more races (1.5%), 0.7% Native American or Alaska Native, and 0.4% were Native Hawaiian or Other Pacific Islander. There was a total of 15.6% missing data on race. The age of the participants ranges from 19 to 69 years, with an average age of 36 and with a median age of 35.

Descriptive Statistics

A summary of the descriptive analysis are shown in Table 11. The *N* of 946 only includes variables with no missing data. The minimum and maximum were within appropriate ranges for each variable. All means seem reasonable. The means for Total Access and Total Post are skewed. In terms of grade performance, of 1,029 students enrolled in five courses throughout the eight-week course, the findings showed approximately 88.7% of students earned grade *A*, *A-*, *B+*, *B*, and *B-*; students who earned grade *C+* and *C* was 6.8%; and 4.4% students got grades of *D* or *F*.

A simple guideline to decide whether a variable is at approximately normal is that the skewness is less than plus or minus one ($< +/-1.0$) (Morgan, Gliner, & Leech, 2009). The skewness of ordinal variables will not be considered relevant as these variables have fewer than five levels. Most of the variables have skewness values between -1 and 1 in which course skewness = .926; age skewness = .668, meaning that they are approximately normally distributed: Total Access (2.436) and Total Post (3.540) were positively skewed. Final grade is negatively skewed (-1.54). A summary of the variables is shown in Table 11 and 12.

Table 11

Descriptive Statistics for Study Participants

Variable	<i>n</i>	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>	<i>Skewness</i>
Total Messages Posted	1,029	0	306	31.84	21.14	3.540
Total Access	1,029	0	2,142	307.61	240.13	2.436
Age (years)	1,013	19	69	36.00	9.575	.668
Course	1,029	1	5	2.11	1.025	.926
Grade	1,029	1	9	7.46	2.063	-1.543
Valid N (listwise)	946					

Table 12

Summary of Variables by Independent Variable, Dependent Variable, Levels, and Skewness

Variable	Independent Variable (IV) or Dependent Variable (DV)	Number of levels	Level of measurement
Total Messages Posted	DV	Continuous	+ skewed
Total Access	DV	Continuous	+ skewed
Age	IV	Continuous	scale/ approximately normal
Race	IV	6	Nominal
Gender	IV	Dichotomous	Dichotomous
Course	IV	5	Nominal
Grade	DV	9	- skewed

The following research questions provided the focus for this study.

1. What is the association between student participation and grade performance?
 - a. Is there an association between total number of messages posted and grade performance?
 - b. Is there an association between total access and grade performance?

Total access refers to the total number of times the forums/files (unique views of discussion threads) were visited by the students over the eight weeks of the course.

2. Is there an association between age and
 - a. total number of messages posted
 - b. total access
 - c. grade performance
3. Is there a difference between race and
 - a. total number of messages posted
 - b. total access
 - c. grade performance
4. Is there a difference between gender and
 - a. total number of messages posted
 - b. total access
 - c. grade performance
5. Is there a difference between courses and
 - a. total number of messages posted
 - b. total access
 - c. grade performance

Research Question 1: Participation and Performance

Research Question 1a: Messages Posted

Spearman rho statistic was computed to analyze if there was a statistically significant association between total number of messages posted and grade performance. In figure 5, the scatter plot for these data are displayed; $r^2 = .08$ and, r is .32. The quadratic curve (one bend) was computed as well as a linear line. The scatterplot fits slightly better; $r^2 = .09$.

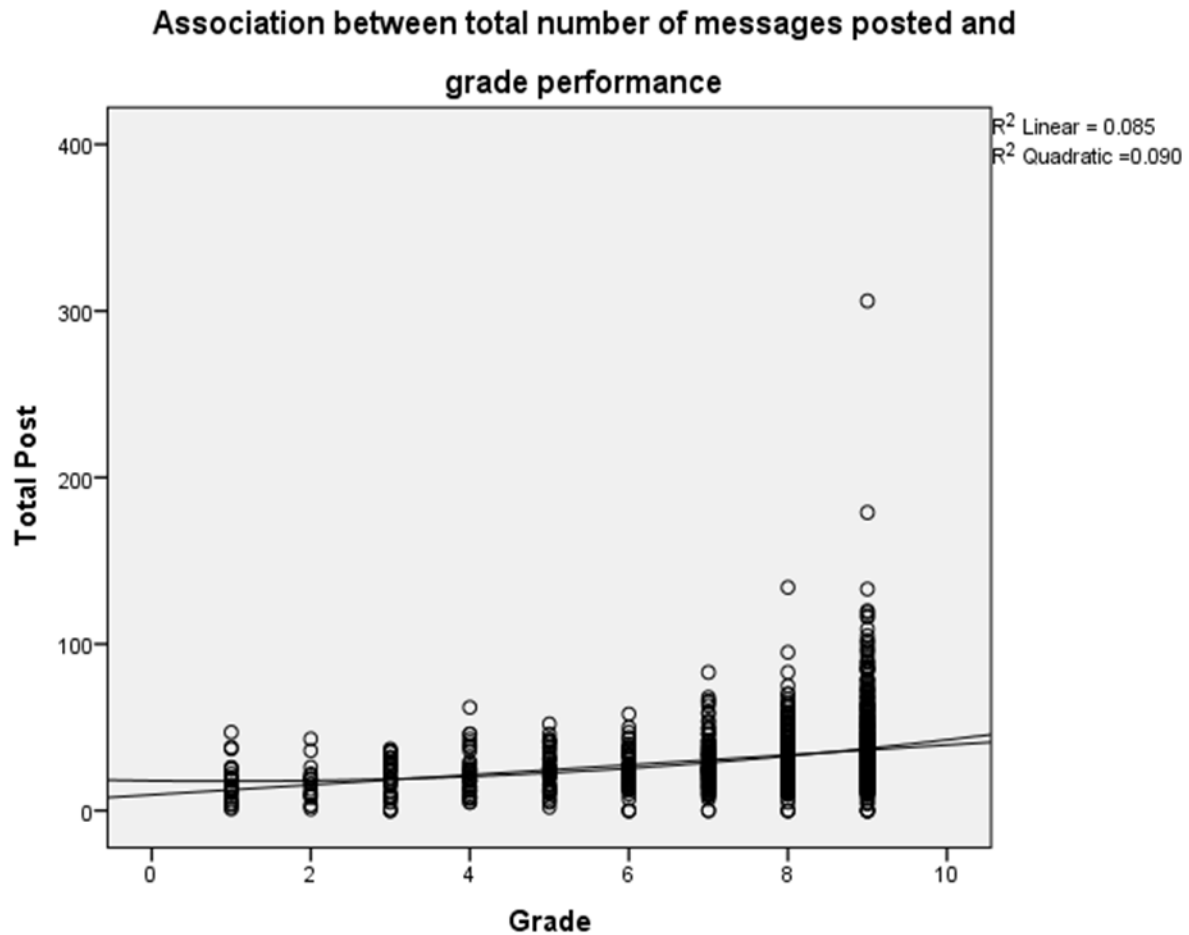


Figure 5. Scatterplot of Total Number of Messages Posted and Grade Performance

The total number of messages posted (skewness = 3.54) was skewed as was grade performance (skewness = -1.54), which violated the assumption of normality, thus, $r_s(1,027) =$

.32, $p = .001$. The null hypothesis was not accepted. There was a positive correlation between the variables, with a medium or typical effect size or correlation according to Cohen (1988) and Morgan, Leech, Gloeckner, and Barrett (2012). Students who posted more messages on the discussion board tended to have higher course grades. Also, due to the positive correlation, it indicates that total numbers of messages posted are generally associated positively with medium grade performance. All these give strong support to rejecting the null hypothesis. The coefficient of determination was $r^2 = .09$, which indicates there is 9% shared variance. Approximately 9% of the variance of students' final grade can be explained from total number of messages posted.

Research Question 1b: Total Access

In figure 6, the scatterplot shows that total access and grade performance were correlated; $r^2 = .09$ and, thus, r is .35; effect size is medium or typical according to Cohen (1988). After using quadratic (one bend) curve as well as linear line, the quadratic scatterplot fits slightly better; $r^2 = .10$.

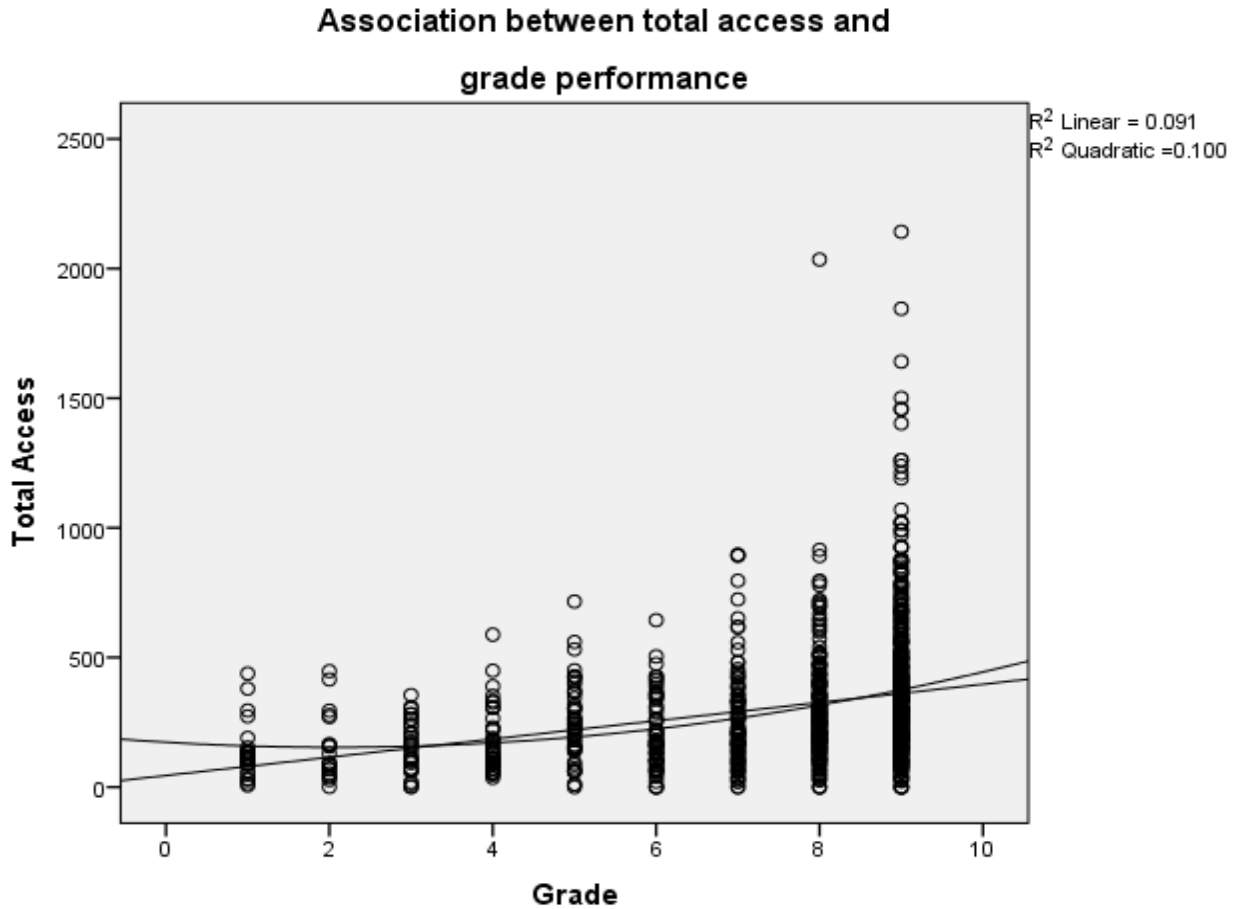


Figure 6. Scatterplot of Total Access and Grade Performance

Spearman rho was computed to investigate if there was a significant association between total access and grade performance. Both variables, total access (2.44) and grades (-1.54) were skewed which violated the assumption of normality. Thus, Spearman rho statistic showed $r_s(1,027) = .35, p = .001$. The correlation was positive. In this case, the correlation is .35, so, using Cohen's guidelines, the effect size is medium or typical (1988). A positive correlation means that the more a student accessed the discussion board over the eight weeks of the course the higher the final grade. The coefficient of determination was $r^2 = .09$, which indicates that approximately

9% of the variance of students' final grade can be predicted from total access or number of times the forums/files (unique views of discussion threads) were visited over the eight-week courses.

Research Question 2: Age, Participation, and Performance

As the variables were not normally distributed and the assumption of linearity was markedly violated, Spearman rho statistic was computed to examine the inter-correlations of the variables. Table 13 shows that each of four pairs of variables was significantly correlated. Age was positively correlated with total number of messages posted, $r_s(1,011) = .27, p = .001$ and total access $r_s(1,011) = .27, p = .001$; these are small effect sizes according to Cohen's (1988) guidelines. As age increases the total number of messages posted and total access increased. Thus, these correlations were positive.

The positive correlation between age and grade was $r_s(1,011) = .15, p = .001$; this is a small effect size according to Cohen (1988), indicating that with an increase of age by 1%, the grade will increase by .15 %. The strongest positive correlation, which has a much larger than typical effect size was between the total number of messages posted and total access, $r_s(1,011) = .78, p = .001$. Students who had relatively higher number of messages posted were very likely to have higher access in the discussion board. These two variables showed high inter correlations among the variables (.78); thus, indicating multicollinearity -- "high inter correlations among some of set of the predictor variables" (Morgan, Leech, Gloeckner, & Barrett, 2010, p. 134) occurred.

Table 13

Intercorrelations, Means, and Standard Deviations for Four Variables (N = 1013)

Variable	Age	Total Num. of Message Posted	Total Access	Grade	<i>M</i>	<i>SD</i>
Age	--	$r = .27^{**}$	$r = .27^{**}$	$r = .15^{**}$	36.00	9.58
Total number of messages posted	--	--	$r = .78^{**}$	$r = .29^{**}$	31.83	21.21
Total access	--	--	--	$r = .30^{**}$	307.52	241.14
Grade	--	--	--	--	7.46	2.06

** $p < .01$

Research Question 3: Race, Participation, and Performance

For the purpose of this research question, although other races were part of this study such as Two or more races ($n = 15$), Native American or Alaska Native ($n = 7$), and Native Hawaiian or Other Pacific Islander ($n = 4$), the researcher analysed the three most frequent races, which were White, Black or African American, and Asian due to low number of participants in each of the specified race groups.

The nonparametric Kruskal-Wallis (K-W) analysis of variance test was computed to determine if there is a significant difference among the races categorized as White, Black or African American, and Asian on total number of messages posted, total access, and grade performance. This test was used as the assumption of equality of group variances was violated. The results indicated that there were no significant differences among the three groups on total number of messages posted, $\chi^2(2, 842) = 2.09, p = .351$; on total access, $\chi^2(2, 842) = 1.57, p = .455$; and on grade performance, $\chi^2(2, 842) = 3.50, p = .174$.

Table 14 shows that the mean ranks of the students who are identified as White, Black or African American, and Asian on total number of messages posted, total access, and grade

performance. The mean rank of students who identified as White (424.70, $n = 786$) had a higher number of messages posted than students who were Black or African American (371.85, $n = 37$). Also, the White students (423.99, $n = 786$) had higher total access than students who identified as Black or African American (373.04, $n = 37$). Asian students had higher total number of messages posted (385.61, $n = 19$) and total access (413.00, $n = 19$) than Black or African American, (371.85, $n = 37$) and (373.04, $n = 37$) respectively. However, the Black or African American students had higher grade performance (389.23, $n = 37$) than Asian students (336.58, $n = 19$). For grade performance, White students had higher mean rank (425.07, $n = 786$) than that of Asian students (336.58, $n = 19$). Overall, the White students had higher mean ranks on total number of messages posted, total access, and grade performance compared to Black or African American and Asian students. Because the overall test results were not significant, pairwise comparisons among the three race groups were not completed.

Table 14

Kruskal-Wallis Analysis of Variance Summary Table Comparing Three Race Groups on Total Number of Messages Posted, Total Access, and Grade Performance

Race	N	df	Total Number of Messages Posted			Total Access			Grade Performance		
			χ^2	p	Mean Rank	χ^2	p	Mean Rank	χ^2	p	Mean Rank
			2.09	.351		1.57	.455		3.50	.174	
White	786	2			424.70			423.99			425.07
Black or African American	37	2			371.85			373.04			389.23
Asian	19	2			385.61			413.00			336.58
Total	842										

Research Question 4: Gender, Participation, and Performance

Mann-Whitney (M-W) *U* tests were performed to compare gender because the dependent variables were non-normally distributed, skewed, and other assumptions of the *t* test were violated. Further, Mann-Whitney (M-W) *U* test “is used with a between-groups design with two levels of the independent variable” (Morgan, Leech, Gloeckner, & Barrett, 2010, p. 147). Table 15 shows the analysis of M-W *U* test and indicated a significant difference in the mean ranks of males (437.84) and females (505.85) on total number of messages posted, $U = 95,552$, $p = .001$, $r = -.125$, which according to Cohen (1988) is a small effect size. Also, the 496 female students had a little higher mean ranks (493.37) than the 450 males (451.59) on Total Access, $U = 101,742.5$, $p = .019$, $r = -.076$, indicating there was evidence of a significant difference between males and females on total access, with a very small or smaller than typical effect size. In brief, females posted more messages and accessed more than males throughout the eight weeks of the

courses. However, male and female students did not differ on grade performance. Mean ranks were 485.37 and 462.73, respectively, $U = 106,257$, $p = .180$, $r = -.044$.

Table 15

Mann-Whitney U Test Summary Table Comparing Gender on Total Number of Messages Posted, Total Access, and Grade Performance

Variable	Mean Rank		Mann-Whitney U	z	p	$r (z/\sqrt{N})$
	Males	Females				
Total Access	451.59	493.37	101,742.500	-2.34	.019	-.076
Total Number of Messages Posted	437.84	505.85	95,552.000	-3.83	.001	-.125
Grade	485.37	462.73	106,257.000	-1.34	.180	-.044

Research Question 5: Courses, Participation, and Performance

Over the two semesters, the five courses used in this study were chosen as they are the core courses for the undergraduate students at Colorado State University-Global Campus (CSU-GC). HUM300¹ had the highest number of enrollees with 40.8% students and followed by COM300 (30.6%). Of the students, 19.0% enrolled in SOC300; 5.8% of the online students took SOC305; and 3.7 % enrolled in ORG405. Table 16 shows mean ranks comparing the five courses on total number of messages posted, total access, and grade performance.

Total number of messages posted and total access indicated overall significant differences between the five courses pairs. However, the five courses did not show any significant difference

¹Note. Abbreviations: COM300 Effective Communication: Research and Writing; HUM300 Dimensions of Ethical Leadership; SOC300 Working in Modern Society; SOC305 Technology and Tools for the Global Information Age; and ORG405 Principles and Practices of Effective Leadership.

on grade performance. The highest mean rank on total number of messages posted was COM300, 559.37, indicating this course had the highest number of posted messages. The lowest mean rank was SOC305, 435.09, meaning students posted fewer messages in this course. Likewise, SOC305 had a mean rank of 224.30 in total access, indicating this course had the least number of accesses of course content throughout the eight weeks. However, the highest mean rank total access was SOC300 (403.42). This course had the highest number of students who viewed or accessed the files. Even though there was no significant difference found between courses and grade performance, ORG405 had the highest mean rank, 572.09, indicating students enrolled in this course had the most higher number of scores compared to other courses. However, students who took COM300 (496.56) had less number of scores compared to other four courses.

As the homogeneity of the variance assumption is violated, a nonparametric analysis, Kruskal-Wallis (K-W) test was run to examine if there were differences between the five courses on total number of messages posted, total access, and grade performance. This test revealed that statistically significant differences were found among the five core courses on total number of messages posted, $\chi^2(2, 1029) = 96.76, p = .001$; and on total access, $\chi^2(2, 1029) = 104.23, p = .001$. However, there was no significant difference between the five core courses on grade performance, $\chi^2(2, 1029) = 4.05, p = .399$.

Table 16

Mean Ranks Comparing Five Courses on Total Number of Messages Posted, Total Access, and Grade Performance

Course	<i>n</i>	Total Number of Messages Posted	Total Access	Grade Performance
		<i>Mean Rank</i>	<i>Mean Rank</i>	<i>Mean Rank</i>
HUM300	420	425.67	248.80	526.18
COM300	315	559.37	349.90	496.56
SOC300	196	661.11	403.42	504.47
SOC305	60	435.09	224.30	531.80
ORG405	38	507.12	245.00	572.09
Total	1,029			

Note. Total number of messages posted and total access had overall significant differences between the five course pairs

Post hoc Mann-Whitney *U* tests compared the five courses on total number of messages posted and total access. Table 17 shows significant differences comparing the five courses on total number of messages posted. Among the course pairs COM300 was significantly different on total number of messages posted from these courses: HUM300, SOC300, and SOC305. But there were no significant difference found between COM300 and ORG405 on total number of messages posted. The HUM300 and SOC300 course pair had a significant difference on total number of messages posted. Also, there were significant difference found on total number of messages posted between SOC300 and SOC305 and between SOC300 and ORG405.

SOC300 (401.02) had significantly higher mean ranks than HUM300 (265.33) on the total number of messages posted, $U = 23,027$, $p = .01$, $r = -.36$, which according to Cohen (1988) is considered a medium effect size. Likewise, there was a significant difference in the mean

ranks of SOC300 (397.15) and HUM300 (267.13) on total access, $U = 23,784$, $p = .01$, $r = -.34$, which is a medium effect size (see Table 18). However, there were no significant differences on total number of message posted between COM300 (179.27) and ORG405 (158.22), $U = 52,71.5$, $p = .230$, $r = -.06$; HUM300 (240.04) and SOC305 (243.72), $U = 12,407$, $p = .85$, $r = -.01$; HUM300 (226.26) and ORG405 (265.30), $U = 6,619.5$, $p = .08$, $r = -.08$; and SOC305 (46.68) and ORG405 (53.95), $U = 971$, $p = .22$, $r = -.12$.

Table 17

Significant Statistical Difference between Five Courses on Total Number of Message Posted

Courses	COM300	HUM300	SOC300	SOC305	ORG405
COM300	--	$z = -6.26$ $r = -.23$ $p = .001^{**}$	$z = -4.26$ $r = -.19$ $p = .001^{**}$	$z = -3.04$ $r = -.16$ $p = .002^{**}$	$z = -1.20$ $r = -.06$ $p = .230$ [NS]
HUM300	--	--	$z = -8.82$ $r = -.36$ $p = .001^{**}$	$z = -.19$ $r = -.01$ $p = .85$ [NS]	$z = -1.74$ $r = -.08$ $p = .08$ [NS]
SOC300	--	--	--	$z = -4.94$ $r = -.31$ $p = .001^{**}$	$z = -2.92$ $r = -.19$ $p = .003^{**}$
SOC305	--	--	--	--	$z = -1.23$ $r = -.12$ $p = .22$ [NS]
ORG405	--	--	--	--	--

Note. Bolded indicate significant differences found between five courses on total number of messages posted.

** $p < .001$

NS - Not Significant

Table 18 compares the five courses on total access. Table 19 shows the effect sizes between course groups and total number of messages posted and total access. The bolded courses have significantly higher mean ranks than the non-bolded courses. Therefore, Table 18 and 19

need to be referred concurrently to make the following discussion meaningful. Table 18 shows there were significant differences in mean ranks on total access between SOC300 (144.28) and SOC305 (76.94), $U = 2,786.5$, $p = .01$, $r = -.39$, a medium effect size. COM300 (242.05) and SOC300 (278.43) also had a significant difference in the mean ranks on total access, $U = 26,474.5$, $p = .007$, $r = -.12$, which is small or smaller than typical effect size. Similarly, COM300 (195.42) and SOC305 (149.03) had a significant difference in the mean ranks on total number of messages posted, $U = 7,112$, $p = .002$, $r = -.16$, which is considered a small or smaller than typical effect size. However, there were no significant differences found on total access between HUM300 (240.04) and SOC305 (243.72), $U = 12,407$, $p = .17$, $r = -.06$; HUM300 (232.17) and ORG405 (199.96), $U = 6,857.5$, $p = .15$, $r = -.07$; and SOC305 (50.16) and ORG405 (48.49), $U = 1,100.5$, $p = .77$, $r = -.03$. Therefore, HUM300 and SOC305; HUM300 and ORG405; and SOC305 and ORG405 had no significant differences in the mean ranks on either total number of messages posted or total access.

Table 18

Significant Statistical Difference between Five Courses on Total Access

Courses	COM300	HUM300	SOC300	SOC305	ORG405
COM300	--	$z = -6.29$ $r = -.23$ $p = .001^{**}$	$z = -2.71$ $r = -.12$ $p = .007^{**}$	$z = -4.70$ $r = -.24$ $p = .001^{**}$	$z = -3.73$ $r = -.20$ $p = .001^{**}$
HUM300	--	--	$z = -8.45$ $r = -.34$ $p = .001^{**}$	$z = -1.38$ $r = -.06$ $p = .17[\text{NS}]$	$z = -1.44$ $r = -.07$ $p = .15[\text{NS}]$
SOC300	--	--	--	$z = -6.16$ $r = -.39$ $p = .001^{**}$	$z = -4.92$ $r = -.32$ $p = .001^{**}$
SOC305	--	--	--	--	$z = -.29$ $r = -.03$ $p = .77[\text{NS}]$
ORG405	--	--	--	--	--

Note. Bolded indicate significant differences found between five courses on total access.

** $p < .001$

NS - Not Significant

Table 19

Effect Sizes: Course Pairs and Total Number of Messages Posted and Total Access

Course Pair	<i>r</i>		<i>Effect Size</i>
	<u>Messages Posted</u>	<u>Total Access</u>	
1. COM300 & HUM300	- 0.23	- 0.23	Small to medium
3. COM300 & SOC300	- 0.19	- 0.12	Small or smaller than typical
3. COM300 & SOC305	- 0.16	- 0.24	Small to medium
4. COM300 & ORG405		- 0.20	Small to medium
5. SOC300 & HUM300	- 0.36	- 0.34	Medium
6. SOC300 & SOC305	- 0.31	- 0.39	Medium
7. SOC300 & ORG405	- 0.19	- 0.32	Small to Medium

Note. Bolded courses have significantly higher means than the non-bolded courses.

Summary

Descriptive and statistical analyses were utilized in analyzing the data. More specifically, the researcher conducted Spearman rho tests to determine the associations between student participation (total number of messages posted and total access) and grade performance. The researcher also used Spearman rho test to analyze the association between age on total number of messages posted, total access, and grade performance. The data revealed significant correlations in the areas of student participation and age on grade performance. To investigate if there was a difference between races on total number of messages posted, total access, and grade performance, the researcher used Kruskal-Wallis test (Analysis of Variance). Mann-Whitney *U* test was conducted to determine whether there is a difference between genders on total number of messages posted, total access, and grade performance.

Finally, the research employed the Kruskal-Wallis test to determine whether there was a difference between courses on total number of messages posted, total access, and grade performance. There was no significant difference between the five core courses on students' final course grades. Yet, due to significant differences in the mean ranks on both total number of messages posted and total access, the researcher utilized post hoc Mann-Whitney *U* tests to compare the courses and to determine if there were significant differences between the courses. The analyses showed HUM300 and SOC305; HUM300 and ORG405; and SOC305 and ORG405 had no significant differences in the mean ranks on either total number of messages posted or total access. COM300 had higher mean ranks compared to HUM300, SOC305, and ORG405. However, SOC300 had higher mean ranks compared to COM300 on both messages posted and total access. The post hoc Mann-Whitney *U* tests showed SOC300 had the highest mean ranks overall compared to the four courses which were COM300, HUM300, SOC305, and ORG405 on total number of messages posted and total access.

CHAPTER 5: DISCUSSION

The purpose of this study is to examine the relationships between undergraduate students' participation and their final grade performance in five courses in an online learning environment at Colorado State University-Global Campus (CSU-GC). The researcher examined the descriptions and relationships of the students' participation (total number of messages posted and total access over the eight weeks of course) to grade performance and demographic characteristics such as age, gender, race, and courses taken. In this chapter, the researcher provides: (a) a summary and discussion of findings; (b) implications for online learning practices; (c) implications for practices in Malaysian education; (d) limitations of the study; (e) recommendations for research; and (f) reflections of the study.

Summary and Discussion of Findings

Participation and Performance

The findings are divided into two sub-sections based on the two student participation indicators: total number of messages posted and total access, which were examined as associated with final grade performance. The results showed there were significant relationships between total numbers of messages posted and grade performance with a medium or typical effect size or correlation. This finding was in line with a study by Coldwell, Craig, Paterson, & Mustard (2008), which suggested students who participated more frequently in discussion forums earned significantly higher grades. However, this result was in contrast with a study by Davies and Graff (2005) who found students who interacted more actively in the 'blackboard' access did not achieve higher grades. Davies and Graff (2005) did indicate that students who interacted the least in online discussions earned failing course grades. Findings by Weisskirch and Milburn (2003) were consistent with Davies and Graff's outcomes and revealed that tutor directed postings were

associated with higher course grades when compared to postings made from peer to peer. Weisskirch and Milburn's (2003) study showed that the amount of interaction in discussion board is not necessarily a factor in achieving a higher grade; however, whether postings were made based on a voluntarily or compulsory basis is important.

In agreement with the current study Webb, Jones, Barker, and van Schaik (2004) and Wang and Newlin (2002) discovered significant correlations between the accesses and postings with grades. Beaudoin (2002) found highly participatory students achieved higher results in graded assignments. In brief, students who had higher numbers of postings and higher total access numbers earned higher final grades in their study. This association was found statistically significant with a medium or typical effect size.

Age, Participation, and Performance

The findings of this study showed positive correlations between age and participation with a medium or typical effect size, and a significant positive correlation between age and grade performance with a small effect size. Older students have a tendency to achieve higher grades when compared to younger students. Alstete and Beutell (2004) and Carbanaro, Dawber, and Arav (2003) supported the notion that age has a positive relationship with grades. They found that older students initiated discussion board threads and outperformed their younger counterparts as they gained more experience in the online environment. They emphasized age and experience factors to enhance performance in online learning. Hoskins and van Hoof (2005) reported the number of messages posted and total access in bulletin boards increased with students' ages and online bulletin board usage by students influenced achievement. These results were in contrast to findings by Palmer, Holt, and Bray (2008) who found that age was not significantly correlated with levels of participation. Other studies showed students' ages

generally have not been associated with learning outcomes in online learning education (Anstine & Skidmore, 2005; Arbaugh, 2005; Hwang & Arbaugh, 2006; Webb, Gill, & Poe, 2005).

In the current study, correlation results indicated students' ages and participation variables are positively and significantly related to final grades in online courses. This suggests as students' ages increase, they are more likely to use the discussion forums and they are more likely to achieve better grades in online learning courses.

Race, Participation, and Performance

Because demographic data were available, analyses were conducted to determine if there were significant associations between race, participation, and grade. The findings showed a significant difference between students by race on grade performance with the most significant difference on mean grade performance between White and Asian students. White students outperformed Asian students in grades and participation in discussion boards. These findings are consistent with Palmer et al. (2008) who reported Western students received better academic results than Asian students in OLL courses, though in this context the term 'western students' is broad and questionable. Palmer et al. (2008) postulate possible reasons for these findings such as Asian students may face language barriers in accessing online content and may be less confident in using web-based learning applications. Similarly, according to Lanham and Zhou (2003), students of Western cultures accepted online learning opportunities more readily compared to Asian students.

When comparing White students with African American students and African American students with Asians in grade performance, no significant differences were found. These results are mixed in agreement with Angiello (2002) who reported White students have a 16% higher success rate is arguable and needs to be defined compared to other races in online courses. White

students were more likely to earn higher course grades compared to Asian and African American students in online learning environments. While the current study supports Angiello's (2002) findings regarding comparisons of White students to Asian students, it is in contrast to the findings that White students outperform African American students. Regarding online participation, the current study found that White, African American, and Asian students participated equally and accessed the discussion forums to a similar level.

Gender, Participation, and Performance

Gender was analyzed in relationship to participation and final course grade. Although females were more likely to have higher numbers of messages posted and total access when compared to males, there was no significant difference in final course grade performance. This finding is in contrast to Hoskins and van Hooff (2005) and Fink (2007) who found males to be more actively engaged in OLL discussions in comparison to females, and concluded both age and gender play a key role in the degree of participation on bulletin boards, but in the opposite direction than the current study's findings. The current study's findings are consistent with Price (2006) and Coldwell et al. (2008) who reported female students were more actively engaged in OLL discussions and outperformed their male counterparts in online courses. Similarly, Arbaugh (2000) investigated the participation patterns by gender and identified that women had consistently higher participation patterns than men.

Similarly, Young and McSporran (2001) found that females averaged consistently more posting messages and viewing files in bulletin boards than males. Their study also revealed that women outperformed men in assignment grades but not in the final exam; men scored better on average than women in final exam.

There were gender differences in online learning in terms of participation and contributions on course bulletin board; women read and posted more messages than males (Gunn, McSporrán, Macleod, & French, 2003). Several studies showed that women perform better than men in technology-assisted courses and have positive attitudes toward online undergraduate students (Silberg & Lennon, 2006; Simmering, Posey, & Piccoli, 2009). Conversely, Yukselturk and Bulut (2007) indicated that gender did not reveal any significant differences to achievements in online discussions. Cheung and Kan (2002) examined 168 students in a distance learning business communication course and found gender was related to students' performance in which women outperformed men. Alstete and Beutell (2004) supported this study and mentioned that women outperformed men generally, "this is may be due to the result of female students' greater tendency to put extra effort and time into their studies" (p. 8).

The current study showed a significant difference in mean ranks of males and females on messages posted and total access with females having slightly higher mean ranks in both categories when compared to males. However, there were no statistically differences for male and female students with respect to final grades. When situating the current study findings within the context of the larger body of literature on gender, it becomes apparent that while differences do exist between the genders concerning performance in OLL environments, there is no definitive evidence that one gender consistently outperforms the other.

Courses, Participation, and Performance

Five courses were reviewed to determine if there were significant differences on total number of messages posted, total access, and final grades. Descriptive statistics over the two semesters showed that Dimensions of Ethical Leadership (HUM300) had the highest enrollments of students (40.8%) and Principles and Practices of Effective Leadership (ORG405) had the least

number of enrolled students (3.7%). There were statistically significant differences between the five courses on total number of messages posted and total access. Students were actively engaged in posting messages and accessing files in the discussion boards at different frequencies depending on the courses in which they were enrolled. This result suggests that some courses offered materials and topics suited to discussion and encouraged students to be fully engaged while other courses might not trigger students' interest in participation.

While students in the courses participated in and accessed discussion boards differently based on the course in which they were enrolled, grade performance was not significantly different among the courses. Analysing the five courses and grade performance showed no differences indicating student performance is similar in these courses.

Research concerning courses taken and the relationship quality of postings and time spent in online discussion environments was not located by this researcher. Data analysis from this study indicates subject matter may be a determining factor in student online participation. In short, educational content, resources available, and interest in topics of courses offered will likely have an impact on student participation in online learning through discussion boards. As discussed in the findings section, students enrolled in SOC300 had the highest mean ranks in both total number of messages posted and total access. Students enrolled in SOC305 had least mean ranks of total access. However, the mean rank for the grade (531.80) was the second highest after ORG405 (572.09).

The key research findings from this study have been summarized in Table 20.

Table 20

Main Research Findings

Variable	Findings
Participation and Grade Performance	High numbers of participation (total number of messages posted and total access) in online discussion forums were positively correlated to higher final course grades in all five courses.
Age	As students' age increases, they have a high tendency of earning higher grades compared to the younger students. Older students also posted comments or messages on discussion boards.
Race	White students outperformed Black or African American and Asian students in participation and final grade. There were no significant differences between White and Black or African American students or between Black or African American and Asian students in final grade.
Gender	Female students have statistically significant higher numbers of messages posted and total access than male students. There were no statistically differences for male and female students with respect to final grades.
Courses	While there were statistically significant differences between the five courses on total number of messages posted and total access, there were no significant differences between the five courses on students' final grade.

Implications for Practices: Malaysian Education

Background of e-learning in Malaysia

While e-learning may have revolutionized teaching and learning in the 1990s around the world (Maslin, Othman, & Rosdina, 2008), illiteracy is still a major issue in developing nations, and e-literacy is even lower (Lopez-Claros, Altinger, Blanke, Drzeniek, & Mia, 2006).

Malaysian development of e-learning started as early as 1972 when the Ministry of Education (MOE) introduced the Educational Technology Division (Asirvatham, Kaur, & Abas, 2005). Yet, e-learning is still in its infancy and flourishing in Malaysia (Balkeese, 2011).

During the 1990s, Malaysia attempted to create infrastructure and e-learning technologies to support distance learning programs offered by many public universities. Universities set up

portals to offer e-learning environments as either teaching aids to support traditional teaching approaches or as a teaching medium for distance or off-campus programs (Khalid, Yusof, Heng, & Yunus, 2006). Table 21 shows a detailed summary of e-learning activities in Malaysia from 1990 to 2005.

Malaysia currently has 20 public universities and university-colleges, 30 private universities and university-colleges, and over 600 private colleges (Ministry of Higher Education, 2007). Despite the number of schools, demand for higher education in the country is increasing and access is limited. Due to this increased demand, many institutions hope to utilize e-learning platforms to meet the needs of a population that is increasingly pursuing higher education (Raja Hussain, 2004).

A 2004 survey by Asirvatham, Kaur, and Abas (2005) showed mixed results about Malaysia's preparedness for moving forward with e-learning plans. They found that while Malaysia is technically equipped and moderately primed for e-learning, it is not environmentally prepared or financially geared toward the technology deemed necessary by policymakers and stakeholders. The survey found that learners were more ready for an online learning environment than their lecturers' perceptions of the students' readiness. This may indicate more apprehension concerning incorporation of e-learning methods among lecturers than students.

Table 21

Chronology of e-learning Activities in Malaysia, 1990 to 2005

Date	Details of Event
Mid 90s	Adoption of e-learning technologies in distance education among public universities.
1996	Setup of computer laboratories in 90 secondary schools.
Sept. 98	Establishment of first virtual university in Malaysia, <i>University Tun Abdul Razak</i> .
1999	Smart School Project by Ministry of Education (MOE).
Mar. 1999	National IT Council (NITC) E-Learning Working Group proposed National Learning Grid as one of the projects under E-Learning Working Group.
Aug. 2000	Formation of Open University of Malaysia.
June 02	NITC-STIC meeting. The meeting endorsed the conceptual framework of Malaysian Grid for Learning (MyGfL).
Aug. 02	Strategic Thrust Implementation Committee Meeting. MyGfL will be used as the integrating platform for the 16 Bridging Digital Divide pilot projects.
Sep. 02	Soft Launch of MyGfL by Ministry of Human Resource (MOHR).
Mar. 03	Development of technical framework. Collaboration with National Library on content for MyGfL.
May 03	Formulation of content, instructional design and technical guidelines.
Oct. 03	Development of Metadata Management Systems by MIMOS Berhad. Development of MyGfL technical architecture and framework by MIMOS Berhad.
Dec. 03 - Aug.04	Three Standard Expert Group meeting were held. National Consultative Committee For e-learning (NCCEL) approved standards.
Feb. 04	Formation of MyGfL Standard Expert Group.

Table 21 continued

Apr. 04	MMU offered Master of Multimedia (e-learning Technologies).
Sept. 04	Submitted the Malaysian e-Learning Standards/Guidelines to SIRIM for endorsement and acceptance as Malaysian Standards. MyGfL Portal was completed and available online.
2005	SchoolNet Project by MOE.
Apr. 05 - Sep. 05	Workshops of National R&D Roadmap e-Learning Technology by MIMOS (Zailan, 2005).
Nov. 05	Establishment of ASEAN E-Learning Centre in Multimedia University.
Dec. 05	ASEAN Seminar on e-Learning by Multimedia University.

Source: *In search of effectiveness factors: A case study of the UNIKL IIM e-learning portal*, by W. H. Tan, 2006, Multimedia University, Malaysia.

While the Asirvatham et al. (2005) study found policymakers not aiming adequate finances to e-learning advances, other members of the Malaysian government hold a firm belief that the use of ICT generally and e-learning specifically are vital to the economic development of the country. The use of computers and other ICT applications are extensively encouraged for all government and private sectors. This was explicitly stated in the Eight Malaysian Plan report (2001-2005), which said:

The ability to create, distribute, and exploit knowledge and information is often regarded as the single most important factor underlying economic growth and improvements in the quality of life. Recognizing that ICT is an important enabling tool towards achieving this objective, the Government undertook various initiatives during the Seventh Plan to facilitate the greater adoption and diffusion of ICT to improve capacities in every field of business, industry, and life in general. (p. 364)

Therefore, the Ministry of Education (MOE) is working to bridge the country's digital divide, defined as the gap between different segments of the population in access to reliable and up-to-date computer technology including hardware, software, infrastructure, and education, and

inspire learners to accommodate and accelerate their learning process specifically in an online environment such as the courses examined in the current study and ICT generally.

Barriers to e-learning in Teacher Education Institutes

Despite strategies taken by the Malaysian government especially MOE, key challenges to fully implementing e-learning in Teacher Education Institutes remain. The main barriers can be placed into two categories as resistance to change among the instructors and students and lack of budget from the government.

Resistance to change. According to Giangreco (2002), “Resistance to change is a form of organizational dissent to a change process (or practices) that the individual considers unpleasant or disagreeable or inconvenient on the basis of personal and/or group evaluations” (p. 14). Hultman (2003) defined resistance as “A state of mind reflecting unwillingness or unreceptiveness to change in the ways people think or behave” (p. 693). Moreover, Hultman (2003) identified eight believes that cause individuals’ resistance to change. Those are: a) the change process is being handled improperly, b) there is not any need for the change, c) the change will make it harder for them to meet their needs, d) the risks outweigh the benefits, e) the change will fail, f) the change is inconsistent with their values, g) those responsible for changes cannot be trusted, and h) they lack the ability to make the change. Thus, resistance to change in the context of online learning among instructors and students appear to be negative influences to their intention to use e-learning systems.

Lack of budget. Ultimately, the financial commitment for infrastructure affects the entire implementation of ICT generally and employment of online learning specifically and the feasibility of maximizing online learning environments in particular (Balkeese, 2011). To overcome the physical barriers to creating a nationwide high-speed internet system, proper

infrastructure and technology are required. Infrastructure is vital but it requires long-term commitments of money and resources to build and maintain these systems. The cost to install ICT services in remote and sparsely areas is even higher especially the Teacher Education Institutes in East Malaysia, Sabah and Sarawak, due to their hilly terrain that obscures lines of sight (Marhaini & Aisyah, 2007).

On-going support by Ministry of Education Malaysia and Teacher Education Institutes

Training for Instructors and Students. One of the important factors of resistance to employ online learning among instructors and teacher trainees is lack of technical training and support provided by the Teacher Education Institutes with the support from Ministry of Education (MOE) Malaysia. As supported by El Mansour and Mupinga (2007), instructors and students in online courses need to be given adequate training and it is one of the ways to reduce resistance to participate in online courses. Ongoing staff development both pedagogy and technical should be given in online courses (Lorenzetti, 2004). Further, online students need time in adjusting to the course design and course management platform. Students should be exposed to orientation to online learning so that they are familiar with the course management framework. Thus giving training to instructors and students in online learning is crucial to improve and to reduce resistance in online courses.

Financial Support. The success of a higher education institutions will depend on sound policies and effective and efficient management of resources, accessibility, and infrastructure provided by the government for online learning. Continuous support by the government in terms of high-speed connectivity, technology hardware, software, and development grants, and training for teachers and students are key for the success of online learning in Malaysia. Funding for the acquisition of hardware and software is imperative for the creation of new online learning

environments and online learning and information technology integration. The instillation of an information technology culture among administrators, educators, and students should be aggressively pursued. To ensure the success of the conceptual model of teaching and learning, Malaysia higher education institutions must require changes be made in the teaching-learning environments to support effective and efficient teaching and learning processes.

Introduction to online methods of content delivery compels instructors to change their pedagogy to remain relevant and meaningful for the students while enabling students to acquire the necessary knowledge and skills for success. Instructors who engage in online teaching should make progressive adaptations in their style of teaching, moving from a didactic teacher-centered instruction to a collaborative learner-centred approach. While this is a major shift in pedagogical theory, teachers dedicated to the success of students must make the effort to become more student centered in teaching practices (Isman, Caglar, Dabaj, Altinay, & Altinay, 2004).

In terms of assessing student learning, it is advisable for instructors to include participation in online discussion in assessing student performance. As proposed by Vonderwell, Liang, and Alderman (2007), “students would value the learning process if participation was built into the assessment” (p. 315). It is also recommended that topic options be provided for students to choose topics of interest for discussion. This act “can diminish redundancy of the responses in the discussions” (Vonderwell et al., 2007, p. 315). Finally, it is vital for instructors to have a discussion topic that is structured rather than open. Whether led by the instructor or by course tutors, guided and monitored discussions have more consistent participation by students (Davies & Graff, 2005).

Limitations of the Study

As with any study, there are limitations to the current study's scope and applicability. The study was limited to data acquired from CSU-GC's student records system and from the Blackboard Learning System (BLS). The study is focused on evidence derived exclusively from online undergraduate students enrolled during Fall 2010 and Spring 2011 at CSU-GC in one or more of the following courses: (a) Effective Communication: Research and Writing (COM300); (b) Dimensions of Ethical Leadership (HUM300); (c) Principles and Practices of Effective Leadership (ORG405); (d) Working in Modern Society (SOC300); and (e) Technology and Tools for the Global Information Age (SOC305). These five core courses comprise the required coursework for all students enrolled in CSU-GC's Bachelor completion program. Students not enrolled in one of the five core courses during the data collection period for this study may be substantially different from those in the study period. It is outside the scope of this research to speculate the ways students may differ.

Because only data from the five required courses in CSU-GS's program are analyzed, the findings should not be considered generalizable to courses specific to the majors or specializations. Similarly, it is not appropriate to apply findings from this study to online courses intended for remediation or acceleration taken by traditionally face-to-face students. Finally, as only fully online courses were investigated, findings should not be generalized to hybrid and mixed delivery courses.

Recommendations for Research

This purpose of this study was to explore learning and teaching of online classes. This study looked at the relationship between undergraduate students' participation and their final grades in five selected courses in an online learning environment and examined the differences

between the demographics characteristics of age, race, and gender to students' participation (total number of messages posted and total access) and grades. Through this research, recommendations for research emerged that would add to the body of knowledge pertaining to online learning.

1. *Areas of research for CSU-GC.*

- a. Research is needed looking specifically at other variables, which were out of the scope of this study and for which data were not available to the researcher: (a) time spent in online discussion board forums, (b) number of messages read by students, (c) number of follow-up messages sent by students, (d) number of new/initial discussion postings, and (e) content of messages. Such analyses could more thoroughly explain student behaviors.
- b. Other courses in addition to the five required core courses examined can be analyzed. Consideration of elective courses and those courses required by specific major areas of study may reveal participation patterns not found in required general studies courses.
- c. A study that focuses on least active students in online learning (Webb, Jones, Barker, & van Schaik, 2004) may reveal motivations for inactivity that could inform improved practices for effective use of online discussion boards.
- d. A study of learner-instructor interaction may reveal an impact on students' final course grades indicating that student-instructor interaction is more valuable than student-student and student-content interaction. Knowing what type of interaction has the most impact on student grades and learning could help inform better practice.
- e. A qualitative study could be conducted to examine the instructors' viewpoints and explore teaching behaviors of instructors. Students' perceptions of the online learning environment and quality of contributions can be taken into consideration as well.

Understanding perceptions of those who are involved in the process may inform changes to policies and practices that impact online discussion quality and quantity and improve student learning.

2. *Change context of populations and environment.* The context of interaction through learning management system goes beyond undergraduate education in university-level settings. To further understand other contexts and to increase the number of rigorous studies, studies might consider exploring the same or similar variables across graduate level courses, community colleges, private academic institutions, K-12 schools, and non-profit organizations to determine patterns of participation and how they are similar or different when accounting for level of education and training. Research using LMS data from different student populations across the United States and throughout the world should be considered.

3. *Longitudinal and Experimental Research.* The study of learner-learner and learner-content interactions in learning management systems over a specified time should be undertaken to help in understanding how interactions evolve over time. A longitudinal study examining the changes and progress of student performance in courses taken over time would add to the understanding of delivery and performance by accounting for student development in both academic and technological use. Such a study could examine differences in individuals regarding performance in required general studies courses, required major area courses, and elective courses, potentially revealing the impact of interest in course content on participation.

Recommendations for Ministry of Education Malaysia

Create specific delivery format to online learning

In line with the country's Information and Communication Technology (ICT) master plan and Vision 2020, Malaysia recognizes that the transformation of its education system is

(Mohamed, 1991) fundamental to achieving its objectives in education. The Ministry of Education (MOE) is focusing on the development of new media as educational, organizational, and partnership-building tools, and as a means for bridging the country's digital divide and empowering all learners. ICT can revolutionize education and learning, therefore, the Ministry plans to integrate ICT into the education system on a fundamental level by incorporating systems to facilitate management, information gathering, access, and various forms of communication. To that end, the MOE outlines three major areas as the foundation for ICT in education (Belawati, 2003):

- a. ICT is to be provided to all students to reduce the digital divide between the country's schools;
- b. ICT is to be used as teaching and learning tools in education and as an independent subject and integrated into core content courses; and
- c. ICT is to be used to enhance efficiency, effectiveness, and productivity of management in education.

Consequently, the Malaysian education system is being transformed to create a new generation of teachers and students who are adept with new technologies and are able to access and manage the information explosion. According to Belawati (2003), Malaysia's ICT developmental plan for the next 10 years (2013) aims to:

- a. Intensify the development of ICT infrastructure;
- b. Expand access to and equity for ICT facilities;
- c. Improve assessment and evaluation systems using ICT;
- d. Emphasize ICT integration in teaching and learning processes;
- e. Improve the ICT knowledge and skills of students, teachers, and other personnel;
- f. Intensify ICT usage in education management;
- g. Improve the management and maintenance of ICT equipment;
- h. Increase research and development efforts in ICT; and
- i. Increase co-operation between educational institutions and the community towards expansion of ICT in education. (p. 108)

One component that seems to be absent in conversation of initiatives by the MOE is a sound online learning delivery format that outlines practices and responsibilities for school leaders, instructors, and students. It is the opinion of this researcher that a policy in OLL should be formed separately from, but parallel to Malaysia's development of National Education Policy (NEP) in ICT. Components of this delivery format specifically to Teacher Education Institutes must include:

1. Mandatory participation in online discussion forums as a portion of student final course grade;
2. Required clear and specific instructions to students outlining participation requirements and how participation will be scored;
3. Instructor-designed rather than student-generated discussion topics given throughout the course topics;
4. Instructor or tutor responses to all discussions with particular attention to discussions that are off topic, disrespectful to classmates, or faulty in content; and
5. Instructors must take initiative and hold responsibility to incorporate e-learning activities effectively into their pedagogy.

Besides, the following aspects should be considered by MOE and Teacher Education Institutes when developing and implementing online learning (de Freitas & Oliver, 2005):

1. Considering the financial plan needed to achieve desired result of implementing online courses such as additional technical cost and pedagogical support, staff development, hardware and software costs.
2. Comparing with other online institutions that have implemented online strategy and looking at their results and barriers for improvements.

3. Consultating with experts within and outside institutions, staff and students within the institutions to establish goals and the needs of the learners.
4. Partnerships and collaborating within and outside the institutions could lead to cost savings and better resource access.

With thorough considerations given to introducing and implementing e-learning across Teacher Education Institutes can be analysed and shared more effectively.

Reflections of the Study

Reflecting on the work completed for this study, it is evident that no clear and obvious differences among the variables tested. While some supporting evidence and effect sizes were found, these differences were small and mostly did not reach the level of statistical significance. Because CSU-GC targets a specific population of students, there may be limited differences in student profiles. While demographic data reveal differences in age, gender, and race, other characteristics such as motivation and interest may impact online participation to a greater degree. This means that researchers need to work through these subtle differences among students, and their participation, and performance to make headway in improving online learning environments. Also, researchers should not expect to find clear and paradigm-changing results from any single study. Instead we can only hope to add to an ever-increasing body of knowledge that continues to add merit to choices made concerning online discussion practices in educational practices.

One of the more surprising results from this study was that the relationship of participation to performance was normally distributed and when graphed looked like a bell curve, with highest and lowest-performing students accessing and posting to the forum the least number of times, while medium-performing students had the highest access rates. A linear

progression was expected, with highest performing students having the highest participation. Perhaps students who knew they were going to perform well were not challenged and felt a necessity to participate only to the minimum required by the instructor as described in the course syllabus as the number of posts necessary to earn all of the participation points calculated into the final grade. Meanwhile, students who felt challenged in the course and felt they needed questions answered and extra time to master the course material accessed the discussion forum more frequently. Students with the lowest grades likely participated infrequently as a reflection of overall low effort in the course.

Even more surprising is fact that a few students with high grades did not access the forum even once. Not only is this an example of the opposite of what was expected by the researcher, it is also unclear how a student could get a good grade in a class that supposedly determines 25-30% of the final course grade based on participation in the forum. This seems to indicate instructors did not place a high degree of importance on the forums and selectively did not enforce the standards concerning participation published in the course syllabi regarding participation. This leads to questions concerning implications on the importance of participation in the online learning environments such as how important instructor view online participation to be and whether participation impacts learning or if it impacts grades only as far as instructors attach points to participation.

The demographic findings revealed some surprising results. Based on past studies, it was expected that females would post and access the discussion forum more frequently and have higher final course grades. While it was found that females posted and accessed the discussion forum more frequently, there was no significant difference between genders by grade performance. This may indicate that other factors such as gender of the instructor, course

content, course expectations, or time available, all of which are outside the scope of the current study, may impact the frequency of accessing and posting in online forums.

Based on personal bias and existing literature (Coldwell et al., 2008) the researcher expected Asian students to participate more than White students due to her own experiences as a participant in online discussions anecdotally compared to the experiences of her White and Asian peers. The current study, however, showed there was no significant difference between amount of participation, but did show a significant difference in grade performance, but in the opposite direction from what was expected; White students ($n = 786$) performed better in the final course grade than Asian students ($n = 19$). This may indicate that other factors such as Internet access and language barriers impact the frequency of accessing and posting in online forums.

Finally, the researcher is concerned by disconnects between the published course grading requirements and the reality of students who did not access or post in online forum discussions who received high final grades. If discussion among peers is considered a critical component of the online learning experience at CSU-GC as school leaders and course developers built 25-30% of the grade on participation in discussions, then instructors must hold students accountable to those standards. If instructors are not willing to hold students accountable for participation in online discussions, the associated grade component should be reconsidered.

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APPENDIX A:

Institutional Review Board (IRB) Approval Letter

IRB Approval Letter



Research Integrity & Compliance Review Office Office of
Vice President for Research Fort Collins, CO
80523-2011
(970) 491-1553
FAX (970) 491-2293

Date: September 26, 2011
To: Gene Gloeckner, Education
Balkeese KunhiMohamed, Education

A handwritten signature in cursive script that reads "Janell Barker".

From: Janell Barker, IRB Coordinator
Re: Student Participation and Grade Performance in an
Undergraduate Online Learning Environment

After review of information regarding the data to be analyzed for the above-mentioned project, it was determined that the data did not meet the requirements of the federal definition of human subject research. "Human subject means a living individual about whom an investigator conducting research obtains data through intervention or interaction with the individual, or identifiable private information."

Living individual – Y About Whom – Y
Intervention/Interaction – N Identifiable
Private Information – N

Thank you for submitting this information. If you have more projects that are similar, please contact us prior to submission. The IRB must determine whether a project needs to have IRB approval.

Animal Care & Use • Human Research • Institutional Biosafety 321
General Services Building <http://web.research.colostate.edu/ricro/>

APPENDIX B:
CSU-GC Institution Course Grading Scale

CSU-GC Institution Course Grading Scale

Grade	%
A (Excellent)	95.0% – 100%
A-	90.0% – 94.9%
B+	86.7% – 89.9%
B (Good)	83.3% – 86.6%
B-	80.0% – 83.2%
C+	75.0% – 79.9%
C (Satisfactory)	70.0% – 74.9%
D (Poor)	60.0% – 69.9%
F (Failure)	59.9% or below
FN*	Failure - Nonparticipation
I**	Incomplete

Note. Adapted from *2011 Academic Catalog: Semester I. Colorado State University-Global Campus*. Retrieved September 23, 2012 from http://csuglobal.blackboard.com/bbcswebdav/institution/public/Academics/Catalog/Academic_Catalog

*Students who stop attending class and fail the course for nonparticipation will be issued the “FN” grade. The FN grade may have implications for financial aid and scholarship awards.

**An “I” grade may be assigned at the instructor’s discretion to students who are in good standing (passing) in the course. Students should have completed a majority of the coursework in order to be eligible for the “I” grade. Students should request an “I” grade from the instructor with a written justification, which must include explanation of extenuating circumstances which prevented timely completion of the coursework. If the request is approved, the instructor will require a written agreement consisting of a) the specific coursework to be completed, b) the plan to complete the coursework, and c) the deadline for completion. The agreement will be kept on file at CSU-Global Campus. An incomplete course must be satisfactorily completed within the time frame stipulated in the agreement, but no later than the end of the following semester from

the date the “I” was given. An incomplete not removed within one year shall convert to an F and be included in the computation of the student’s grade point average.