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## Using a Comprehensive Model to Test and Predict the Factors of Online Learning Effectiveness

Minyan He

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Using a comprehensive model to test and predict the factors of online learning  
effectiveness

By  
Minyan He

A Dissertation  
Submitted to the Faculty of  
Mississippi State University  
in Partial Fulfillment of the Requirements  
for the Degree of Doctor of Philosophy  
in Instructional Systems and Workforce Development  
in the Department of Instructional Systems and Workforce Development

Mississippi State, Mississippi

August 2013

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2013

Using a comprehensive model to test and predict the factors of online learning  
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As online learning is an important part of higher education, the effectiveness of online learning has been tested with different methods. Although the literature regarding online learning effectiveness has been related to various factors, a more comprehensive review of the factors may result in broader understanding of online learning effectiveness. Therefore the purpose of this study was to investigate the relationship among online learning effectiveness, interactivity, collaboration, communication media, and group trust.

A student survey based on online learning effectiveness, interactivity, collaboration, communication media, group trust, and demographic information was used in this study. All these variables were used as predictor variables. A total of 401 responses were received during summer 2013 from a southeastern university. Different models were compared by using multiple linear regression. Results of the best predicting model showed interactivity was the strongest predictor of online learning effectiveness, followed by previous online grades, age, employment status, number of online courses taken, and ethnicity. These predictors explained 38% of the variances in online learning

effectiveness. Findings of this study provide valuable information for online instructors and university administrators.

## DEDICATION

I dedicate this dissertation to my parents, Aiguo He and Lixia Wang, to whom I owe all my beginnings.

## ACKNOWLEDGEMENTS

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## CHAPTER I

### INTRODUCTION

The Internet has revolutionized the world of higher education (Hoffman, 2003). With the advances in Internet technologies, many researchers have indicated that online education is quickly gaining ground as an extension to a traditional education (Ge & Tok, 2002). An online education has emerged as an important component in today's higher education curricula, establishing itself as a core element of tomorrow's educational paradigms (Butner, Murray, & Smith, 1999; Sloan-C, 2004; Yi, 2005). Rapidly developed technologies make online learning popular among students for various reasons, such as convenience and equal opportunities (McBrien, Jones & Cheng, 2009). A growing number of faculty are using the Internet to complement traditional classroom-based courses (IHEP, 2000). Over the past 10 years, online courses and entire online degree programs have been designed and created to serve millions of students in higher education (Sloan-C, 2004).

As noted in an article by Allen and Seaman (2008), over 3.9 million students were taking at least one online course during the Fall 2007 term; a 12.9% increase over the number reported the previous year. The 12.9% growth rate for online enrollments far exceeded the 1.2% growth of the overall higher education student population. Over 20% of all U.S. higher education students were taking at least one online course in the Fall of 2007. Online enrollments have shown growth over the past 5 years since the first Sloan

survey on online learning. Recently, Kaya (2010), reported that in the Fall of 2009, colleges—including public, nonprofit private, and for-profit private institutions—reported that one million more students were enrolled in at least one web-based course than last year, bringing the total number of online students to 5.6 million.

The importance of an online education is shared by most institutions and their administrators. In 2007, over one-half of all surveyed schools believe that an online education is critical to their institution's long-term strategy, a response that is virtually the same as last year (Allen & Seaman, 2008). In their 2009 study, the U.S. Department of Education isolated 51 common elements across thousands of studies and concluded that, in general, online learning is more effective than face-to-face learning.

Online enrollments have seen steady growth, as has the number of institutions with online program offerings. This growth is not just concentrated in a few discipline areas; it is seen across almost all disciplines. The growth was approximately the same across seven of the eight major discipline areas examined. The seven disciplines included Business, Liberal arts and sciences, general studies, humanities, Health professions and related sciences, Education, Computer and information sciences, Social sciences and history, Psychology, and Engineering. Engineering was the only discipline area where online enrollment growth was lower than the other disciplines. (Allen & Seaman, 2008)

Students show great interest in an online education. Students are generally enthusiastic about the opportunity to learn online (Coppola, Hiltz, & Rotter, 2001). In an online environment, students can receive more in-depth exposure to the course content (Wade & Power, 1998).



As a new paradigm of teaching and learning, an online education is also known as a virtual education, Internet-based education, web-based education, and an education via computer-mediated communication (Paulsen, 2002). No matter which term is used, the key component of the new paradigm of education is the use of the Internet. It is a major part of today's distance education (Ascough, 2002; Shelton, 2010). Over the years, the model for distance education has evolved from one that distributes course materials through the postal service to one in which the Internet provides students with a complete online educational experience (Ascough, 2002; Ge & Tok, 2003; Shelton, 2010). Allen and Seaman (2008) defined an online course as a course having at least 80% of the course content delivered online. To be more specific, online education, as a new mode of teaching and learning, had its own features and characteristics. Paulsen (2002), characterized online education into the following four categories:

- the separation of teachers and learners which distinguishes it from face-to-face education
- the influence of an educational organization which distinguishes it from self-study and private tutoring
- the use of a computer network to present or distribute educational content
- the provision of two-way communication via a computer network so that students may benefit from communication with one another, teachers, and staff.

Ascough (2002) listed two features of an online education. First of all, it is characterized by the separation of the teacher and learner for the majority of the duration of the course. Secondly, an online education 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 using electronics and other technology, as well as special organizational and administrative arrangements” (p. 2).

Online courses have some particular and distinctive features. First and foremost, online courses are different from traditional classroom experiences in terms of the learning environment, instructional materials, and teaching methodologies. The learning environment usually involves communication via the computer, and usually over the World Wide Web. The learning environment is usually structured around a course management system that includes a variety of options to facilitate communications, collaboration, and interaction among the participants. Finally, the social dynamics available in online learning environment are drastically different from those of the traditional classroom.

However, taking an online class shares some fundamental characteristics with taking a traditional face-to-face, such as: interactive group communication (Harrison & Stephen, 1996).

Since enrollment in online courses is increasing dramatically, it is very important to assure the effectiveness of online learning and the students’ learning experiences are comparable to traditional face to face instruction. Many schools have had difficulty in transferring effective teaching strategies in the classroom to an online environment (Fisher, 2002). Both administrators and faculty expressed concern regarding the effectiveness of online programs (Benson, 2003). Quality assurance of educational programs is always one of the greatest challenges in higher education today (Shelton,

2010). According to Carnevale's (2000) report, Mick Smith, chairman of the House of Representatives science subcommittee on basic research, stated that effective online learning was quite questionable. He expressed deep concerns during a hearing in May, 2000. He said that students who take online courses do not interact as much as their peers in traditional courses, and they walk away with knowledge, but not with an understanding of how to think for themselves. Barbera (2004) also stated there are quality issues with an online education. According to Hoffman (2003), institutions are seeking methods for continuous improvement in order to demonstrate quality and rigor within online courses and programs.

The quality of an online education is often compared with the quality of a traditional face-to-face education. Faculty members are concerned about the impact of online instruction, learning, and participant interaction (Ward, Peters, & Shelley, 2010). One of the biggest concerns is interaction. Many scholars stated interaction is the key element of a powerful online learning environment (Fulford & Zhang, 1993; Kester, Kirschner, & Corbalan, 2007; Swan, 2001). But educators do not know what forms of interaction would best benefit students in an online environment (Wanstreet, 2006). Their criticism is that students are missing part of the interaction process between student-student and student-instructor in an online course. They feel this will cause less satisfaction in their online learning experiences (Hara & Kling, 2000). According to Allen and Seaman's (2008) study, learning outcomes of online courses are thought to be somewhat inferior to those of traditional classroom instruction because of a lack of face-to-face interaction.

Besides the concerns related to interaction, others have expressed concerns related to collaboration (Brindley, Walti, & Blaschke, 2009; Fisher, 2003), communication media (Armstrong, 2011), and group trust (Wade, Cameron, Morgan, & Williams, 2011) in online learning environments. For collaboration, concerns arise as to the designing of a meaningful learning environment (Fisher, 2003). Peer-to-peer collaboration and active learning has been positively related to online learning effectiveness (Chen, Gonyea, & Kuh, 2008). Learning in a group is an important way to help students gain experience in collaboration and develop the necessary aptitude needed for critical thinking skills and reconstruction of knowledge (Brindley et al., 2009). Through communication media, although students take online courses because they want independence and self-regulation, they desire a concise explanation on everything from assignments and assessments, to when and how to access course information (Armstrong, 2011). Communication media, like discussion boards or chat rooms, are necessary for an effective online learning environment (Eastman & Swift, 2002). For effective online classroom relationships, trust among group members has proved to be an important part of small group work in virtual classrooms. Developing interpersonal relationships with group members may promote a feeling of trust between them (Wade et al., 2011). This sense of trust will help build a community in an online learning environment which later could improve students' learning outcomes (Wallace, 2003).

It is hypothesized that quality online education is related to a number of online learning experiences. In this study, a model for online learning that includes four factors (interactivity, collaboration, communication media, and group trust) was used to evaluate the model's impact on students' learning effectiveness. Each of these individual factors

has been used to evaluate the online learning experience in previous studies (Bell, 2007; Chou & Liu, 2005; Lai, 2011; Neuhauser, 2002; Swan, 2003); however, there is a lack of research examining the impact of these four factors together. This study focused on combining them into a model to predict the impact they have on the quality of students' online learning experiences.

### **Statement of the Problem**

Learning online is different from learning in a traditional classroom in terms of pedagogical approaches and the intensive use of communication technology (Zhao, 2003). However, teachers are required to maintain the components of their face-to-face teaching in their online courses (Connolly, Jones, & Jones, 2007). It becomes the educators' concern as to how they can continuously improve the effectiveness of an online education in line with techniques they have used in traditional classrooms (Porter, Griffiths, & Hedberg, 2003; Shieh, Gummer, & Niess, 2008). In order to provide online students valuable learning experiences, instructors have to plan and develop their courses in a way that will enhance their online learning environment (Starke-Meyerring & Andrews, 2006). A professor has to articulate, in detail, exactly what he/she wants to accomplish every step of the way throughout the course, from start to finish (Dykman & Davis, 2008). They have to include necessary elements in their course in order to assure the quality of online courses and the effectiveness of the students' learning experiences.

Learners have always reported that they miss face-to-face contact when learning online (Shen, Nuankhieo, Huang, Amelung, & Laffey, 2008; Stodel, Thompson, & MacDonald, 2006). Researchers stated that cooperation and motivation to participate are two crucial elements that lead to a successful online learning group work (Lin et al., 2008;

Soyly, 2009). Online learning communities are an important means of sharing and creating knowledge (Yeh, 2010) and can promote active participation, contribute to knowledge creation, increase academic achievements, and improve learner cognitive abilities (e.g., Lin et al., 2008; Moller, 1998; Waltonen-Moore, Stuart, Newton, Oswald & Varonis, 2006). Rovai (2002) also revealed that building a sense of community can affect student satisfaction and learning. What variables enhance the quality of an effective online learning environment?

Previous studies have listed several factors that affect online learning communities, such as interactivity, collaboration, communication media, and group trust. Individually, each one of these factors promotes the achievement of online learning groups. But combining these four factors into a model and examining the relationship among the variables and the impact they have of online learning is unclear. Current studies provide little information on creating a successful model to test online learning effectiveness or to predict online learning outcomes. Therefore, the problem of this study is to investigate the relationship among the variables of interactivity, collaboration, communication media, and group trust and their influence as a model to evaluate the impact they have on online learning effectiveness.

### **Purpose of the Study**

Although the literature regarding online education is increasing (Meyer, 2002), more in-depth and broader studies are needed to ensure student's effective online learning experiences (Kop, 2011). In order to test and predict the effectiveness of students' online learning experiences precisely, a solid and comprehensive model is needed in which multiple variables are evaluated. Many studies about online teaching and learning

describe problems on how to engage students in interactivity or collaboration in online classes; but none have been located that focus on the relationships among learning outcomes and academic achievement, or the contributing online teaching and learning elements involved (Kirtman, 2009), such as interactivity, collaboration, communication media, and group trust. This study was designed to investigate the relationship among interactivity, collaboration, communication media, group trust and the impact they have as model to predict effective online learning experiences.

### **Research Questions**

This study was designed to answer the following questions:

1. What are students' perceptions towards effective online learning experiences?
2. Which factor has the strongest relationship to students' perception of effective online learning? Specifically:
  - Is there a meaningful relationship between interactivity and students' perceptions of effective online learning?
  - Is there a meaningful relationship between collaboration and students' perceptions of effective online learning?
  - Is there a meaningful relationship between communication media and students' perceptions of effective online learning?
  - Is there a meaningful relationship between group trust and students' perceptions of effective online learning?

3. How much variance does this model (gender, age, ethnicity, class rank, employment status, number of online courses, computer expertise, previous online grades, interactivity, collaboration, communication media, and group trust) explain of students' perceptions of the effectiveness of online learning and what is the greatest contributor in this model?

### **Significance of the Study**

Much research has been done to analyze the relationship between an effective online education and interactivity (Chao, Hwu, & Chang, 2011; Fulford & Zhang, 1993; Hwang & Yang, 2008; Kester et al., 2007; Lau & Tsui, 2009; Liu & Wang, 2010; Sherry & Yamashita, 2004; Swan, 2001); the relationship between an effective online education and collaboration (Brindley, Walti, & Blaschke, 2009; Fisher, 2003); the relationship between effective online education and communications media (Eastman & Swift, 2002; Armstrong, 2011); and the relationship between an effective online education and group trust (Wade et al., 2011). However, the researcher was not able to locate any research examining the relationship between effective online learning and the model including interactivity, collaboration, communication media, and group trust. Therefore, there is a need to examine whether the interaction of these four factors as a model has an impact on students perceptions of effective online learning. Among the studies that have been examined, the relationship between effective online learning and communication media, as well as the relationship between effective online learning and group trust, the principal research methodology employed has been qualitative research, utilizing a case study. Qualitative methods, like interviews and observations, have been utilized in those studies. Little quantitative research was located.



This study provides valuable quantitative data for both online teachers and school administrators as they strive to develop more effective online educational experiences.

### **Delimitations**

The following delimitations are included as a part of the study:

1. The scope of this study was limited to one institution and specific programs at that institution during the 2011 – 2012 academic year.
2. Students' perceptions were obtained from the survey instrument shown in Appendix A.
3. This study only includes online courses. Blended online courses or traditional classroom courses were not included.
4. The only demographic data collected from the participants is shown on the instrument in Appendix A.

### **Limitations**

The study is limited in a number of ways and makes the following assumptions:

1. The instrument used to measure students' perception was both valid and reliable.
2. The findings only apply to participants of the study.
3. The value of the data collected will be dependent upon the accuracy and honesty of the respondents' answers.
4. Each online learning experience is different, and many other variables also impact students' perceptions of the effectiveness of their online learning experiences.

## **Definition of Terms**

The following definitions were used in this study:

Collaboration – Collaborative learning is defined as a learning process that emphasizes group or cooperative efforts among faculty and students. It stresses active participation and interaction on the part of both students and instructors (Hiltz, 1997). Collaborative learning activities include complex group projects that need students' collaboration and online help sessions among students and instructor. In this study, collaboration means engagement to group projects and the attitude to collaboration in online learning as measured by questions 14a, 14b, 14c, and 14d of the instrument shown in Appendix A.

Communication media – Communication media includes the platforms by which students can interact with one another, and learn from one another. Examples of communication media include course management systems that include discussion boards and chat rooms. The instruments used for communication, such as mobile phones, are considered communications media. In this study, communication media means various communication channels that have been used in an online learning environment as measured by questions 15a, 15b, 15c, and 15d of the instrument shown in Appendix A.

Group trust – Trust is the most important factor in developing relationships in an online learning environment. It represents high quality group relationships which could be friendship as well as leadership. In this study, group trust means students' perception on the relationship among group members as measure by questions 16a, 16b, 16c, 16d, and 16f of the instrument shown in Appendix A.

Interactivity – Interaction refers to reciprocal events involving at least two actors and/or objects and at least two actions in which the actors, objects, and events mutually influence one another (Wagner, 1994). Interaction happens between student and instructor, between students and material, and between student and students. For example, the interaction could be instructors’ feedback to online discussions, and class chatting. However in this study, interactivity involves the communication between students and instructor, between students and students as measured by questions 13a, 13b, 13c, and 13d of the instrument shown in Appendix A.

Online learning – According to Allen and Seaman (2008), all online courses are defined as having “at least 80% of the course content delivered online” and “typically has no face-to-face meetings” (p. 4). In this study, the online learning environment included courses in which the entire class was online. Students did not meet their instructor face-to-face for any part of the class.

Online Learning Effectiveness – Online learning effectiveness means students’ perceptions of their online learning experiences. It is measured by questions 17a, 17b, 17c, 17d, 17e, and 17d of the instrument shown in Appendix A.

## CHAPTER II

### REVIEW OF RELATED LITERATURE

It is widely accepted that online learning or distance education is a powerful supplement for a traditional education. Distance learning is indeed a viable alternative to classroom instruction and provides increased learning opportunities for traditional and non-traditional students (Cooper, 2000). Cooper also thought that online instruction could be provided in various formats, and this process selected by the instructor will depend on a number of elements such as technical knowledge, administrative support, expertise of the instructor, and technical support offered by the school.

More and more universities are offering online courses and even complete online degrees. A major feature of online learning is its flexibility. For some universities, Griffith University is among them, flexible learning is considered as one of the most important strategic developments. Torrisi and Davis (2000) conducted research on a university's teaching and learning strategies. They found that the university's teaching and learning management plan listed flexible learning as one of the five areas of strategic development. According to the plan, flexible learning is an "extension of the university's commitment to, and history of, student-focused teaching. The result is the development of employment-related skills and the capacity for independent learning." At Griffith University, designing and developing a comprehensive scale of flexible learning resources, containing printing resources, stand-alone audio and video resources, and

multimedia resources are the key duties of their technology department. Technology is one of the biggest issues faced by faculty and staff.

In online learning environment, the number of students who have access to educational resources increases significantly. The advent of the Internet has now led to an exponential growth in the number of distance course offerings (Bruce, 1999). Through distance education, people from other cities, states, or even countries can participate in the same program of study in the same course. An online environment changes dramatically both the roles of teachers and students. The teaching environment has transformed from classroom to online. In many cases, teachers cannot see students, they cannot present lectures, they cannot use a chalkboard, and they cannot get immediate feedback. This mode of instruction, for many, is a new experience.

The students who take online courses are very different from traditional face-to-face students. Studies show that many online learners are part-time or full-time employees (Alexander, & Zhao, 2002; Lindner, Dooley, & Murphy, 2001; Perreault, Waldman, Reisetter & Boris, 2004). An increasing number of students in higher education have work and family responsibilities in addition to their academic work, (Bunn, 2001) and are trying to balance these responsibilities with their educational goals. Lim (2001) showed that participants in online classes are typically females with some computer experience who have limited access to traditional education because of their responsibilities. Besides women, online learning gives a more diverse group of students the opportunity to participate in a higher education (Bickle & Carroll, 2003; Du, Durrington, & Mathews, 2007; Du & Xu, 2010). The advantages of online learning such as: convenience, time flexibility, lack of a commute to campus, and opportunities to be

independent learners can help them attain a higher education from their home (e.g. Bickle & Carroll, 2003; Lindner et al., 2001; Cooper, 2000).

Since the population of online learners is increasing steadily, an increasing number of universities are considering how to offer their programs online in order to continue to recruit more students (Kirtman, 2009). Therefore, a high quality education needs to be delivered via the Internet to assure students' learning effectiveness. Students learning outcomes should be kept equivalent to traditional face-to-face instruction. Research studies have investigated the effectiveness of online learning (Bell, 2007; Chou & Liu, 2005; Lai, 2011; Neuhauser, 2002; Swan, 2003). Most of them focused on the impact of interactivity or collaborative activities in an online environment to ensure learning effectiveness. The author located no studies that focused on models including multiple variables and the impact these models might have on the effectiveness of students' online learning experience.

### **Online Learning and Online Learning Effectiveness**

Online education has become entrenched within higher educational (Shelton, 2010). Statistics published by the National Postsecondary Student Aid Study showed that from 2000 to 2008, the percentage of undergraduate students took one or more online courses has increased from eight to twenty, and the percentage registered in an online program increased from two to four. Among those 20% who enrolled in distance education classes in 2008, 17% of them were seeking a bachelor's degree, while 25% were seeking an associate's degree. In Smith's study (2008), undergraduates enrolled in an online program took a course for credit, which was mainly delivered using pre-

recorded instructional videos, interactive video or audio conferencing, or learning management system.

With the rapid enrollment increase in online classes; the mode of instruction is becoming more and more important among various disciplines, such as Computer and Information Science, Business, General Studies, Education, Health Care Fields, Social Sciences, Engineering and Technology, Natural Science, Mathematics, Agriculture, and Humanities (Sloan-C, 2008).

One reason online learning has become so widespread is that it provides students opportunities to schedule and design their own learning. It offer learners with faster and easier access to information, allows for more individual instruction, accommodates different learning styles, and increases students' satisfaction with their coursework (Baker, Hale, & Gifford, 1997). The new internet-based technologies could facilitate not only better student involvement on learning, but also more individual responsibility for learning. The mode is flexible and dynamic, placing the student, rather than the teacher in control of the timing and communication (Burch, 2001). It also offers valued opportunities for individual pacing and interaction with course materials when necessary, and convenience for the learner (Perreault et al., 2002; Du & Xu, 2010).

For some researchers, the movement towards an online education appears to be inevitable, so it is essential that colleges and universities carefully consider how to meet the growing demand for this method of instruction without compromising the learning effectiveness (Lindner et al., 2001).

## **Online learning effectiveness**

Although online learning is playing a more important role in higher education, its effectiveness remains controversial. Some people think online learning is less effective (Allen, Bourhis, Burrell, & Mabry, 2002), and others have investigated ways to improve it (Bickle & Carroll, 2003; Bunn, 2001; Du & Xu, 2010; Ewing, Dowing, & Doumts, 1998; Reisetter & Boris, 2004). Some studies have indicated online learning is more effective than traditional face-to-face learning (Dobrin, 1999, Hiltz, 1997; Sloan-C, 2005). Students' online learning effectiveness has been investigated from both faculty's view and students' view (Swan, 2003). Kanawattanachi indicated that it is very important to determining the effectiveness of virtual learning groups (Kanawattanachai & Yoo, 2002).

Clark (1983) thought that as well as the quality of online instruction was as good as the quality of face-to-face instruction, there would be no significant difference in learning effectiveness between them. Media or delivery systems would not affect students learning effectiveness. However, Clark's idea has been challenged by researchers like Kozma (1991), who admitted the importance of high quality instruction, but also argued that the delivery system and media mattered as well.

Neuhauser (2002) conducted a study to compare learning effectiveness between face-to-face and online instruction. In his study, Neuhauser compared two sections of the same course, Principles of Management. One of the courses was online and asynchronous, while the other was face-to-face. Several elements were used to test the differences between these two sections. The elements included gender, age, media familiarity, test grades, learning preferences and styles, effectiveness of tasks, course



effectiveness, and final grades. The students in these two sections used the same instructional materials and were taught by the same instructor to address internal validity issues. Even though the researcher did not pre-choose students, the demographics of work experience, age, and prior knowledge did not show significant differences between the two groups. The results of the study indicated no significant differences in test scores, participation grades, assignments, and final grades. More than ninety percent of the students who took this online course, found the course to be either effective or more effective than the traditional learning environment of a typical face-to-face course. Also, the study showed that online and face-to-face learners share equal learning effectiveness as well as using equivalent learning activities. According to the author, another important finding was that learning styles or preferences had little impact on final grades. The findings did not show that learning styles were an effective predictor of success in an online course or a face-to-face course.

Regardless of gender, ethnicity, academic background, and computer expertise, Navarro and Shoemaker (2000) reported that online learners learn as well as, or better, than traditional learners. The major technologies used in these online courses were CD-ROM-based lectures, threaded electronic bulletin boards, electronic testing, and online discussion rooms. CD-ROM based lectures, which stimulated the traditional classroom experience, were deemed as being both the most enjoyable and important learning medium. CD-ROM-based lectures are much like the traditional face-to-face instruction, because the audiences can still see and hear the instructor. But in a typical online course, students cannot see or hear the instructor. Videotaping every lecture is both time consuming and expensive.

Perreault et al. (2002) conducted a study and collected data from 81 business professors who taught distance-learning courses at 61 U.S. business schools accredited by the American Assembly of Collegiate Schools of Business. In this study, faculty members indicated that a student-centered teaching approach is necessary for successful online courses. But this approach comes with problems. First of all, professors had to use self-training for the design and delivery of online course. The majority of them indicated that they had created the distance learning course themselves in their spare time. More than half of the participants created and delivered distance-learning courses without any formal training. Only a few received technical support from the institution. Secondly, eighty percent of the respondents indicated that technology reliability was problematic or somewhat problematic, over 50% of the respondents indicated that the technical support provided by the institution to support the delivery of the course was problematic or somewhat problematic. The authors suggested some solutions to improve the learning effectiveness, such as providing technical support, both to faculty members and students, providing training to instructors on the use of all the technologies available for the distance learning course, and working with curriculum designers to create activities that foster student-to-student collaboration. In Perreault's (2002) study the researchers analyzed the learning effectiveness from faculty's perspective; they did not investigate the problem from the students' point of view.

White (2000) conducted a study to investigate faculty's opinions on online learning environments. In his study, faculty members indicated that many of the problems associated with their distance learning courses were technology related. Many

of the teachers felt that students overestimated their computer expertise when they enrolled in the course.

Shea, Freddericksen, Pickett, Pelz, and Swan (2001) used students' perceptions of their own learning effectiveness, the findings indicated that students at least learn as much from online courses, compared with in traditional higher education courses. Other researchers support the effectiveness of online learning (Fulford & Zhang, 1993; Picciano, 1998).

Findings from other researchers support the effectiveness of traditional face-to-face educational settings. Cooper (2001) designed a study to compare traditional classroom instruction and online instruction, using student perceptions and their performance. Ninety-four students from the traditional classes and thirty-seven students from the online classes completed the survey. The course used in this study was Fundamentals of Computer Application, which included Microsoft Office programs and basic computer concepts and terminology. Compared with Neuhauser's (2002) study, the experiment course in Cooper's (2001) study is less theoretical and more practical.

In Cooper's (2001) study, students from both traditional classrooms and online classrooms were asked to assess understanding of class organization, availability of the instructor, the course contents, and the grading process. The results indicated that overall, students from both sections agreed that the class met their expectations. But more students from traditional classrooms strongly agreed with this statement. Traditional students also agreed more strongly than online students, with those positive statements related to the pace of instruction, understanding of course layout, teacher organization, and grading process. The findings also indicated that 31% of online

students thought that they learned more in a traditional class, while only 12% of them thought that they learned more online.

Lindner et al. (2001) conducted a study to compare the differences between on-campus and distance learners by knowledge, skills, and abilities. On-campus doctoral students at Texas A&M University were compared with doctoral students enrolled in a distance educational program offered jointly with Texas Tech University. Students from both universities were graduate students who were pursuing doctoral degrees in agricultural education. The researchers for the study did not ask if one group is better than the other, but whether distance learners use different competencies or processes to assimilate information. The results indicated a difference between these two groups of students on each of the three competencies. The knowledge competency scores of on-campus students were higher than online students. The skill competency scores of on-campus students were higher in information organization, learning strategies, and synthesis, while distance learners had higher perceived levels of skill in repairing computers and installing programs. The perceived level of ability of on-campus students were higher in written expression, number facility, speech recognition, and speech clarity; while distance students had higher levels of ability in visualization (Lindner et al., 2001). The researchers concluded that an on-campus program would be more effective for doctoral students, because they would utilize a higher level of knowledge competencies, skill competencies, as well as ability competencies overall.

### **Measurement of online learning effectiveness**

The assessment of online learning effectiveness can be approached from various angles, such as learners, courses, design, instructors, and environment (Sun, Tsai, Finger,

Chen, & Yeh, 2008). Since learners are the primary participants, many researchers have investigated the factors that affect the learning effectiveness of online learners (Chou & Liu, 2005; Sun et al., 2008; Piccoli, Ahmad, & Ives, 2001; Vogel, Davison, & Shroff, 2001). Chou and Liu (2005) proposed a four dimension model to measure online learning effectiveness. The dimensions include learning achievement, computer self-efficacy, satisfaction, and learning climate. The four dimensions were used to compare students' learning effectiveness in the two different learning environments, online and face-to-face. Chou and Liu (2005) reported that online students tended to advance higher computer expertise than traditional students, and that participation was an important aspect of online learning effectiveness.

Scholars like Lai (2011) concluded that three components of self-directed learning readiness (independent learning, love of learning, and active learning) and two parts (Information evaluation and internet skill) of network literacy were significant predictors of online learning effectiveness.

However, none of the above mentioned studies addressed high level cognitive skills such as higher order thinking abilities as part of online learning effectiveness. Higher order thinking abilities are critical for college students in traditional face-to-face classes, as well as in an online environment.

### **Interactivity in Online Learning**

Interaction is a crucial variable for learning effectiveness (Chao, Hwu, & Chang, 2011). Practitioners and researchers agreed that interaction is a critical factor in online learning satisfaction (Fulford & Zhang, 1993; Swan, 2001). Interactions among students or between students and instructors are significant to online learning effectiveness (Pallof

& Pratt, 1999). Interaction among students is important for learning effectiveness, because intelligence develops not only at the individual level, but is also gained through interactions within group (Beauchamp & Kennewell, 2010; Hernandez, Pardo, & Kloos, 2007; Hwang & Yang, 2008; Reilly, 2008). It is necessary to direct the participants to achieve the appropriate interaction, thus achieving learning effectiveness (Chao, Hwu, & Chang, 2011). There are several variables involved in an online learning system: the learner, the content, and the instructor (Chou, Peng, & Changa, 2010; Park, 2008; Roblyer & Wiencke, 2003). Researchers identified three modes of interaction that affect learning: learner-instructor interaction, learner-content interaction, and peer interaction (Lau & Tsui, 2009; Moore, 1989). Moore (1989) stated:

Interaction with content refers both to learners' interactions with the course materials and to their interaction with the concepts and ideas they present. Interaction with instructors includes the myriad ways in which instructors teach, guide, correct, and support their students. Interaction among peers refers to interactions among learners which also can take many forms -- debate, collaboration, discussion, and peer review, as well as informal and incidental learning among classmates. Each of these modes of interaction supports learning and each can be uniquely enacted in online learning environments. (p. 3)

None of the three types of interaction function independently in online learning practice. For example, interaction among students is supported by instructor support and facilitation (Swan, 2003).

Hillman, Willis, and Gunawardena (1994) proposed another type of interaction, learner-interface interaction. This interaction is different from the other three; it

addresses preferences for technology, how it is used, and the ease of use (Lehtinen, 2002).

### **Learner-instructor interaction**

A common limitation of distance-learning as reported by students is the lack of face-to-face interaction with the professor. Sometimes students need to contact their instructor outside of class. They may not be able to drive to campus during the instructor's office hours if they live far away (Perreault et al., 2002).

In an educational setting, the instructor serves as a professional who develops instruction to foster students' interests, to motivate their participation in the learning process, and to facilitate their learning. The relationship between learning outcomes and learner-instructor interactions has been well tested traditional classrooms (Powers & Rossman, 1985). However, the interaction in an online learning environment is somewhat different from the interaction in a classroom. Both students and instructors play different roles in the online interactivity. In the classroom settings, it is fine for students to listen to a lecture passively. They do not need to do much to learn something in classrooms. In the online learning environment, they need to be interactive learning participants in order to achieve a good learning outcome (Park, 2008). If the learner is unable to self-motivate to achieve the course goals, he or she may lose interest in learning, resulting in failure in the course (Abrahamson, 1998). In other words, they need to be more active in an online learning environment. Instructors' roles also change in an online educational setting. In the virtual education world, an instructor is often regarded as a content facilitator and provider because of the asynchronous and indirect communications between students and instructors (Abrahamson, 1998). Instructors

should also become active, by participating in their online education as well. They need to visit the course site regularly to give answers to questions in a timely manner, suggest different views, and provide relevant information (Alderman, 2005). Besides active participation, instructors should play the role of moderator in an online learning environment. As an instructor manages the students' behavior in a classroom, the instructor will need to guide students' learning process and moderate their activities in order to facilitate learning and maximize their learning outcomes (Park, 2008).

Many other research studies have presented findings that show a positive relationship between learning effectiveness and learner-instructor interaction. Shea et al. (2001) found significant differences in students' perceived learning based on interaction with their instructors. Students who reported lowest levels of learning also reported low levels of learner-instructor interaction. Conversely, students who reported high levels of learning also reported higher levels of learner-instructor interaction. Swan et al. (2000) found a strong relationship between students' perception of learning and their perceived learner-instructor interactions. Similarly, Jiang and Ting (2000) presented a significant relationship between student satisfaction with their instructor and their perceived online learning effectiveness.

### **Learner-content interaction**

Interaction with content refers to the learners' interaction with the attitudes, skills, and knowledge. Normally, this has to deal with the learners' interaction with the course materials and is primarily concerned with course design components. Evaluation of online learning has been performed in terms of performance (written assignments, exams, and course grades) and faculty and students' perceptions of online learning.



Facilitating interaction between learner and content is the fundamental form of online learning (Moore & Kearsley, 1996). Regardless of the content quality in the online learning environment, learners may think they have learned little from the course because of the features of interactive learning and the online learning environment when the course content:

- is out of date
- can be replaced by better content based on Internet searches
- is presented with a poor visual form and without considering multimedia delivery formats
- does not encourage participation and engagement

In order to overcome these shortcomings, the instructor must assure that the course content is: up-to-date; uniquely designed and developed specifically for the course; interesting and attractive using various media for delivery; and promotes participation and engagement. By doing all of these, online instructors can create a high quality learner-content interaction.

### **Peers interaction**

Based on socio-cognitive theories of learning, all learning has a social nature and knowledge is built through social interactions. Online learning is particularly well developed to support such social learning because of the unique nature of asynchronous course discussions (Wells, 1992).

Studies show that peer interaction can promote learning effectiveness. Picciano (1998) found that students perceived learning in an online course was related to the

amount of discussion in which they were allowed to participate. Jiang and Ting (2000) reported relationships between perceived learning and course grades based on discussions in online environment. Similarly, in their study, Shea et al. (2002) tested 268 online courses across the State University of New York; they found significant differences in students' perceptions of learning effectiveness among different levels of perceived peer interaction. Students who rated a high level of interaction with classmates also reported significantly higher levels of learning. Moreover, Swan et al. (2000) reported a strong relationship between students' perceptions of peer-to-peer interaction and the actual interaction frequencies among students. They also found relationships between students' perceptions of peer-to-peer interaction and the course grades based on discussion.

### **Collaboration in Online Learning**

Collaborative learning is a learning process that emphasizes cooperative or group efforts among students. It focuses on active participation and interaction within groups (Hiltz, 1997). It has been used a great deal in online environments and its benefits have been widely researched (Du et al., 2007; Roberts, 2004). Online collaborative discussion among students can encourage deep learning for higher order thinking (Du, Havard, & Li, 2005). Research also indicated that small groups promote learning as compared to individual learning (Bruffee, 1999; Du, Zhang, Olinzock, & Adams, 2008; Johnson, Johnson, & Stanne, 1985). However, online collaboration does not happen automatically, nor does it simply make learning easier. Instead, it may be challenging for learners in many ways (Zhang & Harkness, 2002). As compared to traditional face-to-face communication, miscommunication and misunderstanding are more likely to appear and are also less detectable in the online environment. In addition, online communication

technologies are relatively new as educational tools, so students may undergo a learning curve with the technologies, as well as with the learning methods (Ge & Zhang, 2006). One common method of ensuring student participation in online collaboration is to illustrate the value of group learning by evaluating both the group assignments and process of group work (Swan, Shen, & Hiltz, 2006). Swan et al. (2006) propose that “Assessment can be seen as the engine that drives student course activity, online or off. It is particularly important in encouraging and shaping collaborative activity online” (p. 45).

What should be included in online collaborative activities to facilitate learning effectiveness? Some researchers have suggested that online group projects is the answer (Frank, Lavy, & Elata, 2003; Zhang, Peng, & Hung, 2009). Through the use of group projects, online discussions allow learners to gain knowledge from both the assignment and their group members.

Du et al. (2007) conducted a study to examine online group discussions from a student’s view to decide what characteristics students consider as meaningful to their learning. In their study, students were asked questions on the size of groups in online discussion, types of interests associated with discussion questions in online discussion, types of discussion response in online discussions, preference for group partners in online discussions, online discussion quality, and strategies for preparation in online discussions. These results indicate that students’ critical thinking skills were enhanced when working collaboratively and found the achievement of course goals easier and more efficient.

Another study discussed how to create effective online collaborative learning groups from an instructor's perspective (Brindley et al., 2009). The authors thought that instructors should combine a variety of instructional methods to improve group collaboration and to stimulate student participation. The methods include: nurture the establishment of learner relationships and sense of community; facilitation of learner readiness for group work and providing scaffolding to build skills; choose tasks that are best performed by a group; and provide sufficient time; establish a healthy balance between structure and learner autonomy; monitor group activities actively and closely; make the group task relevant for the learner. With these instructional methods applied in designing online group projects, the author stated, online collaborative learning would be very effective.

### **Communication Media in Online Learning**

As discussed in previous sections, researchers have examined the non-technology interaction among the learner, instructor, and content; and its relationships with online learning effectiveness. Technology interaction should contain the participants, as well as technology, software and communication media (Hanna, Glowacki, & Concericao-Runlee, 2000).

Online learners may undergo many challenges due to the lack of shared social background or physical communications. The fading temporal, physical, and psychological boundaries make it difficult for online group members to establish a sense of group identity, which is critical for effective group performance. Appropriate communication media can help learners better overcome some of the problems they encounter (Ge & Zhang, 2006). With various information and communication

technologies, it is vital, as well as difficult to select and utilize proper media for different tasks and at different group development stages.

The most common communication media for online learners are discussion boards and chat rooms within the course management system. With these tools, groups can meet either synchronously, using chat rooms, or asynchronously, using threaded discussion boards, in which group members contribute to the group discussion at times convenient to their schedules over a defined time period (Kaiser, Tullar, & McKowen, 2000).

According to Eastman and Swift (2002), discussion boards and chat rooms are very effective in inter-team collaboration, as well as in faculty-student communication. They help ease the problems discussed in the previous section. By solving these problems with technology, faculty can address three learning goals: empowering students, improving their communication skills, and developing their ability to work collaboratively. Finally, these technological communication tools offer teaching opportunities by allowing faculty to be more accessible to students and to track students' efforts more effectively.

Another advantage of both tools is the opportunity for faculty to participate in the discussions and e-mails. Faculty can use these tools to demonstrate concern for students, to provide additional accessibility, and to offer feedback. In fact, an online environment encourages faculty to maintain a facilitative role rather than an authoritative role (Moore, 1993).

Besides, these tools can keep track of what everyone has said, providing a written record for documentation (Kaiser et al., 2000). Students have the opportunity to

reorganize and reshape their understanding of course content though reviewing records. These web-based tools allow thoughts to be captured for future examination, elaboration, and extension. The end result is usually more robust and thoughtful discussions (Bruce & Hwang, 2001).

Eastman and Swift (2002) also suggested ways online instructors can use discussion boards and chat room effectively. For discussion boards, faculty can set up public forums and start threaded discussions for the class to which the students can respond electronically. Students can use these public forums to post questions to which the entire class can respond, such as for help in finding information for the group project. The professors' role is to help get the conversation started. Their job is to involve every student into the discussion and let each one of them speak, instead of allowing a dominant speaker in the discussion process to take over. Even if they are the dominant speaker in a traditional face-to-face classroom, they are not anymore in an online learning environment. Additionally, instructors can create private forums to be used to divide students into groups for class exercises or for the use of asynchronous coordination of group projects in which group members cannot all meet at the same time. In the private group forums, the students are encouraged to use the board to organize group meetings, to post their research findings, and to post drafts of their work for their group members to review and give feedback.

For chat rooms, faculty should set up one for each group where the group members can meet electronically at the same time, no matter where they are. For project work, it is important that instructors periodically meet with student groups to answer

questions, address problems, and provide guidance. Instructors should arrange times with different groups to “meet” with them and answer their questions.

Besides discussion boards and chat rooms within a course management system, students use their mobile phones, utilizing their text feature to frequently discuss issues related to their learning, most commonly in connection with assignments. They also use instant messaging software like MSN Messenger or Skype as communication media (Conole, Laat, Dillon, & Darby, 2008).

### **Group Trust in Online Learning**

Group trust is one of the two dominant themes throughout the group development process (Guzzo & Dickson, 1996; Weiss & Cropanzano, 1996). A trusting relationship among group members has been suggested as another important part of small group work in online classrooms (Smith, 2008).

Mayer et al. (1995) defined trust as “the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trust or, irrespective of the ability to monitor or control that other party.”

Previous research on trust in face-to-face groups indicated that the establishment of trust is of importance in the working relationship (Mayer, Davis, & Schoorman, 1995). Trust also leads to more open communication (Smith & Barclay, 1997) and collaboration (Parks, Henager, & Scamahorn, 1996). In all, this suggested that the presence of a high trust level is associated with a high performance.

The traditional trust research has recognized that trust is a multidimensional construct with both affective and cognitive elements (Lewis & Weigert, 1985). The

relative importance of both elements varies depending on the background and the type of relationship within people. According to Meyerson, Weick and Kramer (1996), the formation and maintenance of trust in online groups relies more on the cognitive than the affective element, because the affective part is personal and defensive, and the cognitive part is productive and beneficial (Thompson, 2000). But, Thompson also suggested that utilizing an open forum to transform affective elements into cognitive elements was important. Timely responses to affective elements help to create internal comfort, motivate participation, stabilize personal and professional relations, and improve group effectiveness (Bocialetti, 1988).

According to Ge and Zhang (2006), it's hard to establish trust among people who are only connected with each other through the Internet. For this reason, it is highly recommended for online groups to arrange at least one initial and face-to-face meeting (Mittleman, Briggs, & Nunamaker, 2000). If face-to-face meetings are not available, initial contacts could be made through the use of media, which has the capability of conveying both verbal and nonverbal communication cue, as well as social presence. Mittleman et al. (2000) also recommended using an informal break for online group meetings so that all parties can share casual talks and socialize with the assistance of communication media.

Although many researchers agree that group trust is important for the effectiveness of online group work, some studies show conflicting results (Wade et al., 2011). In a study conducted by Aubert and Kelsey (2003), it was found that the formation of trust is not necessary for effective online group performances. Some groups showing low levels of trust were able to provide high quality output. It seems that one



explanation of this lack of relationship between trust and performance may reside in the notion of process loss or gain. Although some low trust teams might have delivered high quality results, they may have expended significantly more effort to do so than did high trust teams (Aubert & Kelsey, 2003).

### **Summary of the Review of Related Literature**

Although there is debate on the effectiveness of online learning, more and more studies continue to show that online learning is as effective as traditional face-to-face learning. Although indications about the efficacy of electronically-delivered courses are mixed, many studies have found that there are no significant differences when learning outcomes of online students are compared with those of traditional students (Allen et al., 2002; Navarro & Shoemaker, 2000; Neuhauser, 2002). Characteristics such as gender, ethnic background, academic preparation, aptitude, or computer skills do not appear to influence success in online learning (Navarro & Shoemaker, 2000).

Students reported satisfaction with online courses consistently (Moore, 2002), which had been linked to course success (Sherry, Fulford, & Zhang, 1998). Researchers indicated that the key elements related to learner satisfaction with this delivery mode include group work, clear directions, clear instructor presence, opportunities for reflection, performance-based orientation, equal opportunities to participate, collaborative strategies, and a concentration on ideas rather than facts (Du & Xu, 2010; Moore, 2002). Computer self-efficacy plays a role in satisfaction (Lim, 2001), as does the opportunity to ask questions (Cooper, 2001). Billings and colleagues (2001) found that older students tended to be more satisfied with online learning than were younger ones.

In Moore's study (2002), satisfaction was strongly related to the students' sense that the online instructor has a social presence. Satisfaction was also related to instructors' feedback. For some students, satisfaction came from their invisibility to other students. They thought face-to-face meeting may bring discriminations. For some others, satisfaction was related to the feeling that computer-mediated communication (CMC) let them to express their emotions if they want to. The very nature of the course design and curriculum directly linked to learner satisfaction. For example, students have reported online satisfaction with the kind of courses where they improved their computer communication competencies, as well as courses that were performance based, that applied collaborative learning, and that required teamwork. In such a phenomenon, students moved from outsiders to insiders which increased their feelings of satisfaction.

Just as the social aspect contributes to student satisfaction, it can also feed dissatisfaction (Moore, 2002). Feelings of loneliness, perceived difficulty communicating with those one does not know well, lack of prompt feedback, resentment of perceived cliques, and fear of expressing opposing views in discussion forums are all reported reasons for learner dissatisfaction. Students also complained about ambiguous instructions, heavy time requirements, too many discussion postings, and without real-world application (Moore, 2002).

From the literature, it can be concluded that it is possible to make online learning effective. In order to do this, an online ecological system should be maintained. In this system, there are four fundamental factors: interactivity, collaboration, communication media, and trust. Previous studies could not be located that involve all four factors when examining online learning effectiveness. Therefore, this study is designed to test and

predict online learning effectiveness using the model containing: interactivity, collaboration, communications media, and group trust.

## CHAPTER III

### METHODOLOGY

#### **Introduction**

This chapter describes the research design utilized in this study. Included are the relationships of the research questions to the variables under examination, as well as the procedures followed in the development and implementation of the study. A full description of research design, population and sample, the instrumentation, data collection, and proposed data analysis is presented. The purpose of this chapter is to provide the reader with sufficient details to judge the appropriateness of the methodology, evaluate the research designs, and to replicate the study in other online education settings.

#### **Research Design**

The researcher used multiple regression analysis to address the research questions. Therefore, this research involves descriptive statistics, correlational statistics, and multiple regression statistics. As exploratory research, this study examined students' online learning experiences based on the four factors: interactivity, collaborative learning, communication media, and group trust that an online education provides. Gay, Mills, and Airasian (2009) stated that multiple regression was very useful for the analysis of the relationship among several independent or predictor variables and a dependent variable.

In this study, the researcher examined the relationship between one dependent variable and four independent variables using a multiple regression. Summary descriptive statistics and correlational statistics were also used. Descriptive statistics include the mean and standard deviation, and correlational statistics were used to identify the strength of the associations between the independent and dependent variables (Gall, Gall & Borg, 2003; Johnson & Christensen, 2004).

### **Research Questions**

The purpose of this study is to test the relationship among interactivity, collaboration, communication media, and group trust and its impact as model to predict effective online learning experiences. Each of the four underlining factors has been examined individually, but not as a model. A model containing these four factors was used to examine the impact of the model on online learning effectiveness. Previous studies have stated the importance of examining the effectiveness of online learning (Bickle & Carroll, 2003; Bunn, 2001; Du & Xu, 2010; Ewing et al., 1998; Reisetter & Boris, 2004), however, most of them tended to explore the relationship between learning effectiveness and a single independent variable such as interactivity, collaboration, communication media, or group trust. No research was located that examined these factors as a model for predicting success in a dynamic online learning community. Therefore, this study was designed to answer the following questions:

1. What are students' perceptions towards effective online learning experiences?
2. Which factor has the strongest relationship to students' perception of effective online learning? Specifically:

- Is there a meaningful relationship between interactivity and students' perceptions of effective online learning?
  - Is there a meaningful relationship between collaboration and students' perceptions of effective online learning?
  - Is there a meaningful relationship between communication media and students' perceptions of effective online learning?
  - Is there a meaningful relationship between group trust and students' perceptions of effective online learning?
3. How much variance does this model (gender, age, ethnicity, class rank, employment status, number of online courses, computer expertise, previous online grades, interactivity, collaboration, communication media, and group trust) explain of students' perceptions of the effectiveness of online learning and what is the greatest contributor in this model?

### **Variables of this Study**

The variables examined in this study were online learning effectiveness, interactivity, collaboration, communication media, group trust and demographic variables (gender, age, ethnicity, class rank, employment status, number of online course taken previously, computer expertise, and previous online course grades).

The dependent variable was online learning effectiveness. The independent variables were interactivity, collaboration, communication media, and group trust.

## **Population**

The population used for this study are the students who took online courses offered by the College of Arts & Sciences, College of Business, and College of Education through Academic Outreach & Continuing Education (AOCE) at a southeastern university during the academic year 2011-2012, which included fall 2011 and spring and summer 2012. Those students who were willing to participate are the population of this study. The selection criteria were based on (1) the number of online courses offered by each college, and (2) the enrollment of online students in the online courses offered by each college. The top three colleges which met the two criteria were chosen to participate in the study.

The following data obtained from Office of Institutional Research and Effectiveness provided evidence why the three colleges chosen were selected. In Spring 2012, the current enrollment for the 289<sup>1</sup> courses offered by AOCE was 4, 298<sup>2</sup>. Based on the first selection criteria, the College of Arts & Sciences, the College of Business, and the College of Education were the three colleges that offered almost 81% of the 289 online courses. The College of Arts & Sciences offered 108 online courses, the College of Business offered 74 online courses, and the College of Education offered 52 online courses. The total enrollment for online courses offered by College of Arts & Sciences was 2, 231. The total enrollment for College of Education was 627. The total enrollment for College of Business was 882. The total enrollment for these three colleges accounted for 87% of the total online enrollment. A total of 2,381 surveys were sent to the students

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<sup>1</sup> The same course may include more than one section.

<sup>2</sup> This count is duplicated, as individual students may have enrolled in more than one class.

who took online courses in the College of Arts & Sciences, the College of Business, and the College of Education. By the end of summer 2012, there were 401 responses received.

### **Instrumentation**

A survey instrument was utilized in this study. The survey instrument was designed and developed based on the research questions. This instrument collected information about students' online learning experiences from four aspects: online interactivity, online collaboration, online communication media, and online group trust. Each of the four aspects was measured by several questions.

The survey instrument (See Appendix A) consisted of three parts. The first part of the survey instrument collected demographic information of the participation. Part II of the survey instrument contained 19 Likert scale questions, examining students' online learning experiences. Part III of the survey instrument contained six Likert scale questions, designed to measure students' evaluation of online learning effectiveness.

In Part I of the survey instrument, students were asked to provide demographic information about their gender, age, ethnicity, class rank, employment status, prior online learning experience, computer skill level, course name, reasons for taking the course, perceived class difficulty, and expected grade. Questions 1-12 were developed to answer these questions.

Part II of the survey instrument examined participants' online learning experiences. Specifically, they answered the questions related to online interactivity (e.g. interaction with classmates, and interaction with instructor), online collaboration (e.g. collaboration methods, discussion topics, and instructor's role in online collaboration),



online communication media (e.g. communication methods and locations), and online group trust. Questions 13-16 of the survey instrument addressed this information. Some questions were developed based on the following studies, and others were developed by a highly respected research faculty.

Some “Interactivity” questions were originally developed by Cook, Annetta, Dickerson, and Minogue (2011) and Dennen, Darabi, and Smith (2007). This was one the sources used to develop the questions in this study.

“Collaboration” questions were revised and adapted from Walker and Fraser (2005) and Thompson and Ku (2006). Both studies were designed to evaluate the online learning outcomes from the aspect of collaborative learning. This was one the sources used to develop questions in this part.

“Communication media” was revised and adapted from Barnard, Patton, and Rose (2007) and Leong (2011). This is one of the sources used to develop questions in this part.

“Group trust” was adapted from Jarvenpaa and Leidner (1999) and it was designed to identify the relationships that promote online learning effectiveness. This is one of the sources used to develop questions in this part.

In Part III of the survey instrument, students rated the overall effectiveness of their online courses. Respondents answered the questions regarding overall higher order thinking and critical thinking abilities, overall knowledge construction, doing well in online courses, finishing program or degree online, doing well in online assignments and tests, and reaching educational goal. Question 17 of the survey was designed to address

students' perceptions of online learning. The questions were developed based upon the aforementioned studies.

A Likert Scale format was used for the question in parts 2 and 3 of the instrument. The Likert scale type of question states the issue or opinion and asks for the respondents' degree of agreement or disagreement (Alreck & Settle, 1995). The survey instrument was set up in a five-point scale to allow for differentiation among responses. Respondents needed to circle their answers from Strongly Disagree to Strongly Agree, (Strongly Disagree = 1, Disagree = 2, Undecided = 3, Agree = 4, Strongly Agree = 5) and select from Extremely Poor to Excellent (Extremely Poor = 1, Below Average = 2, Average = 3, Above Average = 4, Excellent = 5) when rating the effectiveness of their online courses.

The survey instrument used in this study was created in both web format which was hosted online at the researcher's personal website as well as hard copies which were handed out to students in classrooms. The researcher sent an email to participants, and provided a link to the survey instrument. Completed web survey instruments were sent to the researcher's email box and aggregated for further data analysis. The use of a web survey instrument had obvious advantages over conventional paper-and-pencil mailed questionnaires: postal costs were eliminated, and the design was interactive (Gall et al., 2003). However, the researcher observed from prior web-based survey studies that the response rate was generally lower than paper-and-pencil surveys. Therefore, a second round follow-up emails were sent out to potential participants, and hard copy surveys were used to collect information from campus classroom sections. In order to prevent

duplication, students were told not to complete the survey if they had completed it in another class.

### **Reliability and validity**

In order to ensure the reproducibility of the research design and findings, it is important to review the reliability and validity of the research tools and measures used in conducting the research. The desired instrument should have high reliability and validity (Gall et al., 2003). Reliability is defined as consistency across the individual questions or subsets of questions of a measuring instrument (Huck, 2004). In an effort to assure an adequate level of reliability, the researcher followed these steps. First, the survey instrument was developed under the supervision of a highly respected research faculty who reviewed each item for appropriate wording and consistent meaning. Second, a pilot administration of the survey instrument was conducted with a group of five students. Third, the researcher examined the responses of the respondents to identify any missed items or to determine clarity of their responses. The internal consistency was determined by pilot results by computing a Cronbach's alpha. As Huck suggested (2004), when the items on an instrument are not scored right versus wrong, Cronbach's alpha is often used to measure the internal consistency. In the pilot, Cronbach's alpha for Interactivity, Collaboration, Communication Media, Group Trust, and Learning Effectiveness were 0.68, 0.95, 0.72, 0.66, and 0.76, which indicates adequate reliability.

**Reliability and validity of online learning effectiveness.** The reliability and validity of different components of the survey have been tested in previous studies. For example, Leong (2011) tested the reliability and validity of the effective of online

learning, online communication, and interactivity. In his study, Leong used the construct of students' satisfaction to represent the effective learning experiences. He measured student satisfaction based on students' responses to five survey questions derived from Tallman's (1994) student satisfaction questionnaire. The student's satisfaction reliability has Cronbach's alpha of 0.90, indicating a very high degree of internal consistency. In the same study, Leong (2011) also checked the reliability of online communication (with a Cronbach's alpha value of 0.84) and interactivity (with a Cronbach's alpha value of 0.67). The research only adapted one part of Leong's (2011) survey with some modification. The title was changed from "Student Satisfaction" to "Student Learning Effectiveness". The Cronbach's alpha for this study is 0.76.

**Reliability and validity of interactivity and collaboration.** According to Fish and Dane (2000), only the items with a factor loading of at least 0.50 with their own scale can assure the validity of the scale. So in Walker and Fraser's (2005) study, they stated high validity of the scale interactivity and collaboration. The factor loading values for the six questions within interactivity and collaboration are 0.90, 0.83, 0.85, 0.86, 0.90, and 0.87. So these items can measure interactivity and collaboration precisely. Walker and Fraser (2005) also checked the reliability of interactivity and collaboration. The result showed the Cronbach's alpha value of 0.94 for the scale of interactivity and collaboration, which represented excellent internal consistency. The researcher adapted these questions and added some new questions, then separated them into two parts in the new survey instrument. From pilot study, Cronbach's alpha of interactivity and collaboration in study are 0.68 and 0.95.

**Reliability and validity of group trust.** Javenpaa and Leidner's (1999) created a survey which investigated the relationships within an online learning group. They reported that the validity of the survey was established by a panel of experts and that the survey was revised based on their recommendations. They also reported the Cronbach's alpha value was 0.92, which also indicated high level internal consistency. Javenpaa and Leidner's (1999) survey was adapted by a research expert and applied in this study. The Cronbach's alpha is 0.66.

Content-related evidence typically is determined systematically by content experts (Gall et al., 2003). Therefore, the researcher consulted a panel of experts for the content validity of the instrument (Appendix A). The researcher asked the experts to go over all the survey questions to determine if the questions are appropriate to the subject and clear to understand, and if any question was inappropriate, and how each question should be reworded. Revisions were made based on the experts' recommendation.

There were several threats the internal validity of a research, namely, but not limited to; instrumentation, subject characteristics, loss of subjects (mortality), location, and attitude of subjects (Fraenkel & Wallen, 2003). To minimize the threats to internal validity, Fraenkel and Wallen (2003) suggested that the researcher can (1) standardize the conditions under which the study occurs, (2) obtain more information on the details of the study, and (3) obtain more information on the subjects of the study.

To reduce this study's instrumentation bias, the researcher kept the survey instrument at a reasonable length to reduce the fatigue of participants. It took approximately 15 minutes for participants to complete the survey instrument. To gauge more accurately the demographics of the participants, the researcher designed seven

questions to obtain key information about the participants. Those demographic questions are located in Part I of the survey instrument listed as questions 1-7. To minimize the threat of location, participants took this survey instrument via a hyperlink directly from their email or took it in a classroom. Finally, the researcher explained the process and purpose of the study in the consent form, and informed participants that their completed survey instruments were anonymous and confidential. The researcher and instructor also explained that participation in the study was completely voluntary.

### **Data Collection**

Prior to conducting this study, the researcher gained the approval of the Institutional Review Board (IRB) for the protection of human subjects in research. The researcher completed Institutional Review Board training on May 5, 2009, and renewed the certificate in May, 2012. The IRB office approved the study on May 10, 2012 (See Appendix B).

Upon the permission from IRB to conduct the study, the researcher conducted a pilot test of the survey instrument. The pilot study determined whether individuals in the population have sufficient knowledge and understanding to express meaningful opinions about the topic (Gall et al., 2003). The participants provided comments and recommendations for improving the questionnaire. An open ended question was included on the instrument asking respondents for feedback to identify ambiguities and difficult questions. Questions that were unclear or confusing were reworded. Unnecessary, difficult, or ambiguous questions were omitted. The researcher verified that all questions were answered. Any unanswered questions were checked for adequacy, and then the

researcher decided if those questions were appropriate to be included in the proposed study.

Convenience sampling was chosen to administer the pilot study. The sample was two undergraduate and three graduate students who had online learning experience at the university. This was consonant with Gall et al.'s (2003) suggestion that, "The pilot test should include a sample of individuals from the population from which you plan to draw your respondents" (p. 230). The pilot test provided space for respondents to make criticisms and recommendations for improving the questionnaire. The researcher asked these five students to finish the survey and identify any concerns or problems in completing the instrument. The researcher revised several problematic questions and updated survey instrument.

Upon the completion of the pilot study, the researcher began the data collection procedure. First, the researcher contacted the Office of Institutional Research and Effectiveness to get the email addresses of students who had taken online courses in the academic year 2011-2012. Then the researcher was able to encourage them to complete the survey by sending them email. In addition, the researcher went to classrooms to hand out survey with the permission of the instructors.

Data were collected during summer 2012. The researcher sent email to students and asked them to complete the online survey using the link provided. At the same time, the researcher contacted instructors who taught online courses that summer semester and asked their willingness to allow their students' participation in this study. In the emails to the instructors, the researcher provided a hyperlink of the web survey so that the instructors could forward the link to their students. The researcher also contacted

instructors who taught regular courses in the summer 2012 and discussed their students' participation of this study. Only the students who took an online course previously were asked to complete the survey. If they had already completed it online, they were asked not to do it second time. This instruction was included on the consent form as well. The survey was available for approximately three months until all data were collected. After three months, the researcher cut off data collection and started analyzing the data.

The figure 1 provided the protocol of the researcher's website in which the survey instrument was stored.

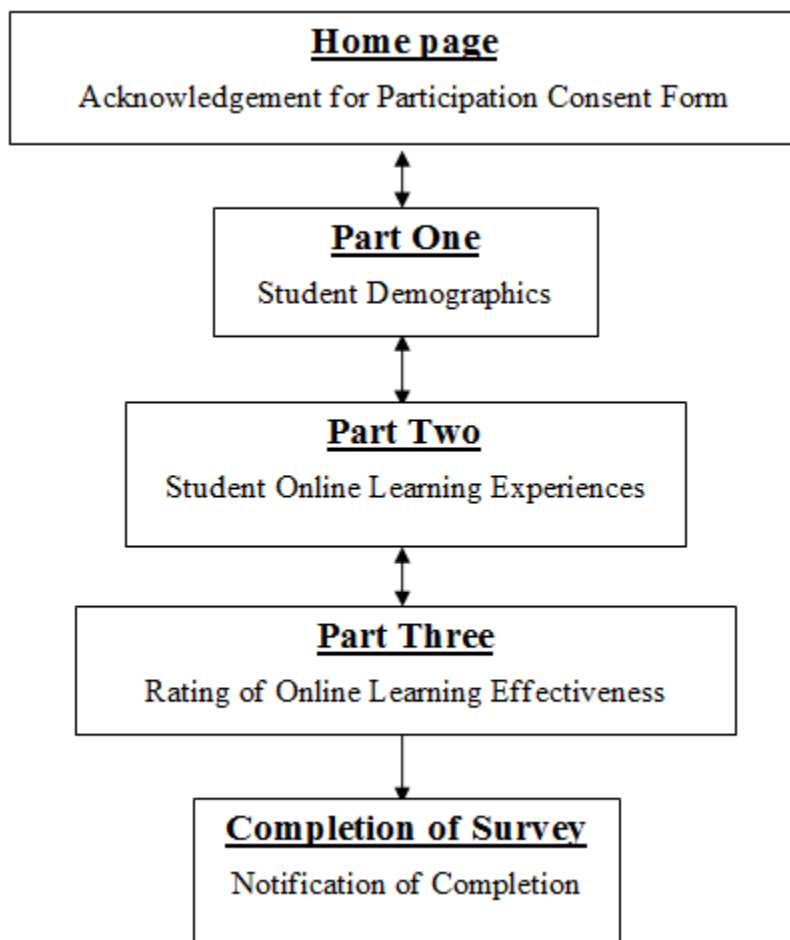


Figure 1. Flowchart of web survey instrument questionnaire.



## **Data Analysis**

The independent variables used in this study were interactivity, collaboration, communication media, and group trust. The dependent variable used in this study was online learning effectiveness. Since the student's perception of online learning effectiveness was a broad concept, the researcher further broke down this broad concept into six specific items: overall higher order thinking and critical thinking abilities, overall knowledge construction, do well in online courses, finish program or degree online, do well in online assignments and tests, and reach educational goal. All the six items were placed in the third part of the survey instrument, Effectiveness of Online Learning. Data obtained from the six items were used together as one single dependent variable in the statistical data analysis.

A coding system was developed and the data were entered and analyzed by using Statistical Package for Social Sciences (SPSS) release 19.0. The data were analyzed using various descriptive statistics, correlational statistics, and multiple regression from SPSS. The statistical analysis methods used to answer each research question are discussed in detail in the subsequent paragraphs.

Questions 17a-17f were designed to answer research question one: What are students' perceptions towards effective online learning experiences? Descriptive statistics include the means, standard deviations, percentages, and frequency distributions. The responses to these six items were first reported individually and then summed up and analyzed as a single score which was the dependent variable. This dependent variable was labeled as perceived online learning effectiveness for further data analysis. When entering data into SPSS, the researcher used the number that participants circled as

indicators for different levels of learning effectiveness they perceived. Specifically, 1 indicated an extremely low level of effectiveness, 3 indicated moderate or medium levels of effectiveness, and 5 indicated excellent effectiveness.

The second research question asks which factor has the strongest relationship to students' perception of effective online learning.

Questions 13a-13d were designed to address the research question 2a: Is there a meaningful relationship between interactivity and students' perceptions of effective online learning? Correlational statistics were used to analyze this research question.

Questions 14a-14d were designed to answer research question 2b: Is there a meaningful relationship between collaboration and students' perceptions of effective online learning? Correlational statistics were used to analyze this research question.

Questions 15a-15d were designed to answer the research question 2c: Is there a meaningful relationship between communication media and students' perceptions of effective online learning? Correlational statistics were used to analyze this research question.

Questions 16a-16d, and 16f were designed to answer the last research question 2d: Is there a meaningful relationship between trust and students' perceptions of effective online learning? Correlational statistics were used to analyze this research question.

### **Multiple regression analysis**

The primary method used in this study was multiple regression. A multiple regression model was used to address research question 3, to examine the variance this model explains regarding students' perception of online learning effectiveness. Online learning effectiveness was entered as dependent variable; gender, age, ethnicity, class

rank, employment status, number of online courses, computer expertise, previous online grades, interactivity, collaboration, communication media, group trust, and demographic variables were entered as independent variables. Each independent variable was entered at one time and a best model explaining most variance was identified among several models.

The general purpose of multiple regression was to learn more about the relationship among several independent variables and a dependent variable. It indicates how much of the variance found in the outcome variable was attributed to the independent variables (Gay et al., 2009). In multiple regression, the following equation was solved:

$$Y = b_0 + b_1 * X_1 + b_2 * X_2 + \dots + b_p * X_p \quad (1)$$

In this model,  $b_0$  represented the intercept and  $b_1, b_2, \dots, b_p$  were the regression coefficients for the predictors  $X_1, X_2, \dots, X_p$ , respectively (Howell, 2001).

For this study, multiple regression was an appropriate method to address the research questions. The dependent variable was the effectiveness of online learning, independent variables were interactivity, collaboration, communication media, group trust, and demographic variables. Using multiple regression models, regression coefficients were used to show how much each independent variable affected dependent variable. The figure 2 illustrated the regression model of this study.

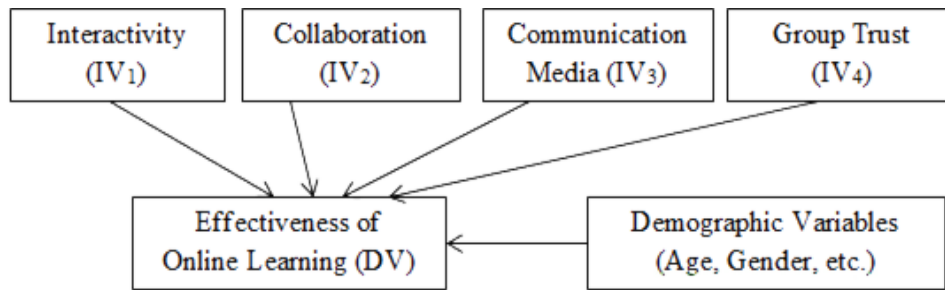


Figure 2. Multiple Regression Model.

Besides examining the major four independent variables, demographic variables (age, gender, ethnicity, class rank, employment status, number of online courses taken previously, computer expertise, family income, parent education, and previous grades for online courses) were also analyzed to test their influence on the dependent variable.

The individual variables within this regression model were checked for normality, linearity, homoscedasticity, and independence of error terms to see whether those assumptions have been met. If the data obtained for individual variables did not meet these assumptions, data transformation was used. The correlation matrix for the five variables was examined to see if there was a multicollinearity effect. Multicollinearity was checked because it could reduce an independent variable's predictive power to the extent that it was associated with the other independent variables (Hair et al., 2009). If multicollinearity effect was determined, regression on principal components was used to obtain another model (Hair et al., 2009).

CHAPTER IV  
DATA ANALYSES

**Introduction**

This study was designed to investigate the following three research questions.

1. What are students' perceptions towards effective online learning experiences?
2. Which factor has the strongest relationship to students' perception of effective online learning? Specifically:
  - Is there a meaningful relationship between interactivity and students' perceptions of effective online learning?
  - Is there a meaningful relationship between collaboration and students' perceptions of effective online learning?
  - Is there a meaningful relationship between communication media and students' perceptions of effective online learning?
  - Is there a meaningful relationship between group trust and students' perceptions of effective online learning?
3. How much variance does this model (gender, age, ethnicity, class rank, employment status, number of online courses, computer expertise, previous online grades, interactivity, collaboration, communication media,

and group trust) explain of students' perceptions of the effectiveness of online learning and what is the greatest contributor in this model?

This research employed both descriptive and inferential statistics in order to explore students' perceptions of online learning effectiveness; the relationships between online learning effectiveness and interactivity, collaboration, communication media, and group trust; and variances that can be accounted for by these variables. In Chapter four, findings of this study are structured into three sections:

1. Description of population and students' online learning effectiveness.
2. Relationships among independent variables and dependent variable.
3. Variables that predict students' online learning effectiveness and the effect size of these variables.

### **Description of the Population**

A survey instrument was utilized to collect data and was administrated in classroom as well as through Internet. Students agreed to participate in this study before they started the survey; data were collected during the summer of 2012 at a southern university. There were 401 responses received, 216 of them were responses from participants in face-to-face classes, and 185 of them were from participants in online classes. All participants were currently enrolled in an online course or had experience in online classes. The following section describes the characteristics of the population. In this section, N varies from 391 to 401 since some participants did not answer specific questions.

### **Gender, age, ethnicity of participants**

As shown in Table 1, slightly more females participated in the study than males. Table 2 shows the age distribution of participants. Sixty-one percent of the participants were below the age of 30. The distribution of participants' ethnicity is reported in Figure 3.

Table 1

#### *Gender of participants*

	Frequency	Percentage
Male	195	48.6
Female	206	51.4
Total	401	100.0

Table 2

#### *Age of the participants*

	Frequency	Percentage
< 20	12	3.0
20 – 29	233	58.1
30 – 39	77	19.2
40 – 49	46	11.5
50 – 59	29	7.2
> 59	4	1.0
Total	401	100.0

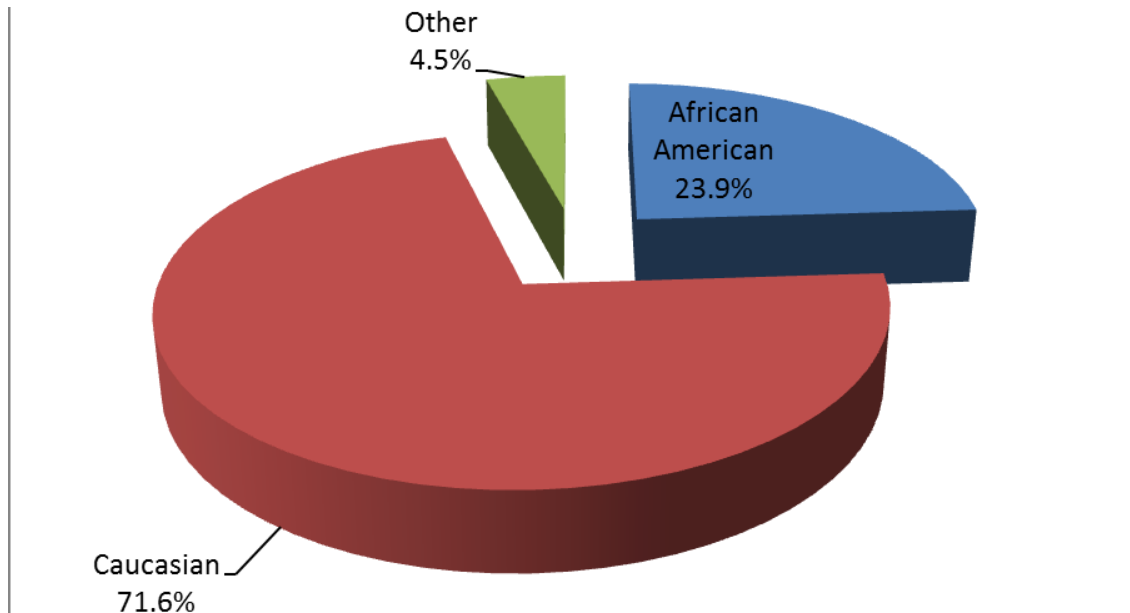


Figure 3. Ethnicity of participants.

### Class rank

In this study, class rank was classified as freshman, sophomore, junior, senior, and graduate student. Frequency and percentage are shown in Table 3. Fifty-nine percent (59%) of the participants were undergraduate students.



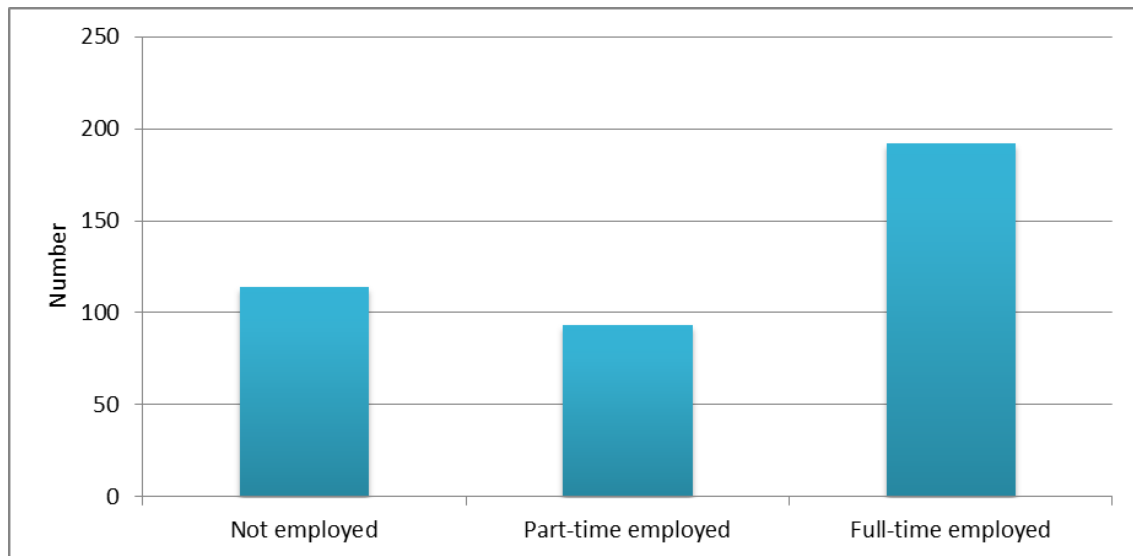
Table 3

*Class rank*

	Frequency	Percentage
Freshman	10	2.5
Sophomore	11	2.8
Junior	43	10.8
Senior	171	42.8
Graduate student	165	41.3
Total	400	99.8
Missing	1	0.2

**Employment status**

Employment status was classified as not employed, part-time employed, and full-time employed. Figure 4 shows that nearly half of the students (48%) were full-time employees.



*Figure 4.* Employment status.

### **Number of online courses taken previously**

Table 4 shows that the majority of the participants had prior online learning experiences. Ninety five percent (95%) of the students had taken one or more online courses. To be more specific, 234 (58.4%) of all the participants had taken three or more online courses previously; 73 (18.2%) had taken two, and 75 (18.7%) had taken one.

Table 4

*Number of online courses taken previously*

	Frequency	Percentage
None	18	4.5
One	75	18.7
Two	73	18.2
More than two	234	58.4
Missing	1	0.2
Total	401	100.0

Note: "None" means they are currently taking their first online class.

### **Computer expertise**

Computer expertise was ranked as novice, intermediate, advanced, and expert. As shown in Figure 5, most participants (90%) considered their computer expertise as intermediate or advanced.

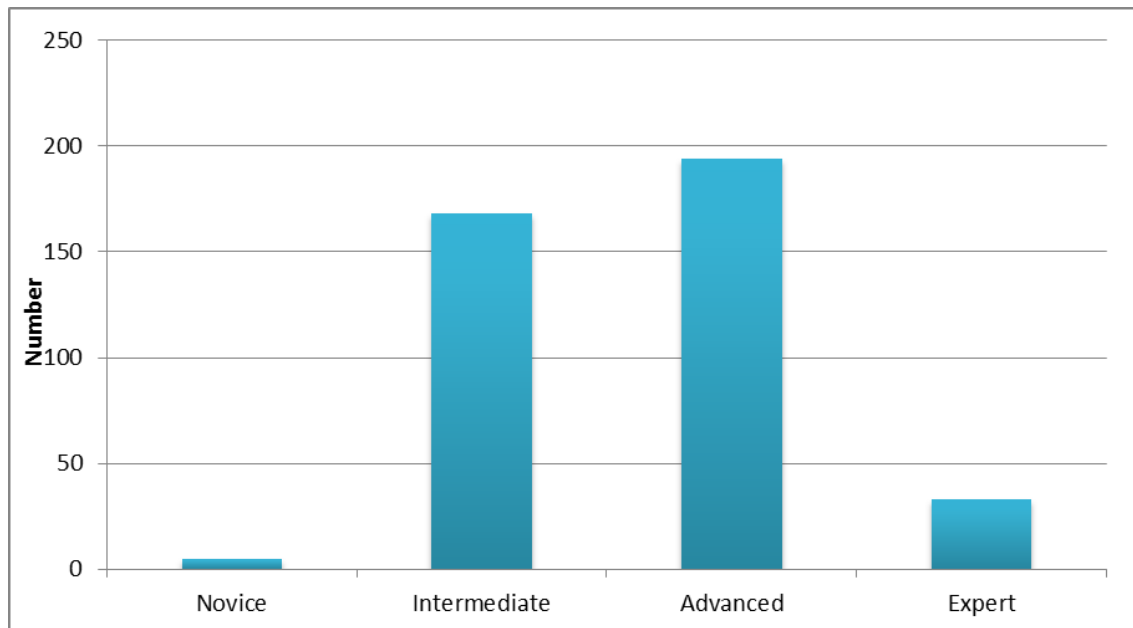


Figure 5. Computer expertise.

### Reasons for taking online courses

Reasons for taking online courses were classified as online classes offer more knowledge than traditional classroom lessons; it saves me time and money; the flexibility to take online class anytime, anywhere; it is a required course in my program; it's easy to get a good grade (A or B) in online classes; and other. Participants were allowed to choose multiple options for this item. As shown in Figure 6, flexibility was ranked the top reason that students took online courses. The reason ranked second popular “required class”, which meant the online course was required by the program.

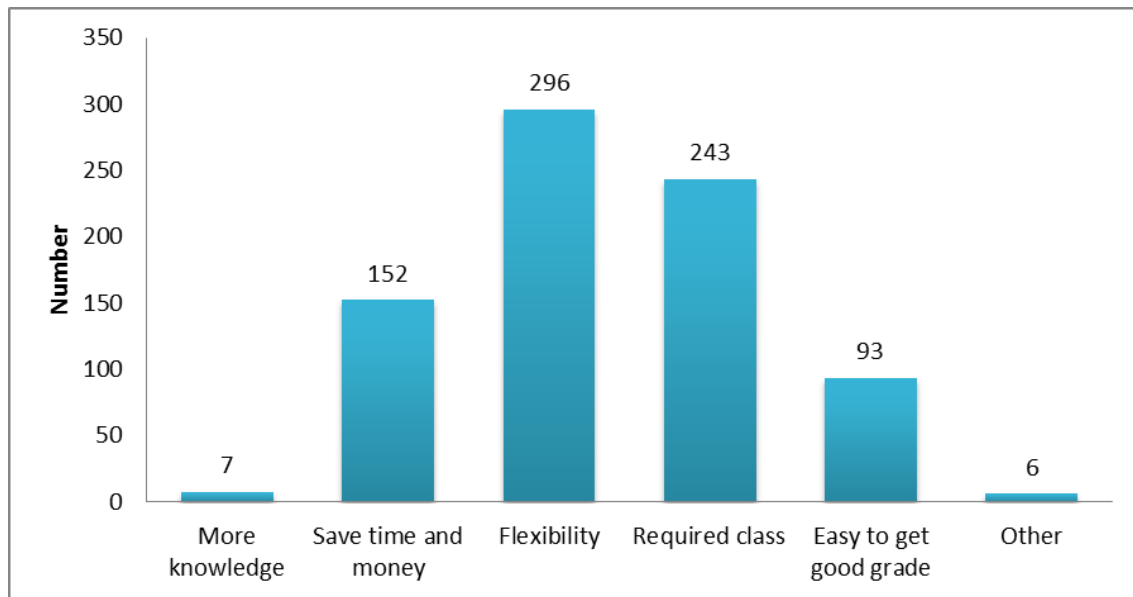


Figure 6. Reasons for taking online courses.

### Family income

As shown in Table 5, 57.1% of participants had a family income above 50,000 dollars. Fourteen percent (14%) of the participants' family income was between 35,000 and 49,999, 11.5% of the participants had a family income between 25,000 and 34,999. 15.4% of the family had an income less than 24,999.

Table 5

*Family income*

	Frequency	Percentage
< 14,999	25	6.2
15,000 – 24,999	37	9.2
25,000 – 34,999	46	11.5
35,000 – 49,999	56	14.0
> 50,000	229	57.1
Total	393	98.0
Missing	8	2.0

**Parent education**

More than half (54.1%) of the participants reported that one or more parent had a college degree or higher. Table 6 also shows a distribution of parent education level.

Table 6

*Parent education*

	Frequency	Percentage
None	1	0.2
Elementary school	4	1.0
Some high school	13	3.2
Completed high school	80	20.0
Some college	86	21.4
Completed college	110	27.4
Master or other graduate degree	107	26.7
Total	401	100.0

### Previous grades for online courses

Table 7 shows students' grades for their previous online courses. The majority (91.3%) earned a B or above. Only two students, less than 1% reported failing a previous online class.

Table 7

#### *Previous grades of online courses*

	Frequency	Percentage
Mostly A's	233	58.1
Mostly B's	133	33.2
Mostly C's	22	5.5
Mostly D's	1	0.2
Fail	2	0.5
Missing	10	2.5
Total	401	100.0

### Research Question One

This section reports students' perception of effective online learning.

Research question one:

What are students' perceptions towards effective online learning experiences?

To answer the first research question, the researcher used various descriptive statistics for students' ratings of the online learning effectiveness. Table 8 and Table 9 show the interpretation of the Likert Scale used to evaluate students' perception of online learning.

Table 8

*Interpretation of online learning (Part 1)*

Likert Scale	Interpretation
1	Extremely poor
2	Below average
3	Average
4	Above average
5	Excellent

Table 9

*Interpretation of online learning (Part 2)*

Likert Scale	Interpretation
1	Not at all likely
2	Not very likely
3	Somewhat likely
4	Likely
5	Extremely likely

The dependent variable, Online Learning Effectiveness, was measured by the following six items (17a, 17b, 17c, 17d, 17e, and 17f), using a mean rating of these six items. For each individual student, his/her rating for these items was added together and then divided by six. The result was his/her rating for online learning effectiveness. Table

10 shows how students rated their online learning effectiveness. The mean rating of students' online learning effectiveness is 4.10 (out of maximum of 5).



Table 10

*Items relating to online learning effectiveness in percentages*

Question #	Extremely poor	Below average	Average	Above average	Excellent
17a. I would rate my overall higher order thinking ability and critical thinking ability after online course as:	0.3	3.0	28.6	49.4	18.8
17b. I would rate the overall knowledge construction in this online course as:	1.3	6.3	30.5	41.8	20.3
17c. I will do well in my online courses.	0.2	1.5	10.7	33.9	53.6
17d. I will finish my program or degree online.	17.8	15.0	8.0	13.0	46.3
17e. I will do well my online course assignments and tests.	0.0	1.5	10.0	35.0	53.5
17f. I will reach my educational goal.	0.0	0.5	4.8	16.5	78.3

Note: N varies from 399 – 400.



### **Computer expertise and online learning effectiveness**

Computer expertise was classified as novice, intermediate, advanced, and expert. Results of Pearson correlation indicated that online learning effectiveness was correlated significantly with computer expertise,  $r = .20$ ,  $**p < .01$ .

One-Way ANOVA was used to determine if there was a statistically significant difference in online learning effectiveness based on computer expertise. Checks on homogeneity of variances yielded no problem of assumption,  $p = .346$ . Results from ANOVA (Table 11) indicated that there was a statistically significant difference among different computer expertise groups,  $F(3,390) = 5.2$ ,  $p < .01$ . Post Hoc tests using least Significant Difference (LSD) indicated that students who viewed themselves as experts in computer expertise rated their online learning effectiveness significantly higher ( $M = 4.37$ ,  $SD = 0.67$ ,  $n = 31$ ) than those who viewed themselves as intermediate in computer expertise ( $M = 3.98$ ,  $SD = 0.62$ ,  $n = 167$ ). Students who viewed themselves as advanced in computer expertise rated their online learning effectiveness significantly higher ( $M = 4.18$ ,  $SD = 0.6$ ,  $n = 191$ ) than those who viewed themselves as intermediate in computer expertise ( $M = 3.98$ ,  $SD = 0.62$ ,  $n = 167$ ). Table 12 provides details of Post Hoc tests among different computer expertise groups.

Table 11

*ANOVA of computer expertise and online learning effectiveness*

	Sum of Squares	df	Mean Square	F
Between Groups	6.023	3	2.008	5.202**
Within Groups	150.514	390	.386	
Total	156.537	393		

Note: \*\*  $p < .01$ 

Table 12

*Post hoc tests of computer expertise and online learning effectiveness*

Computer Expertise	Computer Expertise	Mean Difference	Std. Error
Novice	Intermediate	-.076	.282
	Advanced	-.275	.281
	Expert	-.465	.299
Intermediate	Novice	.076	.282
	Advanced	-.199**	.066
	Expert	-.390**	.121
Advanced	Novice	.275	.281
	Intermediate	.199**	.066
	Expert	-.191	.120
Expert	Novice	.466	.299
	Intermediate	.390**	.121
	Advanced	.191	.120

Note: \*\*  $p < .01$

### Online courses taken previously and online learning effectiveness

A Pearson Product Moment Correlation was used to test whether there was a relationship between online courses taken previously and online learning effectiveness. The relationship was found as,  $r = .23$ ,  $**p < .01$ .

An ANOVA was used to determine if there was a statistically significant difference in online learning effectiveness based on online courses taken previously. Checks on homogeneity of variances yielded no problem of assumption,  $p = .07$ . Results from the ANOVA (Table 13) indicated that there was statistically significant difference among different computer expertise group,  $F(3,390) = 13.43$ ,  $***p < .001$ . Post Hoc tests using LSD indicated that students who took more than two online courses rated their online learning effectiveness significantly higher ( $M = 4.25$ ,  $SD = 0.59$ ,  $n = 229$ ) than those who took one online course previously ( $M = 3.81$ ,  $SD = 0.67$ ,  $n = 74$ ). Students who took more than two online courses rated their online learning effectiveness significantly higher ( $M = 4.25$ ,  $SD = 0.59$ ,  $n = 229$ ) than those who took two online courses previously ( $M = 3.9$ ,  $SD = 0.62$ ,  $n = 73$ ). Table 14 provides details of Post Hoc tests about the number of online courses taken previously.

Table 13

*ANOVA of online courses taken and online learning effectiveness*

	Sum of Squares	df	Mean Square	F
Between Groups	14.666	3	4.889	13.425***
Within Groups	142.024	390	.364	
Total	156.691	393		

Note: \*\*\*  $p < .001$

Table 14

*Post hoc tests of online courses taken and online learning effectiveness*

N Online Course	N Online Course	Mean Difference	Std. Error
None	One	.386*	.159
	Two	.291	.159
	More than two	-.059	.148
One	None	-.386*	.159
	Two	-.095	.100
	More than two	-.445***	.081
Two	None	-.291	.159
	One	.095	.100
	More than two	-.350***	.081
More than two	None	.059	.148
	One	.445***	.081
	Two	.350***	.081

Note: \*  $p < .05$ ; \*\*\*  $p < .001$

### Research Question Two

This section examines the relationship among the four independent variables and dependent variable. The independent variables include: interactivity, collaboration, communication media, and group trust. The dependent variable is: online learning effectiveness.

Which factor has the strongest relationship to students' perception of effective online learning? Specifically:

- Is there a meaningful relationship between interactivity and students' perceptions of effective online learning?
- Is there a meaningful relationship between collaboration and students' perceptions of effective online learning?

- Is there a meaningful relationship between communication media and students' perceptions of effective online learning?
- Is there a meaningful relationship between group trust and students' perceptions of effective online learning?

The following tables show the questions on the instrument (Appendix A) that measure each of the variables in the study. Interactivity was measured by items 13a, 13b, 13c, and 13d (Table 15); collaboration was measured by items 14a, 14b, 14c, and 14d (Table 16); communication media was measured by items 15a, 15b, 15c, and 15d (Table 17); group trust was measured by items 16a, 16b, 16c, 16d, and 16f (Table 18). The mean rating was calculated for each independent variable. Table 19 consisted of the means and standard deviations of the dependent variable and four independent variables.

Table 15

*Items relating to interactivity in percentages*

Question #	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
13a. I was given multiple ways to interact with other students in my online course, such as email, discussion board, chat room, web-conferencing, etc.	2.2	9.0	3.7	47.4	37.7
13b. I was given multiple ways to interact with my instructor in my online course, such as email, discussion board, chat room, etc.	1.2	6.7	4.5	7.9	39.7
13c. The interaction with other students helped me to succeed in online course.	9.0	18.7	21.9	2.4	18.0
13d. The instructor's feedback helped me to succeed in this course.	5.2	10.7	14.5	45.6	23.9

Note: N = 401



Table 16

*Items relating to collaboration in percentages*

Question #	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
14a. If a task is sufficiently challenging, I am more likely to be actively engaged in collaborations.	1.8	10.3	15.6	56.5	15.8
14b. Using collaboration among students in the group, the group should be able to take a very difficult task and complete it in an efficient manner.	0.8	6.3	17.1	58.9	16.9
14c. When using team collaboration on a complex group project, a variety of task types can be utilized for the effectiveness of the end results of the group project.	0.5	3.8	20.3	58.7	16.7
14d. I enjoyed feelings of safety or control in completing a collaborative task.	3.5	9.8	26.5	45.7	14.4

Note: N varies from 395 to 398

Table 17

*Items relating to communication media in percentages*

Question #	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
15a. I used discussion boards and chat rooms a lot in online course	7.2	24.5	10.0	35.3	23.0
15b. I had face-to-face meetings with my group members.	40.8	33.8	6.0	15.8	3.8
15c. I contacted my group member with personal email besides the online learning and management system.	26.0	25.3	7.8	32.0	9.0
15d. I contacted my group members with cell phones, including text and phone call.	30.1	23.8	7.3	29.6	9.3

Note: N varies from 399 to 400

Table 18

*Items relating to group trust in percentages*

Question #	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
16a. I trusted my group members and believe that they would finish the part of job they are supposed to do.	4.3	13.3	31.6	42.3	8.4
16b. I built friendship with my group members online and we contacted each other out of class.	15.0	29.7	24.4	23.9	7.1
16c. I prefer to be the leader in the group.	4.1	16.2	33.2	30.9	15.7
16d. I have the will and desire to work in a racially mixed group for online project.	1.3	3.0	17.8	44.4	33.5
16f. Peer support is a give-and-take process where a sense of fairness is essential.	0.8	1.3	17.3	55.0	25.7

Note: N varies from 392 to 395

Table 19

*Descriptive statistics of independent variables*

	Mean	Standard deviation	N
Interactivity	3.83	0.81	401
Collaboration	3.76	0.67	394
Communication media	2.72	0.95	399
Group trust	3.53	0.58	389
Online learning effectiveness	4.10	0.63	395

Table 20 provides the interpretation of Pearson Product Moment Correlation values and Table 21 shows the Cronbach's alpha coefficients and Pearson Product Moment Correlations among the four independent variable (interactivity, collaboration, communication media, and group trust) and dependent variable. The Cronbach's alpha coefficients for interactivity, collaboration, communication media, group trust, and online learning effectiveness were .76, .78, .69, .56, and .75, respectively. Online learning effectiveness was correlated significantly with interactivity ( $r = .42, p < .01$ ), collaboration ( $r = .15, p < .01$ ), and group trust ( $r = .18, p < .01$ ). Only interactivity had a meaningful and significant relationship with online learning effectiveness.

A moderate positive and significant relationship (Pearson Correlation) was found between interactivity and online learning effectiveness,  $r = .42, p < .01$ . (Table 21) For other three variables, the relationship was not meaningful.

Table 20

*Interpretation of Pearson Correlation*

Pearson Coefficient ( $r$ )	Relation Between Variables
Between $-.35$ and $+.35$	Weak or none
Between $+.35$ and $+.65$ or between $-.35$ and $-.65$	Moderate
Between $+.65$ and $1.00$ or between $-1.00$ and $-.65$	Strong

Note: Table retrieved from Gay et al., (2009)

Table 21

*Alpha Coefficients and Pearson Correlation Interactivity, Collaboration, Communication media, Group trust, and Online learning effectiveness*

Variables	Alpha	M	SD	Interactivity	Collaboration	Communication	
						Media	Group Trust
Interactivity	.76	3.83	0.81	----			
Collaboration	.78	3.76	0.67	.38**	----		
Communication media	.69	2.72	0.95	.31**	.32**	----	
Group trust	.56	3.53	0.58	.35**	.44**	.53**	----
Online learning effectiveness	.75	4.10	0.63	.42**	.15**	.05	.18**

Note: N varies from 389 to 401. \*\*  $p < .01$

### Research Question Three

This section addressed research question three: how much variances these four independent variables (interactivity, collaboration, communication media, and group trust) explain in students' online learning effectiveness, and which independent variable accounts for the most variance.

#### Multiple linear regression procedures

To answer research question three, the researcher used a multiple linear regression to explain the variance in students' learning effectiveness. In this regression model, online learning effectiveness served as dependent variable, demographic variables (age, gender, ethnicity, class rank, employment status, number of online courses taken previously, computer expertise, and previous online course grades) and four independent variables (interactivity, collaboration, communication media, and group trust) were entered as independent variables. Different regression models were compared to obtain the optimal model.

**Model one: Dependent variable and eight demographic variables.** The eight demographic variables were gender ( $X_1$ ), age ( $X_2$ ), ethnicity ( $X_3$ ), class rank ( $X_4$ ), employment status ( $X_5$ ), number of online course taken previously ( $X_6$ ), computer expertise ( $X_7$ ), and previous online course grades ( $X_8$ ). Model one explained 23% of the variance in student learning effectiveness,  $R^2 = .25$ ,  $R^2_{adj} = .23$ ,  $F(8, 355) = 14.41$ ,  $***p < .001$ . Multicollinearity was checked and all VIFs (variance inflation factors) were less than 1.5 which meant no demographic variables were highly correlated.

**Model two: Dependent variable, eight demographic variables, and Interactivity.** In this model, the predictor Interactivity was added to the right side of equation besides the eight demographic variables. No multicollinearity problem was found for this analysis. The results indicated that Model two explained 33% of the variance in student learning effectiveness,  $R^2 = .34$ ,  $R^2_{\text{adj}} = .33$ ,  $F(9, 354) = 20.44$ ,  $***p < .001$ . Adjusted  $R^2$  increased from .23 to .33 after Interactivity was added as predictor.

**Model three: Dependent variable, eight demographic variables, and Collaboration.** Predictor Collaboration (instead of Interactivity) was added to regression equation with demographic variables. Therefore, Model three included the dependent variable, eight demographic variables and Collaboration. No multicollinearity problem was found for the analysis. This model explained 25% of the variance in student learning effectiveness,  $R^2 = .27$ ,  $R^2_{\text{adj}} = .25$ ,  $F(9, 349) = 14.57$ ,  $***p < .001$ . Adjusted  $R^2$  increased from .23 to .25 after Collaboration was added as predictor.

**Model four: Dependent variable, eight demographic variables, and Communication Media.** Model four included the dependent variable, eight demographic variables, and Communication Media. No multicollinearity problem was found. This model explained 24% of the variance in student learning effectiveness,  $R^2 = .25$ ,  $R^2_{\text{adj}} = .24$ ,  $F(9, 352) = 13.33$ ,  $***p < .001$ . Adjusted  $R^2$  increased from .23 to .24 after Communication Media was added as predictor.

**Model five: Dependent variable, eight demographic variables, and Group trust.** Model five included the dependent variable, eight demographic variables, and Group Trust. A multicollinearity test was performed and indicated no problems. This



model explained 26% of the variance in student learning effectiveness,  $R^2 = .28$ ,  $R^2_{adj} = .26$ ,  $F(9, 361) = 14.94$ ,  $***p < .001$ . Adjusted  $R^2$  increased from .23 to .26 after Group Trust added as predictor.

**Model six included the dependent variable, eight demographic variables, Interactivity, Collaboration, Communication Media, and Group Trust.** Model six included the dependent variable, eight demographic variables, Interactivity, Collaboration, Communication Media, and Group Trust. Model six is a comprehensive model which contains eight demographic variables and four independent variables. The multiple correlation coefficient ( $R$ ), using all the predictors simultaneously, is .60 ( $R^2 = .365$ ) and the adjusted  $R^2$  is .342. However, the resulting tolerance statistics for Group Trust was less than .635 ( $1 - .365$ ), indicating that too much multicollinearity (overlap between predictors) exists. According to Anderson and Miller (2002), “a tolerance value less than  $1 - R^2$  indicated that a variable was highly correlated with at least one other independent variable in this analysis” (p. 17). As a result, the variable relating to Group Trust was removed from the subsequent multiple regression analyses for two reasons: (a) group trust was highly correlated with communication media ( $r = .53$ ) and collaboration ( $r = .44$ ), and (b) its alpha coefficient was relatively low ( $\alpha = .56$ ). In addition, during this stage of preliminary data analyses, the researcher excluded two outliers ( $|\text{Std. Residual}| > 3.0$ ) from subsequent data analyses. The two outliers were case 316 and 317.

**Model seven (Final model): Dependent variable, eight demographic variables, Interactivity, Collaboration, and Communication Media.** The sample in the present study was 71.6% Caucasian, 23.9% African American, 1.9% others, 1.2%

Latino, 1.0% Asian American, and 0.2% Native American. As 95.5% of the participants were either Caucasians or African Americans, it would be interesting to incorporate race as a variable in multiple regression. As a result, Caucasian students were recorded as 1, African American students were recorded as 0, whereas as 4.5% of the students from other racial backgrounds were excluded from multiple regressions. Furthermore, all the undergraduate students (freshman, sophomore, junior, and senior) were recorded as 0, and graduate students were recorded as 1.

The following eleven variables were entered (Model seven): gender, age, ethnicity, class rank, employment status, number of online course taken previously, computer expertise, previous online course grades, interactivity, collaboration, and communication media. A multiple linear regression was conducted and two more outliers ( $|Std. Residual| > 3.0$ ) were found and excluded from subsequent analyses. The two outliers are case 1 and 54.

Finally, the above mentioned eleven independent variables, gender ( $X_1$ ), age ( $X_2$ ), ethnicity ( $X_3$ ), class rank ( $X_4$ ), employment status ( $X_5$ ), number of online course taken previously ( $X_6$ ), computer expertise ( $X_7$ ), previous online course grades ( $X_8$ ), interactivity ( $X_9$ ), collaboration ( $X_{10}$ ), and communication media ( $X_{11}$ ) were entered. No outliers were found and review of the tolerance statistics indicated that all independent variables were tolerated in the model. Checks on normality, linearity, homoscedasticity, multicollinearity yielded no problem either. Together, these variables explained 38% of the variance in student learning effectiveness,  $R^2 = .40$ ,  $R^2_{adj} = .38$ ,  $F(11, 341) = 20.76$ ,  $p < .001$ . A summary of regression coefficients is presented in Table 22. The variable corresponding to interactivity was the best predictor of online learning effectiveness ( $\beta$

= .37, \*\*\* $p < .001$ ). This variable was followed by previous online grades ( $\beta = -.30$ , \*\*\* $p < .001$ ), age ( $\beta = .15$ , \*\* $p < .01$ ), employment status ( $\beta = .13$ , \* $p < .05$ ), the number of online courses taken ( $\beta = .12$ , \* $p < .05$ ) and ethnicity ( $\beta = -.10$ , \* $p < .05$ ).

Table 22

*Multiple regression predicting online learning effectiveness*

Independent Variables	$\beta$	$F$	Total $R^2$	Total $R^2_{adj}$
1. Gender	.04			
2. Age	.15**			
3. Ethnicity	-.10*			
4. Class rank	.01			
5. Employment status	.13*			
6. Number of online courses	.12*			
7. Computer expertise	.07			
8. Previous online grades	-.30***			
9. Interactivity	.37***			
10. Collaboration	.07			
11. Communication media	-.03			
		20.76 (11, 341)***	.40***	.38

Note:  $N = 353$ . \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

## Summary of Findings

In this study, students' overall rating of online learning effectiveness is 4.10 (possible maximum 5) which indicates good overall online learning effectiveness. Online learning effectiveness is correlated significantly with interactivity ( $r = .42, p < .01$ ), group trust ( $r = .18, p < .01$ ), and collaboration ( $r = .15, p < .01$ ).

In the regression model, the following eleven independent variables, gender, age, ethnicity, class rank, employment status, number of online course taken previously, computer expertise, previous online course grades, interactivity, collaboration, and communication media, explains 38% of the variances to online learning effectiveness. Among these eleven variables, interactivity is the best predictor of online learning effectiveness ( $\beta = .37, ***p < .001$ ). The other significant predictors include previous online grades ( $\beta = -.30, ***p < .001$ ), age ( $\beta = .15, **p < .01$ ), employment status ( $\beta = .13, *p < .05$ ), the number of online courses taken ( $\beta = .12, *p < .05$ ) and ethnicity ( $\beta = -.10, *p < .05$ ).

## CHAPTER V

### FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

#### **Summary**

The present study examined the impact of interactivity, collaboration, communication media, and group trust on students' online learning effectiveness. The impact of gender, age, ethnicity, class rank, employment status, number of online course taken previously, computer expertise, and previous online course grades on learning effectiveness was also examined. In this study, online learning effectiveness is the dependent variable; interactivity, collaboration, communication media, and group trust are independent variables; gender, age, ethnicity, class rank, employment status, number of online course taken previously, computer expertise, and previous online course grades are demographic variables. Results from the multiple regression analyses revealed that most of the variance in students' learning effectiveness occurred at the interactivity level, followed by previous online grades, age, employment status, number of online courses taken, and ethnicity. This chapter discusses the findings, conclusions, and recommendations for future study.

#### **Findings**

A total of 401 students participated in this study. Descriptive statistics were used to answer the first research question. Pearson Product Moment Correlations were used to

answer research question two. Multiple regression analyses were used to answer research question three. The Statistical Package for Social Sciences (version 19) was the primary statistical program used for data analyses.

**Summary findings of research questions one:**

Research question one: What are students' perceptions of effective online learning?

The mean score of students' online learning effectiveness was 4.10, above average. To be specific, the mean score of "overall higher order thinking ability and critical thinking ability" was 3.83; the mean score of "overall knowledge construction" was 3.74; the average score of "will do well in my online courses" was 4.39; the mean score of "will finish my program or degree online" was 3.55; the mean score of "will do well in my online course assignments and tests" was 4.41; and the mean score of "will reach my educational goal" was 4.72. All of these scores were in the above average to excellent range. Reliability analyses using Cronbach's alpha yielded no problem of internal consistency,  $\alpha = .75$ . Additional analyses were conducted using correlations, Independent-samples T Test, and ANOVA. Two demographic variables were found to be significantly correlated with learning effectiveness: computer expertise and number of online courses taken. Students who reported that they had expert or advanced skills in computer technology indicated their online learning effectiveness was higher than students who reported an intermediate level of skills in computer technology. Students who had taken three or more online courses reported higher online learning effectiveness than those who had taken two or less online courses.

### **Summary findings of research question two:**

Research Question 2 was: Which factor has the strongest relationship to students' perception of effective online learning?

Pearson Product Moment Correlation analyses were used to answer research question two.

A moderate positive and significant relationship was found between interactivity and online learning effectiveness,  $r = .42, p < .01$ .

A weak positive and significant relationship was found between collaboration and online learning effectiveness,  $r = .15, p < .01$ .

A weak positive non-significant relationship was found between collaboration and online learning effectiveness,  $r = .05$ .

A weak positive and significant relationship was found between collaboration and online learning effectiveness,  $r = .18, p < .01$ .

Only the moderate positive and significant relationship between interactivity and online learning effectiveness,  $r = .42, p < .01$  is a meaningful finding.

### **Summary findings of research question three:**

Multiple linear regressions were used to answer question three. A series of multiple linear regressions were conducted and during the procedures, seven regression models were compared to determine the best model for predicting online learning effectiveness. Analyses of multiple linear regression models indicated that of the following variables: gender, age, ethnicity, class rank, employment status, number of online course taken previously, computer expertise, previous online course grades, interactivity, collaboration, and communication media; interactivity was the best

predictor for online learning effectiveness, followed by previous online grades, age, employment status, number of online courses taken and ethnicity.

### **Discussions and Conclusions**

This study found evidence that interactivity was the strongest predictor of students' online learning effectiveness. This finding supports previous study findings that interactivity is a key component in online learning (Chao, Hwu, & Chang, 2011; Gunawardena & Duphorne, 2001; Moore, 1989; Swan, 2001; Wanstreet, 2006;). Findings from this study also support other researchers' findings that students with stronger computer expertise tend to perform higher in an online environment than students with less computer expertise. (Menchaca & Bekele, 2008; Rakap, 2010; Shih, Munoz, & Sanchez, 2006; Summer, Waigandt, & Whittaker, 2005; Yan, 2004).

Limited quantitative research was located that explored the relationship between online learning effectiveness and demographic variables such as age, ethnicity, employment status, and previous online experiences. Findings of this study add to the literature in this area. Demographic information should be included in the analyses of students' learning effectiveness (Bradford & Wyatt, 2010).

Previous research concluded that ethnicity had little or no influence on student learning effectiveness (Bradford & Wyatt, 2010). However, results of this study show that ethnicity played a role on students' online learning effectiveness. African American students had higher levels of learning effectiveness than White/Caucasian students. Only these two ethnicity groups were included in final regression analysis because African American and Caucasian students accounted for 95.5% of all participants. The other 4.5% were extracted from the study.



Previous research has examined the relationship between online learning and different age groups. For the 16-24 age group, students had strong preference for traditional campus-based study; for the 25-34 age group, face-to-face study remained priority, but online learning gained more popularity than 16-24 age group; for the over 35 age group, online learning was the preference (Garrett, 2007). Garrett's finding indicated that older individuals prefer learning online more than face-to-face, while younger people prefer face-to-face study. In this study, age was positively correlated with online learning effectiveness; older participants preferred an on-line learning environment while younger participants preferred a face-to-face environment. This study also found that work status was a predicting factor for student online learning effectiveness. Possible explanations for this finding are: First, full-time employees come to take courses with specific learning purposes. They have less time to learn, so they need to plan their learning well and learn effectively. Second, full-time employees might have more social and life experiences which could help facilitate effective learning.

In Lim and Kim (2003) study, gender was a significant predictor of effective online learning. In their research, they reported that in an online learning environment, female students gained better learning outcomes than male students. However, gender was not a strong predictor of learning effectiveness in the current study. This finding could be the result of the large difference in sample size between this study and the Lim and Kim study. The sample size in Lim and Kim's (2003) study was 77 compared with 401 in current study.

The number of previous online courses taken was a moderate predictor of learning effectiveness in the current study. It seems logical that as students gain more experience

in an on-learning environment and the learning management system; many of the technical issues related to online classes would have less impact, enabling them to focus on the course content.

Kirby, Barbour, and Sharpe (2012) conducted a study to compare the online learning outcomes between college students who had previous online learning experiences in high school with those who didn't have such an experience. Their results indicated no differences between these two groups on learning outcomes. However, a high school online learning environment is not necessarily the same as a college online learning environment. The course management systems and learning tools might not be the same, and the structure of the online college learning environment is likely to be much different than that of a high school online learning environment. Further study needs to be done to compare the effect of students' high school online learning experiences and their college online learning experiences.

The findings of the current study did not show that collaboration was a key component of online learning effectiveness. This finding does not support prior research findings. Peer-to-peer collaboration and active learning has been a key component to online learning effectiveness (Chen, Gonyea, & Kuh, 2008; Jahng, Neilsen, & Chan, 2010). Learning in a group is an important way to help students gain experience in collaboration, develop their skills in critical thinking and reconstruction of knowledge (Brindley et al., 2009). There are several possible reasons why collaboration was not a predictor of online learning effectiveness in this study. First of all, 48% of the participants were full-time employees who might not have had the time to devote a significant amount of time working on group projects and interacting with group

members. Secondly, some participants reported that they didn't have a collaboration component in their online courses; they didn't have group assignment; and they did not have group discussions. Possible explanations for the limited amount of collaboration expressed by some participants are: some online instructors had limited knowledge or experiences in the design and development of effective online courses. They didn't see the importance of group work in an online environment. They excluded collaboration because they didn't feel it fit into the subject they taught. In many highly technical online courses, students spend time learning and applying specific skills individually and there is little group work in the class. Participants in this study were from different colleges and departments. They came from the college of education, the college of business, and the college of arts and sciences. Some students had taken only one online course during their entire college experience while others had taken their entire program online. In the future, researchers could separate online learners based on their departments or majors to see whether collaboration is an important component of their courses.

In the current study, communication media was not found as a significant predictor of online learning effectiveness. Many participants rated communication media the least important among four major independent variables. But previous researchers found that communication media was necessary for an effective online learning environment (Eastman & Swift, 2002; Jahng, Neilsen, & Chan, 2010). One reason communication media might not been a significant predictor of online learning effectiveness is many online courses require students to work on their own. In such courses, each student works individually and doesn't need to communicate or discuss

course content with his or her classmates. Another reason might be that the online instructor was not an effective communication facilitator. For example, instructors should initiate discussion topics using various communication media, such as discussion boards or chat rooms. Students can only play limited roles in initiating the use of media. Future studies could be done to compare communication media usage between a class with an effective communication facilitator and a class with a less effective facilitator.

The present study further suggests that feedback and student initiative play an important role in most of the variance in online learning effectiveness. Consequently, it would be beneficial to promote feedback among the instructor and students in the online learning process.

In summary, online learning effectiveness is affected by many elements such as the structure of the course, the course management system, the instructors, technology and so on. More research needs to be done from different perspectives to determine the predictors of online learning effectiveness.

### **Recommendations**

There are several recommendations for future researchers. First, it is recommended that participants for this type of study need to be classified. For example, researchers could sample a population from the same department or major. Online courses offered by the same department may share some attributes, such as focusing on group work or having an interest in discussion. These courses are more likely to create a similar online learning environment. The more similar those online courses are, the more representative the findings will be.

Second, more needs to be known regarding the relationship between collaboration and online learning effectiveness. In this study, the relationship between these two variables was low. Collaboration was not a predictor of the learning effectiveness. However, prior researchers have reported the importance of collaboration for successful online learning. The component of collaboration was missing in some of the online courses analyzed in this study. Future study should be done to compare the online courses with collaboration work built in and the same online courses without collaboration work so that the relationship between collaboration and learning effectiveness can be examined more clearly.

Third, more research need to be done to analyze the use of communication media in an online learning environment. Results of this study showed a lack of usage of various communication media by students. Communication media was the weakest predictor of online learning effectiveness of the four independent variables. In the future, online courses with rich application of various communication media could be analyzed to examine the relationship between learning effectiveness and communication media. The current study included some online courses with limited use of communication media.

Fourth, future research is also needed to determine the relationship between learning effectiveness and group trust. Prior research indicated group trust was an important part of online group work (Smith, 2008). According to Smith (2008), high level collaboration in an online environment served as a prerequisite of a relatively high level group trust. In this study the correlation between learning effectiveness and collaboration was low. It is possible that a low level of group collaboration could

contribute to a low trust relationship among group members. Future studies of group trust and learning effectiveness should focus on the courses that already contain a powerful group collaboration component.

Finally, additional research needs to be done to justify relationships between computer expertise and learning effectiveness. In this study, participants who felt they were experts in using computers rated their online learning effectiveness higher than students with intermediate computer skills. But in the final regression model, computer expertise was not a strong predictor which meant the tested relationship between computer expertise and learning effectiveness was not strong enough. Therefore, the relationship needs to be further examined.

The relationship between class rank and learning effectiveness is another area needs more consideration. Results of this study indicated that graduate students rated their learning effectiveness higher than undergraduate students. But class rank didn't serve as a strong predictor for online learning effectiveness. Further study could be done in this area to investigate the relationship between online learning effectiveness and class rank. An online course offered to both undergraduate and graduate students is a good scenario for conducting this kind of research.

## REFERENCES

- Abrahamson, C. E. (1998). Issues in interactive communication in distance education. *College Student Journal*, 32(1), 33-42.
- Alderman, B. (2005). The role of interaction in enhancing achievement and student satisfaction in an online course: A rubric analysis. In G. Richards, *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education* (pp. 214-219). Chesapeake, VA: AACE.
- Allen, E., & Seaman, J. (2009a). *Entering the mainstream: The quality and extent of online education in the United States, 2003 and 2004*. Retrieved from The Sloan Consortium:  
[http://sloanconsortium.org/publications/survey/entering\\_the\\_mainstream2004](http://sloanconsortium.org/publications/survey/entering_the_mainstream2004)
- Allen, E., & Seaman, J. (2009b). *Staying the course-Online education in the United States, 2008*. Retrieved from The Sloan Consortium:  
[http://sloanconsortium.org/publications/survey/staying\\_course](http://sloanconsortium.org/publications/survey/staying_course)
- Allen, M., Bourhis, J., Burrell, N., & Mabry, E. (2002). Comparing student satisfaction with distance education to traditional classroom in higher education: A meta-analysis. *American Journal of Distance Education*, 16(2), 83-97.
- Alrech, P., & Settle, R. (1995). *The survey research handbook* (2nd ed.). Columbus, OH: McGraw-Hill.

- Anderson, J., & Miller, S. (2002). A study to assess patient satisfaction of transitioning from Medicaid to managed care by sickle cell patients in Hampton Roads, Virginia. *Journal of Health and Social Policy, 16*(1-2), 5-20.
- Armstrong, D. A. (2011). Students' perceptions of online learning and instructional tools: A qualitative study of undergraduate students use of online tools. *The Turkish Online Journal of Educational Technology, 10*(3), 222-226.
- Ascough, R. S. (2002). Designing for online distance education: Putting pedagogy before technology. *Teaching Theology and Religion, 5*(1), 17-29.
- Aubert, B., & Kelsey, B. (2003). Further understanding of trust and performance in virtual teams. *Small Group Research, 34*(5), 575-618.
- Baker, W., Hale, T., & Gifford, B. (1997). From theory to implementation: The mediated learning approach to computer-mediated instruction, learning and assessment. *Educom Review, 32*(5). Retrieved February 16, 2012, from <http://net.educause.edu/apps/er/review/reviewArticles/32542.html>
- Barbera, E. (2004). Quality in virtual education environments. *British Journal of Educational Technology, 1*, 13-20.
- Barnard, L., Paton, V., & Rose, K. (2007). Perceptions of online course communications and collaboration. *Online Journal of Distance Learning Administration Content, 5*(4), 1-9.
- Beauchamp, G., & Kennewell, S. (2010). Interactivity in the classroom and its impact on learning. *Computer & Education, 54*(3), 759-766.
- Bell, P. D. (2007). Predictors of college student achievement in undergraduate asynchronous web-based courses. *Education, 127*(4), 523-533.



- Benson, A. (2003). Dimensions of quality on online degree programs. *The American Journal of Distance Education, 17*(3), 145-159.
- Bickle, M. C., & Carroll, J. C. (2003). Checklist for quality online instruction: Outcomes for learners, the professor and the institution. *College Student Journal, 37*(2), 208-218.
- Bocialetti, G. (1988). Teams and the management of emotion. In W. B. Reddy, *Team building: Blueprints for productivity and satisfaction* (pp. 62-71). Arlington, VA: NTL Institute.
- Bradford, G., & Wyatt, S. (2010). Online learning and student satisfaction: Academic standing, ethnicity and their influence on facilitated learning, engagement, and information fluency. *Internet and Higher Education, 13*, 108-114.
- Brindley, J. E., Walti, C., & Blaschke, L. M. (2009). Creating effective collaborative learning groups in an online environment. *International Review of Research in Open and Distance Learning, 10*(3), 1-18.
- Brindley, J., Walti, C., & Blaschke, L. (2009). Creating effective collaborative learning groups in an online environment. *International Review of Research in Open and Distance Learning, 10*(3), 1-18.
- Bruce, B. (1999). Education online: Learning anywhere, any time. *Journal of Adolescent & Adult Literacy, 42*(8), 662-665.
- Bruce, S. M., & Hwang, T. (2001). Web-based teacher preparation in visual impairment: Course development, teaching, learning and quality assurance. *Journal of Visual Impairment & Blindness, 95*(10), 609-622.

- Bruffee, K. (1999). *Collaborative learning: Higher education, interdependence, and the authority of knowledge* (2nd ed.). Baltimore, MD: Johns Hopkins University Press.
- Bunn, M. D. (2001). Timeless and timely issues in distance education planning. *American Journal of Distance Education, 15*(1), 55-68.
- Butner, B., Smith, A., & Murray, J. (2012, January 30). *Distance Technology: A National Study of Graduate Higher Education Programs*. Retrieved from University of West Georgia: <http://www.westga.edu/~distance/ojdla/fall23/butner23.html>
- Cameron, B., Morgan, K., Williams, K., & Kostelecky, K. (2009). Group projects: Student perceptions of the relationship between social tasks and a community in online group work. *The American Journal of Distance Education, 23*, 20-33.
- Carnevale, D. (2000, May 26). *U.S. Lawmaker Questions Quality of Online-Learning Experience*. Retrieved February 13, 2012, from The Chronicle of Higher Education: <http://chronicle.com/article/US-Lawmaker-Questions/4121/>
- Chao, C.-Y., Hwu, S.-L., & Chang, C.-C. (2011). Supporting interaction among participants of online learning using the knowledge sharing concept. *The Turkish Online Journal of Educational Technology, 10*(4), 311-319.
- Chen, P., Gonyea, R., & Kuh, G. (2008). Learning at a distance: Engaged or not? *Innovate, 4*(3). Retrieved February 18, 2012, from [http://www.innovateonline.info/pdf/vol4\\_issue3/Learning\\_at\\_a\\_Distance-\\_\\_Engaged\\_or\\_Not\\_.pdf](http://www.innovateonline.info/pdf/vol4_issue3/Learning_at_a_Distance-__Engaged_or_Not_.pdf)

- Chou, C., Penga, H., & Changa, C.-Y. (2010). The technical framework of interactive functions for course management systems: Students' perceptions, uses, and evaluations. *Computer & Education, 3*(55), 1004-1017.
- Chou, S.-W., & Liu, C.-H. (2005). Learning effectiveness in a web-based virtual learning environment: A learner control perspective. *Journal of Computer Assisted Learning, 21*, 65-76.
- Clark, R. E. (1983). Reconsidering research on learning from media. *Review of Educational Research, 53*(4), 445-459.
- Connolly, M., Jones, C., & Jones, N. (2007). New approaches, new vision: Capturing teacher experiences in a brave new online world. *Open Learning, 22*(1), 43-56.
- Conole, G., Laat, M., Dillon, T., & Darby, J. (2008). Disruptive technologies, pedagogical innovation: What's new? Findings from an in-depth study of students' use and perception of technology. *Computers & Education, 50*, 511-524.
- Cook, M., Annetta, L., Dickerson, D., & Minogue, J. (2011). In-service teachers' perceptions of online learning environments. *Quarterly Review of Distance Education, 12*(2), 73-79.
- Cooper, L. (2000). On-line courses: Tips for making them work. *Electronic Journal of Instructional Science and technology, 3*(3), 20-25.
- Cooper, L. (2001). A comparison of online and traditional computer applications classes. *Technological Horizons in Education, 28*(8), 52-58.
- Coppola, N. W., Hiltz, S. R. & Rotter, N. (2001). Becoming a virtual professor: Pedagogical roles and ALN. HICSS 2001 Proceedings, *IEEE Press*.

- Dennen, V., Darabi, A., & Smith, L. (2007). Instructor-learner interaction in online learning courses: The relative perceived importance of particular instructor actions on performance and satisfaction. *Distance Education*, 28(1), 65-79.
- Dillon, C., & Greene, B. (2003). Learner differences in distance learning: Finding differences that matter. In M. Moore, & W. Anderson, *Handbook of Distance Education* (pp. 235-244). Mahwah, NJ: Lawrence Erlbaum Associates.
- Dobrin, J. (1999). Who's teaching online? *ITPE News*, 2(12), 6-7.
- Du, J., & Xu, J. (2010). The quality of online discussion reported by graduate students. *The Quarterly Review of Distance Education*, 11(1), 13-24.
- Du, J., Durrington, V., & Mathews, J. (2007). Online collaborative discussion: Myth or valuable learning tool. *Journal of Online Learning and Teaching*, 3(2), 94-104.
- Du, J., Havard, B., & Li, H. (2005). Dynamic online discussion: task-oriented interaction for deep learning. *Educational Media International*, 42(3), 207-218.  
doi:10.1080/09523980500161221
- Du, J., Zhang, K., Olinzock, A., & Adams, J. (2008). Graduate students' perspective on the meaningful nature of online discussions. *Journal of Interactive Learning Research*, 19(1), 21-26.
- Dykman, C. A., & Davis, C. K. (2008). Online education forum-Part three: A quality online education experience. *Journal of Information Systems Education*, 19(3), 281-289.
- Eastman, J. K., & Swift, C. O. (2002). Enhancing collaborative learning: Discussion boards and chat rooms as project communication tools. *Business Communication Quarterly*, 65(3), 29-41.

- Erlich, Z., Erlich-Philip, I., & Gal-Ezer, J. (2005). Skills required for participating in CMC courses: An empirical study. *Computers & Education, 44*, 477-487.
- Ewing, J., Dowling, J., & Coutts, N. (1998). Learning using the World Wide Web: A collaborative learning event. *Journal of Educational Multimedia and Hypermedia, 8*(1), 3-22.
- Fish, M. C., & Dane, E. (2000). The classroom systems observation scale: Development of an instrument to assess classrooms using a systems perspective. *Learning Environments Research, 3*, 67-92.
- Fisher, M. (2003). Online collaborative learning: Relating theory to practice. *Journal of Educational Technology Systems, 31*(3), 227-249.
- Fraenkel, J. R., & Wallen, N. E. (2003). *How to design and evaluate research in education* (5th ed.). New York, NY: McGraw-Hill.
- Frank, M., Lavy, I., & Elata, D. (2003). Implementing the project-based learning approach in an academic engineering course. *International Journal of Technology and Design Education, 13*, 273-288.
- Fulford, C. P., & Zhang, S. (1993). Perceptions of interaction: The critical predictor in distance education. *American Journal of Distance Education, 7*(3), 8-21.
- Gall, M., Gall, J., & Borg, W. (2003). *Educational research: An introduction* (7th ed.). Boston, MA: Pearson Education Inc.
- Garrett, R. (2007). Expanding demand for online higher education: Surveying prospective students. *Journal of Asynchronous Learning Networks, 11*(1), 49-53.
- Gay, L., & Airasian, P. (2009). *Educational research-Competencies for analysis and applications* (9th ed.). Upper Saddle River, New Jersey: Pearson Education Inc.

- Ge, S., & Tok, M. (2002). Enhancing online education using collaboration solutions. *Journal of Educational Technology Systems, 31*(4), 361-380.
- Ge, X., & Zhang, K. (2006). The dynamics of online collaboration: Team task, team development, peer relationship, and communication media. In A. Figueiredo, & A. P. Afonso, *Managing Learning in Virtual Settings: The Role of Context* (pp. 98-116). Hershey, PA: Information Science Publishing.
- Gunawardena, C. N., & Duphorne, P. L. (2001, April). *Which learner readiness factors, online features, and CMC related learning approaches are associated with learner satisfaction in computer conferences?* Paper presented at the 2001 Annual Meeting of the American Educational Research Association, Seattle, WA.
- Guzzo, R., & Dickson, M. (1996). Team in organization: Recent research on performance and effectiveness. *Annual Review of Psychology, 47*, 307-338.
- Hair, J. F., Black, W., Babin, B., & Anderson, R. (2009). *Multivariate data analysis* (7th ed.). Upper Saddle River, NJ: Prentice Hall.
- Hanna, D. E., Glowacki, M., & Conceicao-Runlee, S. (2000). *147 practice tips for teaching online groups: Essentials of Web-based education*. Madison, WI: Atwood Publishing.
- Hara, N., & Kling, R. (2001). Student distress in web-based distance education. *Educause Quarterly, 3*, 68-69.
- Harrison, T., & Stephen, T. (1996). *Computer networking and scholarly communication in the twenty-first-century university*. Albany, NY: State University of New York Press.

- Hernandez, R., Pardo, A., & Kloos, C. D. (2007). Creating and deploying effective eLearning experiences using LRN. *IEEE Transactions on Education*, 50(4), 345-351.
- Hillman, D. C., Willis, D. J., & Gunawardena, C. N. (1994). Learner-interface interaction in distance education: An extension of contemporary models and strategies for practitioners. *The American Journal of Distance Education*, 8(2), 30-42.
- Hiltz, S. R. (1997). Impacts of college-level courses via asynchronous learning networks: Some preliminary results. *Journal of Asynchronous Learning Networks*, 1(2), 1-19.
- Hoffman, K. (2003). Online course evaluation and reporting in higher education. *New Directions for Teaching & Learning*(96), 25-29.
- Howell, D. (2001). *Statistical methods for psychology* (5th ed.). Pacific Grove, CA: Duxbury.
- Huck, S. (2004). *Reading statistics and research*. Boston, MA: Pearson Education Inc.
- Hwang, K. A., & Yang, C. H. (2008). A synchronous distance discussion procedure with reinforcement mechanism: Designed for elementary school students to achieve the attending and responding stages of the affective domain teaching goals within a class period. *Computer & Education*, 51, 1538-1552.
- Jahng, N., Nielsen, W. S., & Chan, E. (2010). Collaborative learning in an online course: A comparison of communication patterns in small and whole group activities. *Journal of Distance Education*, 24(2), 39-58.

- Jiang, M., & Ting, E. (2000). A study of factors influencing students' perceived learning in a web-based course environment. *International Journal of Educational Telecommunications*, 6(4), 317-338.
- Johnson, B., & Christensen, L. (2004). *Educational research: Quantitative, qualitative, and mixed approaches* (2nd ed.). Boston, MA: Pearson Education Inc.
- Johnson, R., Johnson, D., & Stanne, M. B. (1985). Effects of cooperative, competitive, and individualistic goal structures on computer-assisted instruction. *Journal of Educational Psychology*, 77(6), 668-677.
- Kaiser, P., Tuller, W., & McKowen, D. (2000). Student team projects by Internet. *Business Communication Quarterly*, 63(4), 78-82.
- Kanawattanachai, P., & Yoo, Y. (2002). Dynamic nature of trust in virtual teams. *The Journal of Strategic Information Systems*, 11(3), 187-213.
- Kaya, T. (2010, November 17). *Enrollment in online courses increases at the highest rate ever*. Retrieved from The Sloan Consortium:  
[http://sloanconsortium.org/news\\_press/november2010\\_enrollment-online-courses-increases-highest-rate-ever](http://sloanconsortium.org/news_press/november2010_enrollment-online-courses-increases-highest-rate-ever)
- Kester, L., Kirschner, P., & Corbalan, G. (2007). Designing support to facilitate learning in powerful electronic learning environments: Introduction. *Computers in Human Behavior*, 23, 1047-1053.
- Kirby, D., Barbour, M., & Sharp, D. (2012). Student perceptions and preferences for tertiary online courses: Does prior high school distance learning make a difference? *American Journal of Distance Education*, 26(1), 34-49.



- Kirtman, L. (2009). Online versus In-class courses: An examination of differences in learning outcomes. *Issues in Teacher Education, 18*(2), 103-116.
- Kop, R. (2011). The challenges to connectivist learning on open online networks: Learning experiences during a massive open online course. *International Review of Research in Open and Distance Learning, 12*(3), 19-38.
- Kozma, R. B. (1991). Learning with media. *Review of Educational Research, 61*, 179-211.
- Lai, H.-J. (2011). The influence of adult learners' self-directed learning readiness and network literacy on online learning effectiveness: A study of civil servants in Taiwan. *Educational Technology & Society, 14*(2), 98-106.
- Lau, A., & Tsui, E. (2009). Knowledge management perspective on e-learning effectiveness. *Knowledge-Based Systems, 22*, 324-325.
- Lehtinen, E. (2002). Developing models for distributed problem-based learning: Theoretical and methodological reflection. *Distance Education, 23*(1), 109-117.
- Leong, P. (2011). Role of social presence and cognitive absorption in online learning environments. *Distance Education, 32*(1), 5-28.
- Lewis, J., & Weigert, A. (1985). Trust as a social reality. *Social Factors, 63*(4), 967-985.
- Lim, C. K. (2001). Computer self-efficacy, academic self-concept, and other predictors of satisfaction and future participation of adult distance learners. *American Journal of Distance Education, 15*(2), 41-51.
- Lim, D. H., & Kim, H. (2003). Motivation and learner characteristics affecting online learning and learning application. *Journal of Educational Technology Systems, 31*(4), 423-439.

- Lin, F.-r., Lin, S.-c., & Huang, T.-p. (2008). Knowledge sharing and creation in a teachers' professional virtual community. *Computers & Education, 50*, 742-756.
- Lindner, J., Dooley, K., & Murphy, T. (2001). Differences in competencies between doctoral students on-campus and at a distance. *American Journal of Distance Education, 15*(2), 25-40.
- Liu, M.-C., & Wang, J.-Y. (2010). Investigating knowledge integration in web-based thematic learning using concept mapping assessment. *Educational Technology & Society, 13*(2), 25-39.
- Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integrative model of organizational trust. *Academy of Management Review, 20*, 709-734.
- McBrien, L., Jones, P., & Cheng, R. (2009). Virtual spaces: Employing a synchronous online classroom to facilitate student engagement in online learning. *International Review of Research in Open and Distance Learning, 10*(3), 1-17.
- McKnight, D., & Chervany, N. (2000). What is trust? A conceptual analysis and an interdisciplinary model. *AIS 2000*.
- Menchaca, M. P., & Bekele, T. A. (2008). Learner and instructor identified success factors in distance education. *Distance Education, 29*(3), 231-252.
- Meyer, K. A. (2002). *Quality in distance education: Focus on online-line learning*. San Francisco, CA: Jossey-Bass.
- Meyerson, D., Weick, K., & Kramer, R. (1996). Swift trust and temporary groups. In R. Kramer, & T. Tyler, *Trust in organization: Frontiers of theory and research* (pp. 166-195). Thousand Oaks, CA: Sage Publications, Inc.

- Mittleman, D. D., Briggs, R. O., & Nunamaker, J. F. (2000). Best practice in facilitating virtual meetings: Some notes from initial experience. *Group Facilitation: A Research and Applications Journal*, 2, 5-14.
- Moller, L. (1998). Designing communities of learners for synchronous distance education. *Educational Technology Research and Development*, 46(4), 115-122.
- Moloney, J., & Oakley, B. (2010). Scaling online education: Increasing access to higher education. *Journal of Asynchronous Learning Networks*, 14(1), 55-70.
- Moore, M. (1993). Theory of transactional distance. In D. Keegan, *Theoretical Principles of Distance Education* (pp. 22-38). New York, NY: Rutledge.
- Moore, M. G. (1989). Three types of interaction. *American Journal of Distance Education*, 3(2), 1-6.
- Moore, M. G. (2002). Editorial, what does research say about the learners using computer-mediated communication in distance learning? *American Journal of Distance Education*, 16(2), 61-64.
- Moore, M., & Kearsley, G. (1996). *Distance education: A systems view*. Belmont, CA: Wadsworth Publishing Company.
- Navarro, P., & Shoemaker, J. (2000). Performance and perceptions of distance learners in cyberspace. *The American Journal of Distance Education*, 14(2), 15-35.
- Neuhauser, C. (2002). Learning style and effectiveness of online and face-to-face instruction. *American Journal of Distance Education*, 16(2), 99-113.
- Palloff, R. M., & Pratt, K. (1999). *Building learning communities in cyberspace: Effective strategies for the online classroom*. San Francisco, CA: Jossey-Bass.

- Park, J. (2008). iLED: interactive learning experience design. *Journal of Online Learning and Teaching*, 4(3), 357-370.
- Parks, C., Henager, R., & Scamahorn, S. (1996). Trust and reactions to messages of intent in social dilemma. *Journal of Conflict Resolution*, 40(1), 134-151.
- Paulsen, M. (2002). Online education systems: Discussion and definition of terms. *NKI Distance Education*, 1-8.
- Perreault, H., Waldman, L., Alexander, M., & Zhao, J. (2002). Overcoming barriers to successful delivery of distance-learning courses. *Journal of Education for Business*, 313-318.
- Picciano, A. (1998). Developing an asynchronous course model at a large, urban university. *Journal of Asynchronous Learning Networks*, 2(1), 1-14.
- Piccoli, G., Ahmad, R., & Ives, B. (2001). Web-based virtual learning environments: A research framework and a preliminary assessment of effectiveness in basic IT skills training. *MIS Quarterly*, 25(4), 401-427.
- Porter, A., Griffiths, D., & Hedberg, J. (2003). From classroom to online teaching: Experiences in improving statistics education. *Journal of Applied Mathematics & Decision*, 7(2), 65-73.
- Powers, S., & Rossman, M. (1985). Student satisfaction with graduate education: Dimensionality and assessment in college education. *Psychology: A Quarterly Journal of Human Behavior*, 22(2), 46-49.
- Radford, A. (2011, October 5). *National Center for Education Statistics*. Retrieved from Institute of Education Sciences: <http://nces.ed.gov/pubs2012/2012154.pdf>

- Rakap, S. (2010). Impacts of learning styles and computer skills on adult students' learning online. *The Turkish Online Journal of Educational Technology*, 9(2), 108-115.
- Reilly, R. (2008). Virtual laboratories: Enhancing deep learning in model-based knowledge domains. *IEEE Transactions on Education*, 51, 69-75.
- Reisetter, M., & Boris, G. (2004). What works: Student perceptions of effective elements in online learning. *The Quarterly Review of Distance Education*, 5(4), 277-291.
- Roberts, S. T. (2004). *Online collaborative learning: Theory and practice*. Hershey, PA: Information Science.
- Roblyer, M. D., & Wiencke, W. R. (2003). Designing and use of a rubric to assess and encourage interactive qualities in distance courses. *The American Journal of Distance Education*, 17(2), 77-98.
- Rovai, A. P. (2002). Sense of community, perceived cognitive learning, and persistence in asynchronous learning networks. *Internet and Higher Education*, 5, 319-332.
- Shea, P. J., Swan, K., Fredericksen, E., & Pickett, A. (2002). Student satisfaction and reported learning in the SUNY learning network. In J. Bourne, & J. C. Moore, *Elements of Quality Online Education* (Vol. 3). Needham, MA: Sloan Center for Online Education.
- Shea, P., Fredericksen, E., Pickett, A., Pelz, W., & Swan, K. (2001). Measures in learning effectiveness in the SUNY learning network. In J. Bourne, & J. Moore, *Online Education: Proceeding of the 2000 Sloan Summer Workshop on Asynchronous Learning Networks* (Vol. 3, pp. 1-24). Needham, MA: Sloan-C Press.

- Shelton, K. (2010). A quality scorecard for the administration of online education programs: A delphi study. *Journal of Asynchronous Learning Networks*, 14(4), 36-62.
- Shen, D., Nuankhieo, P., Huang, X., Amelung, C., & Laffey, J. (2008). Using social network analysis to understand sense of community in an online learning environment. *Journal of Educational Computing Research*, 39(1), 17-36.
- Sherry, A., & Yamashita, S. (2004). Selected strategies for interaction in web-based courses. *Distance Learning*, 4(1), 1-6.
- Sherry, A., Fulford, C., & Zhang, S. (1998). Assessing distance learners' satisfaction with instruction: A quantitative and qualitative measure. *American Journal of Distance Education*, 12(3), 4-28.
- Shief, R. S., Gummer, E., & Niess, M. (2008). The quality of a web-based course: Perspectives of the instructor and the students. *TechTrends*, 52(6), 61-68.
- Shih, P.-C., Munoz, D., & Sanchez, F. (2006). The effect of previous experience with information and communication technologies on performance in a Web-based learning program. *Computers in Human Behavior*, 22, 962-970.
- Smith, J., & Barclay, D. (1997). The effects of organizational differences and trust on the effectiveness of selling partner relationships. *Journal of Marketing*, 61(1), 3-21.
- Smith, R. (2008). The paradox of trust in online collaborative groups. *Distance Education*, 29(3), 325-340.
- Soong, M.H.B., Chan, H.C., Chua, B.C., & Loh, K.F. (2001). Critical success factors for online course resources. *Computers & Education*, 36(2), 101-120.

- Soylu, F. (2009). Designing online learning communities: Lessons from Eksisozluk. *European Journal of Open, Distance and E-Learning*, 2, 1-10.
- Starke-Meyerring, D., & Andrews, D. (2006). Building a shared virtual learning culture. *Business Communication Quarterly*, 69(1), 25-49.
- Stodel, E., Thompson, T. L., & MacDonald, C. J. (2006). Learners' perspectives on what is missing from online learning: Interpretations through the community of inquiry framework. *International Review of Research in Open and Distance Learning*, 7(3), 1-24.
- Summers, J. J., Waigandt, A., & Whittaker, T. (2005). A comparison of student achievement and satisfaction in an online versus a traditional face-to-face statistics class. *Innovative Higher Education*, 29(3), 233-250.
- Sun, P.-C., Tsai, R. J., Finger, G., Chen, Y.-Y., & Yeh, D. (2008). What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & Education*, 50, 1183-1202.
- Swan, K. (2001). Virtual interactivity: Design factors affecting student satisfaction and perceived learning in asynchronous online courses. *Distance Education*, 22(2), 306-331.
- Swan, K. (2003). Learning effectiveness: What the research tells us. In J. Bourne, & J. Moore, *Elements of Quality Online Education, Practice and Direction* (pp. 13-45). Needham, MA: Sloan Center for Online Education.
- Swan, K., Shea, P., Fredericksen, E., Pickett, A., Pelz, W., & Maher, G. (2000). Building knowledge building communities: Consistency, contact and communication in the virtual classroom. *Journal of Educational Computing Research*, 23(4), 389-413.

- Swan, K., Shen, J., & Hiltz, S. R. (2006). Assessment and collaboration in online learning. *Journal of Asynchronous Learning Networks*, 10(1), 41-52.
- Tallman, F. (1994). Satisfaction and completion in correspondence study: The influence of instructional and student-support services. *The American Journal of Distance Education*, 8(2), 43-57.
- The Sloan Consortium. (2010, September 29). *Celebrating excellence in online education*. Retrieved from The Sloan Consortium:  
[http://sloanconsortium.org/news\\_press/september2010\\_celebrating-excellence-online-education](http://sloanconsortium.org/news_press/september2010_celebrating-excellence-online-education)
- Thompson, L. (2000). *Conflicts in teams: Learning differences to create opportunity. Making the team: A guide for managers*. Englewood Cliffs, NJ: Prentice Hall.
- Thompson, L., & Ku, H.-Y. (2006). A case study of online collaborative learning. *The Quarterly Review of Distance Education*, 7(4), 361-375.
- Torrise, G., & Davis, G. (2000). Online learning as catalyst for reshaping practice-The experiences of some academics developing online learning materials. *The International Journal for Academic Development*, 166-176.
- U.S. Department of Education, National Center for Education Statistics. (2011). Learning at a distance: Undergraduate enrollment in distance education courses and degree programs.
- U.S. Department of Education. (2009). *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies*. Retrieved from <http://www.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf>



- Vogel, D. R., Davison, R. M., & Shroff, R. H. (2001). Sociocultural learning: A perspective on GSS-Enabled global education. *Communications of the Association for Information System*, 7(9), 1-41.
- Wade, C. E., Cameron, B. A., Morgan, K., & Williams, K. C. (2011). Are interpersonal relationships necessary for developing trust in online group projects? *Distance Education*, 32(3), 383-396.
- Wade, V., & Power, C. (1998). Evaluating the design and delivery of WWW based educational environments and courseware. *Proceedings of the 6<sup>th</sup> Annual Conference on the Teaching of Computing and the 3<sup>rd</sup> Annual Conference on Integrating Technology into Computer Science Education*, pp. 243-248.
- Wagner, E. D. (1994). In support of a functional definition of interaction. *The American Journal of Distance Education*, 8(2), 6-29.
- Walker, S., & Fraser, B. (2005). Development and validation of an instrument for assessing distance education learning environments in higher education: The distance education learning environments survey. *Learning Environments Research*, 8, 289-308.
- Wallace, R. M. (2003). Online learning in higher education: A review of research on interactions among teachers and students. *Education, Communication & Information*, 3(2), 241-280.
- Waltonen-Moore, S., Stuart, D., Newton, E., Oswald, R., & Varonis, E. (2006). From virtual strangers to a cohesive online learning community: The evolution of online group development in a professional development course. *Journal of Technology and Teacher Education*, 14, 287-311.

- Wanstreet, C. E. (2006). Interaction in online learning environments: A review of the literature. *The Quarterly Review of Distance Education*, 7(4), 399-411.
- Ward, M. E., Peters, G., & Shelley, K. (2010). Student and faculty perceptions of the quality of online learning experiences. *International Review of Research in Open and Distance Learning*, 11(3), 57-77.
- Weiss, H., & Cropanzano, R. (1996). Affective events theory: A theoretical discussion of the structure, causes and consequences of affective experiences at work. *Research in Organizational Behavior*, 18, 1-74.
- Wells, R. (1992). *Computer-mediated communication for distance education: An international review of design, teaching, and institutional issue*. University Park, PA: The American Center for the Study of Distance Education.
- White, C. (2000). Learn on-line. *Technological Horizons in Education Journal*, 27(9), 66-70.
- Yeh, Y.-C. (2010). Analyzing online behaviors, roles, and learning communities via online discussions. *Educational Technology & Society*, 13(1), 140-151.
- Yan, Z. (2006). Different experiences, different effects: a longitudinal study of learning a computer program in a network environment. *Computers in Human Behavior*, 22, 364-380.
- Zhang, K., & Harkness, W. L. (2002). Groups going online in a large class: Critical reflections. *Journal of Interactive Instructional Development*, 14(3), 14-18.
- Zhang, K., Peng, S.-W., & Hung, J.-L. (2009). Online collaborative learning in a project-based learning environment in Taiwan: A case study on undergraduate students' perspectives. *Educational Media International*, 46(2), 123-135.

Zhao, F. (2003). Enhancing the quality of online higher education through measurement.  
*Quarterly Assurance in Education, 11*(4), 214-221.

APPENDIX A  
SURVEY QUESTIONS



Mark (X) one box on each line.

<b>13 Interactivity:</b>	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
a. I was given multiple ways to interact with other students in my online course, such as email, discussion board, chat room, web-conferencing, etc.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
b. I was given multiple ways to interact with my instructor in my online course, such as email, discussion board, chat room, etc.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
c. The interaction with other students helped me to succeed in online course.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
d. The instructor's feedback helped me to succeed in this course.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
<b>14 Collaboration:</b>	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
a. If a task is sufficiently challenging, I am more likely to be actively engaged in collaborations.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
b. Using collaboration among students in the group, the group should be able to take a very difficult task and complete it in an efficient manner.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
c. When using team collaboration on a complex group project, a variety of task types can be utilized for the effectiveness of the end results of the group project.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
d. I enjoyed feelings of safety or control in completing a collaborative task.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
<b>15 Communication Media:</b>	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
a. I used discussion boards and chat rooms a lot in online course	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
b. I had face-to-face meetings with my group members.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
c. I contacted my group member with personal email besides the online learning and management system.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>

d.	I contacted my group members with cell phones, including text and phone call.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
<b>16</b>	<b>Group Trust:</b>	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
a.	I trusted my group members and believe that they would finish the part of job they are supposed to do.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
b.	I built friendship with my group members online and we contacted each other out of class.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
c.	I prefer to be the leader in the group.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
d.	I have the will and desire to work in a racially mixed group for online project.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
e.	I have a timid attitude towards participating in online discussion.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
f.	Peer support is a give-and-take process where a sense of fairness is essential.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
<b>17</b>	<b>Effectiveness of online learning:</b>	Extremely poor	Below average	Average	Above average	Excellent
a.	I would rate my overall higher order thinking ability and critical thinking ability after online courses as:	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
b.	I would rate the overall knowledge construction in this online course as:	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
	Mark (X) <u>one</u> box on each line.	Not at all likely	Not very much likely	Somewhat likely	Likely	Extremely likely
c.	I will do well in my online courses.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
d.	I will finish my program, or degree online.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
e.	I will do well my online course assignments and tests.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
f.	I will reach my educational goal.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>

APPENDIX B  
IRB APPROVAL





Wednesday, January 23

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## IRB Review Dashboard

\* Notice - status refers to initial review only and is not updated at time of expiration. You may click a record to see its full history.

View:

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IRB Review Records for mh654					
IRB #	Type	Status	PI	Advisor	Added
12-167 : Using a Compreh...	New Protocol	Review Complete - Results Sent to PI	Minyan He	Jianxia Du	05-10-2012

Technical problems, contact the [Help Desk](#) - Last modified: 08/03/2012 11:20:25 am  
Information about Mississippi State University, contact [msuinfo@ur.msstate.edu](mailto:msuinfo@ur.msstate.edu)  
URL: <http://ssl2.msstate.edu/research/orc/index3.php>