An Analysis of Factors that May Influence Student Satisfaction in Computer Programming Courses at an Online Midwestern University

by

Belinda Andromeda Patton

A dissertation submitted to the Graduate Faculty of
Auburn University
in partial fulfillment of the
requirements for the Degree of
Doctor of Philosophy

Auburn, Alabama
August 8, 2020

Keywords: student satisfaction, computer programming, instructor interaction, content interaction, interface interaction, distance education, online classes

Approved by

James Witte, Chair, Professor of Educational Foundations, Leadership and Technology
Maria Witte, Professor of Educational Foundations, Leadership and Technology
Jane Teel, Associate Clinical Professor of Educational Foundations, Leadership and Technology
Chih-hsuan Wang, Associate Professor of Educational Foundations, Leadership and Technology

Abstract

The rise in demand for computer programming jobs has created a significant need for computer programming training. Online learning can be an effective tool for meeting the needs of these job demands. The challenge for universities is that computer programming is perceived as a difficult course by many students (Askar & Davenport, 2009; Baser, 2013) and online course satisfaction is generally low (Maki et al., 2000). This study investigated the influence of instructor interaction, content interaction, interface interaction, and other factors to determine their effects on student satisfaction in online computer programming courses. A quantitative research design was used to address eight research questions. Participants were undergraduate students enrolled in an introductory Python computer programming essentials course at a small Midwestern university. An End of Course (EOC) student satisfaction survey was used to examine the relationship between student satisfaction and the predictor variables. Survey data was analyzed through Spearman's correlation, Chi-Square Test of Independence, and binary logistic regression analysis.

Results show that content interaction, interface interaction, and different instructor interactions are related to overall student satisfaction; however, no evidence was found to suggest that instructors responding to emails and/or phone calls within 48 hours is related to overall student satisfaction. Moreover, Chi-Square Tests revealed that there was a statistically significant difference between student satisfaction, interface interaction, and instructor interactions where instructors treated students with respect and professionalism based on gender. There were no statistically significant differences in student satisfaction, interface interaction, content interaction, or different instructor interactions based on race and age. Additionally, none of the interaction variables were significant predictors of student satisfaction. These findings

suggest that more research is needed to determine the factors that may predict student satisfaction in online computer programming courses.

Acknowledgments

I owe a debt of gratitude to many people who have helped me along the way to completion of this project. Foremost, I would like to thank Dr. James Witte and Dr. Maria Witte for providing me with the support and guidance necessary to complete my studies. As my instructors and mentors, you have taught me more than I could ever give you credit for. To my committee chair, Dr. James Witte, thank your believing in me, your doors and ears were always open. Dr. Maria Witte, thank you for always inspiring and motivating me see to this through to the end, your inspirational words of wisdom were instrumental in giving me the confidence I needed to keep writing. To Dr Jane Teel, I truly thank you for the support you gave me over the years, your consistent encouragement and persistence motivated me to continue pushing forward. Dr. Chih-hsuan Wang, thank you for your professional guidance and willingness to serve on my committee. Lastly, Dr. Wohleb thank you for agreeing to serve as my University Reader.

No one has been more important to me in the pursuit of this project than my family. I would like to thank my husband, Willie Patton, for all the encouraging support and for challenging me to pursue this goal. To my children, Olivia, Coral, Noah, and Beau, thank you for your patience and confidence in me, I am so grateful that you have stood by my side throughout this process. Lastly, I would like to thank my parents Aurelia and Gary Casimir for their assistance and support throughout the years. Your encouragement was instrumental in helping me accomplish this dream.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

CAAHE	Consortium for the Advancement of Adult Higher Education
CD	Compressed disks
CoI	Community of Inquiry
CS	Computer Science
EOC	End of Course
GPA	Grade Point Average
IRB	Institutional Review Board
LMS	Learning Management Systems
LCMS	Learning Content Management Systems
SPSS	Statistical Package for Social Sciences
STEM	Science, Technology, Engineering, and Mathematics

CHAPTER 1. INTRODUCTION

Background

This study examined the factors that may have an influence on student satisfaction in computer programming courses at an online Midwestern university. The rise in demand for computer programming jobs has created a significant need for computer programming training however, computer programming courses are often seen as challenging and unattractive to students (Butler & Ahmed, 2016; Fotaris et al., 2016; Pineda-Corcho & Moreno-Cadavid, 2017). The National Center for Education Statistics reported that retention rates for computer programming courses declined by 17% from 2005-2011 (National Center for Education Statistics, 2018). The problems encountered by students in first-year computer programming courses were the most common concern. Computer programming competencies are based on knowledge and skills. Knowledge consists of definitions, facts, language constructs, and programming knowledge, and skills consist of certain required actions and strategies in applying programming knowledge (Caspersen, 2007). Computer programming is a mandatory fundamental component of the computer science curriculum. It is also one of the most challenging courses for new students, and they often drop out as a consequence of having failed or performing poorly in an introductory programming course. Studies suggest that student satisfaction could positively predict student retention and learning outcomes in these courses (Lyke & Frank, 2012) and that interaction is necessary for student satisfaction to occur (Ryan et al., 2004; Brown, 2004; Oblinger et al., 2001).

Prior to 1989, dimensions of interaction in online courses had not been defined. In his editorial in *The American Journal of Distance Education*, Moore (1989) identified a three-dimensional construct that characterized interaction as either learner to content, learner to

instructor, or learner to learner. Moore's framework has been widely accepted in the literature and has sparked extensive research on learner to instructor (Dennen et al., 2007; Garrison, 1993; Garndzol & Grandzol, 2010; Garrison & Cleveland, 2005), learner to content (Hoey, 2017; Zimmerman, 2012), and learner to learner (Bain, 2006; Burnett et al., 2007) dimensions of interaction. Hillman et al. (1994) introduced learner to interface interaction as an additional dimension to the interaction construct.

Of the different types of interactions, instructor to learner interaction was identified as the most critical element to the success of instruction (Appana, 2008; Thurmond & Wambach, 2004). Instructor interactions allow students and faculty to get to know each other as individuals (White & Weight, 2000). Students who perceived that they had high levels of interaction with the instructor had high levels of satisfaction with the course and reported higher levels of learning, compared to students who thought they had less interaction (Swan, 2001). Powers and Rossman (1985) discovered that students' sense of satisfaction was related to instructor to learner interactions. Thurmond and Wambach (2004) suggested that interactions between students and faculty could help students clarify and obtain a correct understanding of the course content.

Researchers have also identified the importance of understanding learner to content interactions (Anderson et al., 2001; Grant & Thornton, 2007; Hoey, 2017; Kidd, 2005; Lee & Lim, 2007; Zimmerman, 2012). Vrasida (2000) noted that learner to content interaction was "the fundamental form of interaction on which all education is based" (p. 2). Tuovinen (2000) called learner to content interaction the most critical form of interaction since it is where student learning takes place.

Learner to interface interaction has also emerged as a dimension to the interaction construct and has been explored theoretically and empirically in the literature (Dunlap et al., 2007; Jung & Choi, 2002; Rhode, 2009). Jung and Choi (2002) empirically tested learner to interface interaction with 124 participants in an online course and concluded that learner to interface interaction could help increase students' learner to content interactions in online courses. Additionally, researchers reported that learner perceptions and pre-conceptions might contribute to student satisfaction and successful learning (Korpershoek et al., 2013).

Statement of the Problem

The rise in demand for computer programming jobs has created a significant need for computer programming training. Online learning can be a useful tool for meeting these needs however, there has been excessive dropout rates in online computer programmer courses. Computer programming courses require a significant amount of time and practice that may not be easily obtained in an online learning environment. The isolation and distance experienced by online computer programming students can result in negative feelings of learning computer programming online. These feelings may weigh heavily on whether students decide to stay in a class or drop out (Steinman, 2007). Despite the growth in online learning, there is little research on web-based learning environments (Sheard & Markham, 2005) in computer programming courses. Given the nature of computer programming courses, more research is needed to effectively analyze factors that contribute to students' overall levels of satisfaction and academic achievement in these courses (Durante & Koohang, 2003).

Purpose of the Study

The purpose of this study was to determine if selected variables (instructor interaction, content interaction, and interface interaction) affect students' satisfaction in online computer

programming courses. This study extends the work of Kauffman (2015) and Khalid (2014) by examining instructor interaction, content interaction, interface interaction, and their effects on student satisfaction in online computer programming courses. Identifying additional factors that contribute to student satisfaction in online courses may aid in predicting possible learning outcomes and assist universities in designing quality online courses to meet students' needs. It was anticipated that information obtained from this research will provide a foundation for future assessments of computer programming online courses by identifying the factors that may positively affect student satisfaction in these courses.

Research Questions

The research questions were structured within the framework of best practices identified within distance education and Computer Science education. The literature review identified best practices within the framework of instructor interaction, content interaction, and interface interaction. According to the literature, these elements may have an influence on student satisfaction in online computer programming classes. To validate these claims, the following research questions will be addressed in this study:

1. What is the relationship between student satisfaction and different instructor interaction?
2. What is the relationship between student satisfaction and content interaction?
3. What is the relationship between student satisfaction and interface interaction?
4. Are there differences in student satisfaction based on age, gender, and race?
5. Are there differences in content interaction based on age, gender, and race?
6. Are there differences in interface interaction based on age, gender, and race?

7. Are there differences in different instructor interaction based on age, gender, and race?
8. Do independent variables: instructor interaction, content interaction, and interface interaction, predict student satisfaction?

Overview of Research Content

A quantitative study was performed to gain insight into the factors influencing student satisfaction among online computer programming students. This research approach was selected following the advice of Creswell (2002), who explained that quantitative research allowed the researcher to better examine the relationship between variables. The method used for data collection was a survey instrument, as it was a recommended tool for measuring, observing, or documenting quantitative data (Creswell, 2002). The data for this study were collected using a web-based survey utilizing the Blackboard Learning Management System. The study sample was drawn from a population of students enrolled in online Introduction to Python courses at a university in the Midwest. The sample size was 115 students. Additional details about the sample are presented in Chapter III.

Significance of The Study

There is a lack of research aimed at determining the factors that influence student satisfaction in online computer programming courses. Prior research on student satisfaction in computer programming education has focused on factors related to face-to-face instruction; however, little research has been conducted to explore the effects of instructor interaction, content navigation, and content relevance in online computer programming courses. This is alarming considering that enrollment in online computer programming courses is expected to grow (National Center for Education Statistics, 2018). American universities are also facing a

significant increase in enrollment in undergraduate Computer Science courses (Computing Research Association, 2017), though the retention rates in these courses continue to decline (Anastasiadou & Karakos, 2011; Korkmaz & Altun, 2013; Hawi, 2010). With the continued growth of computer programming courses and distance education programs, it is important for universities to look at factors that contribute to student satisfaction in these courses. Further research is needed to understand the extent to which these factors contribute to student satisfaction in an online learning environment.

Assumptions, Delimitations, and Limitations of the Study

The study was focused on determining if instructor interaction, content interaction, and interface interaction were predictors of student satisfaction for online computer programming students. An assumption in this study was that data on student satisfaction predictors could be gleaned from survey responses provided by the participants. Another assumption was that all participants answered the questions honestly.

A delimitation of this study was that the participants in this study were selected from an online university with a low student population. A larger and more diverse student population may have provided more insight into the factors influencing student satisfaction in online computer programming courses. Another delimitation was that data collection was confined to Programming Essentials programming classes which focus exclusively on the Python programming language. Perceptions may vary from other introductory computer programming languages such as Java, C++, or Visual Basic.

In this study, the use of archival data served a limitation in accessing additional factors that may have an influence on student satisfaction in online computer programming courses. The use of archival data also served as a limitation on the number of survey responses used for the

study. Another limitation of the study was use of a pre-defined student satisfaction survey instrument. This limitation did not allow the researcher to modify or adjust the survey questions. For instance, student interaction is often considered a predictor of student satisfaction for online courses (Jung et al., 2002); however, this factor was not included in the survey and could not be analyzed.

The researcher took great effort to make this study as precise as possible; however, having worked as an online computer programming instructor at the university, the researcher likely has some unconscious and conscious biases from her work experience. Despite the assumptions, delimitations, and limitations provided, this study is expected to open new avenues for further research in this area.

Definition of Key Terms

The following terms are defined to help the reader understand the context of each term in this study.

Adult learners. Adult learners are typically considered as students who are 25 years of age and older (Ely, 1997; Kasworm, Polson, & Fishback, 2002).

Asynchronous. Asynchronous is used to describe forms of education, instruction, and learning that do not occur in the same place or at the same time.

Distance Education. Distance education is teaching and learning that occurs asynchronously; the learner(s) and instructor are separated by time and space, using a variety of technical media to support teaching and learning (Eastmond, 1998; Keegan, 1996; Locatis & Weisburg, 1997).

E-Learning. E-learning is defined as an education based on electronic tools and media via Internet and network technologies (Driscoll, 2002).

Instructor- Interaction. Instructor interaction is defined as the interaction that occurs when the instructor and students work and communicate with each other (Moore, 1989)

Content Interaction. Content interaction is defined as the interaction that occurs when students are working with the instructional materials or activities (Moore, 1989).

Interface Interaction. Interface interaction is defined as the interaction that occurs when students navigate through the online instruction, complete and submit assignments, and track their progress and grades (Hillman et al., 1994).

Student Interaction. Student interaction is defined as the interaction that occurs when students work or communicate with each other in small or large groups or on an individual basis (Moore, 1989).

Synchronous. Synchronous is used to describe forms of education, instruction, and learning that occur in the same place or at the same time.

Online Course. An online course is a designation reserved for courses that have absolutely no onsite requirements (Seamon et al., 2018).

Self-directed Learning. Self-directed learning is defined as "a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating their learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes" (Knowles, 1975, p. 18).

Self-regulated Learning. Self-regulated learning is defined as a means of raising students' achievement outcomes, and results from learners' self-generated thoughts and behaviors that are oriented systematically toward the attainment of their goals (Zimmerman, 2001).

Student Satisfaction. Student satisfaction is defined as a short-term attitude resulting from an evaluation of students' educational experience, services, and facilities (Weerasinghe et al., 2017).

Traditional learners. Traditional learners are defined as students who are typically aged 18-22 years old and younger, and they usually follow an unbroken linear path through the education system (Bye et al., 2007; Crompton & Tan, 2002).

Organization of the Study

This study sought to understand the factors influencing student satisfaction in distance education computer programming courses, using a quantitative theory study. There are many studies that focus on the factors influencing student satisfaction; however, there are very few studies that have focused on student satisfaction in online computer programming courses. The knowledge gap in this area needs to be researched since computer programming has such a high dropout rate and is one of the fastest-growing career fields in the United States. The results of this study may serve multiple stakeholders, including universities, instructors, students, course content designers, and employers of computer programmers.

The research, methods, results, and conclusions of this study are outlined in the following chapters. Chapter II presents a theoretical overview and review of the related literature. Chapter III describes the method adopted for conducting this study and measures used for the collection and analysis of the data. Chapter IV describes the analysis and interpretation of the data obtained for this study to answer the research questions taken up by this study. Chapter V provides the conclusion drawn for this study, the educational implication of the findings, and suggestions for further research. The Bibliography and References for this study are provided at the end of Chapter V. The bibliography is followed by a series of appendixes pertaining to this study.

CHAPTER 2. LITERATURE REVIEW

Introduction

This study examined the factors that have an influence on student satisfaction in computer programming courses at an online Midwestern university. The rise in demand for computer programming jobs has created a significant need for computer programming training; however, computer programming courses are often seen as challenging and unattractive to students (Butler & Ahmed, 2016; Fotaris et al., 2016; Pineda-Corcho & Moreno-Cadavid, 2017). The National Center for Education Statistics reported that retention rates for computer programming courses declined by 17% from 2005-2011 (National Center for Education Statistics, 2018). The problems encountered by students in first-year computer programming courses were the most common concern. Computer programming competencies are based on knowledge and skills. Knowledge consists of definitions, facts, language constructs, and programming knowledge, and skills consist of certain required actions and strategies in applying programming knowledge (Caspersen, 2007). Computer programming is a mandatory fundamental component of the computer science curriculum. It is also one of the most challenging courses for new students, and they often drop out as a consequence of having failed or performed poorly in an introductory programming course. Studies suggest that student satisfaction could positively predict student retention and learning outcomes in these courses (Lyke & Frank, 2012) and that interaction is necessary for student satisfaction to occur (Ryan et al., 2004; Brown, 2004; Oblinger et al., 2001).

This chapter is focused on student satisfaction in online courses, factors related to student satisfaction, and the influence of these factors in online computer programming courses. The chapter is divided into six sections. The first section provides an overview of adult learners. The

next section discusses online learning. The third section examines the Community of Inquiry framework and its role in online learning. The fourth section discusses student satisfaction in online courses. The fifth section reviews the factors influencing student satisfaction in online courses. The sixth and final section presents a review of studies in online computer programming courses and explores factors influencing student satisfaction in these courses. The chapter concludes with a synthesis of how the literature reviewed pertains to this study.

Purpose of the Study

The purpose of this study was to determine if selected variables (instructor interaction, content interaction, and interface interaction) affect students' satisfaction in online computer programming courses. This study extends the work of Kauffman (2015) and Khalid (2014) by examining instructor interaction, content interaction, interface interaction, and their effects on student satisfaction in online computer programming courses. Identifying additional factors that contribute to student satisfaction in online courses may aid in predicting possible learning outcomes and assist universities in designing quality online courses to meet students' needs. It was anticipated that information obtained from this research will provide a foundation for future assessments of computer programming online courses by identifying the factors that may positively affect student satisfaction in these courses.

Research Questions

The research questions were structured within the framework of best practices identified within distance education and Computer Science education. The literature review identified best practices within the framework of instructor interaction, content interaction, and interface interaction. According to the literature, these elements may have an influence on student

satisfaction in online computer programming classes. To validate these claims, the following research questions will be addressed in this study:

1. What is the relationship between student satisfaction and different instructor interaction?
2. What is the relationship between student satisfaction and content interaction?
3. What is the relationship between student satisfaction and interface interaction?
4. Are there differences in student satisfaction based on age, gender, and race?
5. Are there differences in content interaction based on age, gender, and race?
6. Are there differences in interface interaction based on age, gender, and race?
7. Are there differences in different instructor interaction based on age, gender, and race?
8. Do independent variables: instructor interaction, content interaction, and interface interaction, predict student satisfaction?

Adult Learners

Knowles's (1970) theory of adult learning provided the theoretical foundation for examining student satisfaction in online courses. Knowles' interpretation of andragogy is one of the most widely used definitions within adult education literature (Jarvis, 2012; Kearsley, 2010; Kember, 2007; Savicevic, 2008). In 1970, Knowles introduced the term andragogy when he wrote his article, "Andragogy vs. Pedagogy," in Adult Leadership. Knowles recognized that there were many differences in the ways that adults learn as opposed to children. His thoughts surrounding andragogy sought to capitalize on the unique learning styles and strengths of adult learners (Knowles, 1975). Knowles (1970) identified six principles of adult learning. He assumed that adult learners were practical learners who valued respect and brought a wealth of

knowledge and real-world experience to the classroom (Knowles, 1970). He also assumed that adult learners were internally motivated, self-directed, relevancy oriented, and goal oriented (Knowles, 1970). Knowles (1975) developed a theory of andragogy based on these assumptions.

Knowles' first assumption in his theory of andragogy is that adult learners move from being dependent toward being self-directed (Knowles, 1980). Knowles suggests that self-directed learning occurs when individuals take the initiative and responsibility for their education (Knowles, 1970). Since adults are at a more mature developmental stage, they have a more secure sense of self, which allows them to be more involved in the shaping and directing of their own learning experiences (Knowles, 1970). They select, manage, and assess their learning activities, set their personal goals, and define what is worthwhile to learn (Knowles, 1970). In self-directed learning, teachers provide mentoring and advising for their students. This is not the case in traditional education. In a pedagogy model, the role of the learner is a dependent one (Rashty, 1999). The teacher is the dominant source of knowledge in the class; they are the senders of knowledge, and students are the receivers (Rashty, 1999). The teacher is expected to take full responsibility for determining what is learned, when it is learned, how it will be learned, and if it has been learned (Knowles, 1970). Though this may be an effective way to teach traditional learners, it is not ideal for adult learners. Adult learners want to take control of what they are learning and do not respond well to traditional teaching styles. They need educational solutions that fit their specific needs. Some learners may even see themselves as a source of knowledge within the class (Rashty, 1999). These assumptions provide the basis for Knowles' second key assumption of adult learners.

Knowles assumes that adult learners are problem-centered rather than subject-centered (Knowles, 1980). In practical terms, this means that instruction for adults should focus more on

the process and less on the content taught (Knowles, 1980). Knowles assumes that adults enter education with a different perspective from children, which, in turn, can produce a difference in the way they view learning. To a child, education is essentially a process of the accumulation of information that might be useful later in life. Adults, however, tend to have a different perspective and immediacy of application toward their learning. They view education as a process of improving their ability to deal with problems they face now and want to be able to apply whatever knowledge and skill they gain today to living more effectively tomorrow. Knowles's third assumption makes light of this point, emphasizing the difference in experiences adult learners bring to the classroom.

Knowles assumes that adults enter educational activities with a higher volume and quality of experience than children (Knowles, 1980). In traditional learning models, learners are not expected to and do not have a wealth of knowledge to bring to the classroom. Most of the experience gained will be that of the teacher, the textbook writer, and other experts. Consequently, the primary teaching delivery techniques used in pedagogy are lectures, assigned readings, and presentations. On the contrary, adult learners accumulate a wealth of experience that becomes a useful resource of learning for themselves and others. They establish their self-identity through the accumulation of their skills and bring a variety of learning experiences in the classroom (Knowles, 1970). Compared to traditional learners, adult learners are more likely to contribute to the learning of others, have a better foundation of knowledge to relate new experiences, and have acquired a more significant number of fixed habits and patterns of thinking (Knowles, 1970).

The fourth assumption made by Knowles is that adults have reached a point in their lives where they see the value of education and are ready to focus on learning (Knowles, 1980). As

adults move into various social roles, their readiness to learn becomes oriented toward those roles. When they start a new job or take on a new position, they are forced to adapt their learning toward the skills necessary to complete their tasks. These new roles require new knowledge which provides greater motivation for adults to learn. Adult learners also become more and more willing to learn as they face real-world problems like raising a family or caring for a relative. Traditional learners do not have the real-life pressures experienced by adult learners and are ready to learn whatever they are told to learn.

The last assumption made by Knowles (1980) is that adult learners and traditional learners have differences in their willingness to learn. Knowles (1980) assumes that adults are internally rather than externally motivated to learn; therefore, adult educators cannot motivate adults using traditional teaching methods used to encourage children. Adults are generally motivated to learn something when they experience a need to learn something (Knowles, 1980). This motivation can be triggered by a need to perform more effectively in a specific area or a desire to improve at a particular skill. Children, however, are told what they must learn to advance to the next level of mastery and are therefore not as internally motivated to learn (Knowles, 1980).

The adult learner characteristics of self-direction, self-motivation, and relevance detailed in Knowles' theory are critical to the success of students in computer-based courses (Knowles et al., 2011). Online asynchronous activities require learners to be self-directed because activities are not monitored by an instructor in real-time and are completed at the learner's own pace and time. Instructional activities and content must be designed to account for this autonomy. Content must be learner-centered and encourage a high degree of self-direction. The design and support of learning modules must also consider the online student's degree of self-direction and the

practical reasons to learn (Knowles et al., 2011). Adult learners are looking for practical, problem-centered approaches to learning (Knowles, 1989), therefore online course content should be designed in a manner that is perceived to be useful to their personal or professional development (Howell & Buck, 2012).

Online Learning

Advances in technology have increased the accessibility and popularity of online courses (Lee & Choi, 2011), making them viable alternatives to traditional face-to-face classroom and learning activities (Rohayani et al., 2015; Yakin & Gencel, 2013; Yukselturk & Bulut, 2007). The growth and popularity of online courses also increased the need to understand online learning. Carliner (1999) defined online learning as educational material that is presented on a computer. Khan (1997) added that online learning involved the delivery of instruction to a remote audience using the Web. For this study, online learning is defined as instruction delivered on a digital device such as a computer or mobile device that is intended to support learning (Clark & Mayer, 2003). The term online learning will be used throughout this study; however, different terminologies have been used throughout the literature to define this construct. Terms commonly used include e-Learning, Internet learning, distributed learning, networked learning, tele-learning, virtual learning, computer-assisted learning, Web-based learning, distance education, and distance learning (Anderson, 2004). All of these terms imply that the learner is at a distance from the instructor, that the learner uses some form of technology to access the learning materials, that the learner uses technology to interact with the instructor and other learners, and that some form of support is provided to the learner. Seamon et al. (2018) provided further clarification of the differences between traditional and online courses (see Table 1).

These descriptions provide additional clarification of the types of online courses that will be discussed in this study.

Table 1

Course Classifications

Proportion of Content Delivered Online	Type of Course	Typical Description
0%	Traditional	Course where no online technology is used. Content is delivered in writing or orally.
1 to 29%	Web Facilitated	Course that uses web-based technology to facilitate what is essentially a face-to-face course. May use a learning management system (LMS) or web pages to post the syllabus and assignments.
30% to 79%	Blended/Hybrid	Course that blends online and face-to-face delivery. Substantial proportion of the content is delivered online. Typically uses online discussion and has a reduced number of face-to-face meetings.
80+%	Online	A course where most or all the content is delivered online. Typically has no face-to-face meetings.

Although the concept of online learning is widely known today, the history of distance education should not be ignored. In fact, the delivery of distance education courses has been practiced in a multitude of forms since the early 1990s (Campbell et al., 2002). It began with distance education correspondence classes and progressed to what is known today as online courses (Verduin & Clark, 1991). In the United States, the first correspondent college to offer correspondence degrees and diplomas was Chautauqua Correspondence College (Moore, 1989). By 1910 there were more than 200 correspondence schools throughout the United States (Garrison, 1989). Students who participated in correspondence education received printed course material by mail and returned it to their instructors. Instructors graded these assignments and returned them back to students through the mail (Mood, 1995). Correspondence courses were

beneficial because they allowed students to work on assignments at their own pace while presenting opportunities for them to take examinations in a proctored environment (Misanchuk, 1997).

With the development of electronic media, distance educators began broadcasting course content to their students. From 1954-1955, 334 institutions offered a radio and television workshop, and 81 institutions offered broadcasting degrees (Broderick, 1956). Because radio and television were widely available, course activities were easily accessible; however, colleges and universities made little use of these broadcasting technologies. According to Brey (1991), people had concerns about the effectiveness of telecommunication distance education. These concerns prevented television technologies from gaining immediate acceptance as an effective means of distance learning. Another concern with broadcasting courses was the fact that videotapes provided minimal interaction between instructors and students. Students were able to see and hear the instructor, but videotapes did not engage students in interactive learning (Brey, 1991). Compressed disks (CDs) emerged as a popular alternative to broadcasting courses, allowing institutions to develop course content, press CDs with that content, and send them out to students as supplemental material for their classes (McKune, 1967). These courses allowed students to learn at their own pace and provided both audio and visual information, resulting in higher course enrollments (McKune, 1967); however, the rise in popularity of alternative delivery methods diminished the need for CD content courses.

Today, many distance educators use learning content management systems (LCMS) and learning management systems (LMS) to deliver distance learning content. Learning management systems are designed to facilitate distance learning in the online environment and can function as a virtual environment within which instructors can deliver lectures, offer course resources,

communicate with students, and assess learning (Chang, 2011a). These systems are predominately made available through the Internet and allow for the complete delivery of learning online. The learning management system provides a set of interactive online services that provide learners with access to information, tools, and resources to support educational delivery and management through the Internet (Clark & Mayer, 2003), and the ability to use interactive features such as videoconferencing and discussion forums. There are a variety of learning management systems with different levels of complexity, but their most important features include (Cooke, 2018):

- Learning content management – creation, storage, access to resources
- Curriculum mapping and planning – lesson planning, personalized learning experience, assessment
- Learner engagement and management – learner information, progress tracking
- Tools and services – forums, messaging system, blogs, group discussions

Table 2 displays a features-based comparison of four online learning management systems.

Table 2

Comparison of LMS Course Interaction Features

Features	Platform			
	Blackboard	Canvas	Moodle	eFront
Blogs	✓	✓	✓	✓
Announcement Posts	✓	✓	✓	✓
Discussion Forum	✓	✓	✓	✓
File Exchange	✓	✓	✓	✓
Chat	✓	✓	✓	✓
Wiki	✓	✓	✓	✓
Whiteboard	✓	✓	✓	✓
Document Sharing	✓	✓	✓	✓
Assignment Upload	✓	✓	✓	✓
Email	✓	✓	✓	✓
Polling	✓	×	✓	×
Collaboration System	✓	×	✓	×

In a somewhat different approach, learning content management systems focus on creating e-learning content. Both LMSs and LCMSs are designed to manage course content. However, learning management systems manage and track online activities and events, and learning content management systems only manage digital content (Choudhury & Khataniar, 2016). The differences are summarized in the table below (see Table 3).

Table 3

Comparison of Learning and Content Management System Features

	LMS	LCMS
Manages online learning	✓	✓
Manages tradition training	✓	×
Tracks results	✓	✓
Schedule events	✓	✓
Competency mapping	✓	×
Creates assessments	✓	✓
Supports content creation	×	✓
Develops content navigation and user interface	×	✓
Includes learner profile	✓	×

Over time, these systems have continued to gain popularity due to the technological freedom they bring to learners about where, when, what, and how to learn (Clinefelter & Aslanian, 2016; Harrington & Loffredo, 2010; Means et al., 2009). This growth in popularity has also led to the accelerated development of online courses and degree programs (Sher, 2009), with 31% of all college and university students now taking at least one online course (Seaman et al., 2018). Given these facts, it is essential to understand the demographics of these learners, the factors that encourage them to enroll in online courses, and factors that influence their success once they are enrolled.

Research suggests that typical online learners are older, nontraditional students (Brooks et al., 2006; Garman et al., 1999; Kotey & Anderson, 2006; Qureshi et al., 2002). This perception has evolved over the past decade as universities and colleges increase the number of online

courses offered. The current demographics of online learners include younger, full-time, and traditional students; however, Porter (2004) noted that most of these students were adult learners. In a 2001 study exploring the services offered to adult learners, Porter reported that the number of female students significantly outnumbered the number of male students enrolled (65% to 35%) and that 30% of the learners were aged 21-30 years old. Researchers also reported that convenience, economic and household factors were significant reasons why students choose to undertake distance education courses (Bocchi et al., 2004; Draves, 2000; Lee & Choi, 2011; Liu et al., 2009; Marsh et al., 2000; Parker, 1999; Shea et al., 2016). In a study on blended learning distance mediation, Shea et al. (2016) found that most students (70% or more) reported that they enrolled in the courses to advance their careers, because they needed the courses, and because of their interest in the subject matter. About half of them enrolled because of scheduling convenience.

Throughout the literature, convenience appeared to be the preferred reason for enrolling in online courses (Arbaugh, 2005; Bocchi et al., 2004; Lee & Choi, 2011; Liu et al., 2009; Parker, 1999; Yukselturk & Inan, 2006). Moreover, Lee and Choi (2011) reported that students choose to study online because online learning was not determined by time and location, making it a convenient way to study and educate both teachers and students (Yukselturk & Inan, 2006). Arbaugh (2005) also made note of the increased flexibility in the delivery of content and learning in online learning environments. Bocchi et al. (2004) found that there was significant growth in the online education market because students working fulltime were the fastest-growing segment of the student population. Online courses provided flexibility (Parker, 1999) and support for those students with multiple responsibilities such as work and family (Liu et al., 2009). Additional benefits of online learning reside in the accessibility and affordability of the course

material via the Internet for many groups of people (Draves, 2000; Marsh et al., 2000; Porter, 1997). The accessible online material allows universities to educate more students while charging less for tuition (Porter, 1997). Researchers have also reported that online courses may prevent discrimination because they take away restrictions of education that are determined primarily by economic and demographic factors such as age and ethnicity (Ko & Roseen, 2001), family responsibilities, physical distance from campus, work schedules (Wyatt, 2005), and students' physical characteristics. Attributes like disabilities and appearance are unknown to course instructors when students are online (Alamri, & Tyler-Wood, 2017; Harasim, 1987). Online learning also provides equal opportunities for all types of students to express themselves, especially introverted or timid individuals who may not feel comfortable vocally expressing their viewpoints within traditional classroom settings (Wyatt, 2005).

Despite its popularity and advantages over face-to-face instruction, online education suffers from high dropout rates (Lee & Choi, 2011; Parker, 1999). Generally, online students have exhibited up to 20% higher dropout rates than on-campus students (Diaz, 2002; Frankola, 2001). These findings are significant since student retention is linked to student satisfaction in online courses (Lee & Choi, 2013; Levy, 2007; Park & Choi, 2009). The findings also indicate that student, environmental, and program factors could be decisive for online student retention (Varner, 2013). Additional factors shown to increase online student dropout rates include insufficient time, unexpected events, and distractions (Anderson & Moore, 2003; Packham et al., 2004; Panagiotakopoulos et al., 2004; Perry et al., 2008; Xenos et al., 2002). Personal problems and insufficient time were reported as the main environmental reasons why students drop out of online courses (Vergidis & Panagiotakopoulos, 2002; Willging & Johnson, 2004; Yukselturk & Inan, 2006).

Support was identified as a top reason for students dropping out of online courses (Johnson & Willging, 2004). Park and Choi (2009) identified family support, support from employers, and organizational support, as decisive factors in students' choosing to remain enrolled in an online program. Sahin (2007) found that support from an instructor was an important predictor of student satisfaction in an online course. Additionally, support from the institution was identified as a crucial factor by several researchers (Gaytan, 2013; Gilmore & Lyons, 2012; Heyman, 2010; Meyer et al., 2009). In fact, institutional support, including general student support services, orientation programs, and technological support, was reported as the main significant factor related to student retention and satisfaction in online courses (Gilmore & Lyons, 2012). Johnson and Willging (2004) found that the lack of support from technical staff and the lack of preparation in the online setting were among the top reasons students cited for dropping out of their program. Panagiotakopoulos et al. (2004) and Xenos et al. (2002) also reported the lack of support from a tutor as the main reason for students leaving an online program.

Alternatively, Rovai (2003) theorized that learners were likely to drop out of school if they were not able to pay for college, make adequate childcare arrangements, or adjust their work schedules. Rovai also reported that the first-year experience, a supportive learning community, academic, personal attention, and assistance with personal and financial problems were critical to persistence in an online learning course. In a similar study, Thompson (1997) found that external attributes, such as insufficient time and circumstances that hindered study, had the greatest effect on students' decisions to drop out. In that same year, Panagiotakopoulos et al. (2004) reported that inappropriate teaching methods and poor learning material were the main contributors to a student's decision to drop out. More recent evidence has suggested that the

perceived lack of relevance of the course content may be a significant factor in this decision (Park & Choi, 2009). Others suggest that the adequacy of assessment methods (De Freitas et al., 2015), clarity and consistency with the course design (Cole et al., 2014) and good course design (Meyer et al., 2009) may positively contribute to student retention and be significant reasons for students to stay enrolled in an online course. Although these factors have been shown to influence student satisfaction in online courses, the literature suggests that there are additional factors that may impact student satisfaction in these courses (Bocchi et al., 2004; Draves, 2000; Lee & Choi, 2011; Liu et al., 2009; Marsh et al., 2000; Parker, 1999; Shea et al., 2016).

Additional factors shown to influence online student satisfaction and retention were learner characteristics (Moore et al., 2003; Packham et al., 2004; Panagiotakopoulos et al., 2004; Parker, 2007; Xenos et al., 2002), and students' educational experience (Dupin-Bryant, 2004; Moore et al., 2003). Park (2007) analyzed learner characteristics (age, ethnicity, gender, employment status, and socioeconomic group) and concluded that they were related to student persistence and dropout rates in online courses. Packham et al. (2004) found that successful online learners were typically female, non-higher education qualified, self-employed, and aged between 31 and 50. They found that learners without those characteristics were more likely to drop out (Packham et al., 2004). Menager-Beeley (2004) reported that students with low task values and nontraditional students were also more likely to drop out of a distance-learning course. Alternatively, the student's university grade point average (GPA) (Boston et al., 2012; Lint, 2013b), and high school GPA (Dupin-Bryant, 2004; Morris et al., 2005), were found to be positively related to retention in online courses, while academic inability, comprising a lack of knowledge of or interest in a specific course, was shown to negatively impact student retention in online classes (Packham et al., 2004; Panagiotakopoulos et al., 2004; Xenos et al., 2002).

Internal factors were also found to have an impact on student success and satisfaction in online courses. Students' involvement in and attachment to their school were internal factors that were found to be essential to their success in online classes (Rovai, 2003). Thompson (1997) found that students with higher intrinsic motivation were more likely to stay or complete their online program. In fact, the standard academically successful online student could be described as self-motivated, self-directed, and exhibiting an internal locus of control with above-average executive functioning, communication, interaction, and technological skills (Dabbagh, 2007). However, not every online student exhibits these characteristics.

The literature provided a variety of examples of the challenges that may be faced by online students in online learning environments (Dupin-Bryant, 2004; Moore et al., 2003; Panagiotakopoulos et al., 2004; Xenos et al., 2002). Students may vary on learning styles, cognitive styles, self-efficacy, persistence, self-regulation, and affective skills (Cercone 2008). As a result, online learning environments may lead to negative emotions, including frustration (Berenson et al., 2008), especially if courses are poorly designed, or students do not exhibit the skills they need to learn online. Though these challenges exist, research suggests that the learning outcomes of online courses are equally effective and are often perceived as being more advantageous when compared to traditional face-to-face courses (Neumann & Shachar, 2003; Olson & Wisher, 2002; Shapley, 2000; Shea et al., 2001).

In examining a variety of studies on student success in the distance education environment, Verduin and Clark (1991) found that students typically performed at the same level or better in distance education environments than they did in normal, face-to-face classroom settings. This may be since online instructors have access to a variety of features, such as the discussion boards, and other tools provided by the course management system. Also, researchers

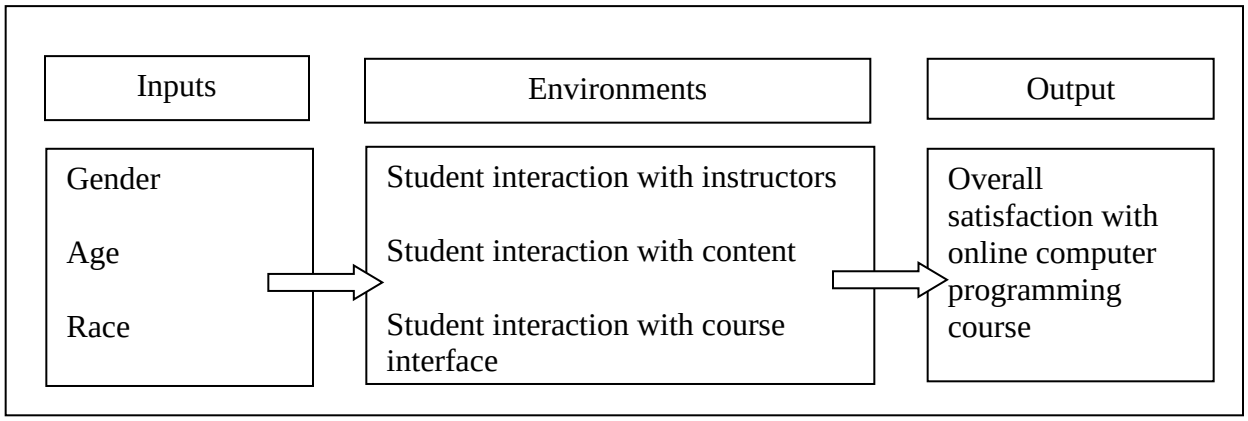
concluded that students' reflections on discussion postings and written assignments were more thoughtful than those from students in traditional classrooms (Collins & Berge, 1995; Gunawardena, 1992; Lynch, 2002). This implies that online learning can be equally or more effective than traditional learning, therefore it is essential to understand more about the learning elements in an online learning environment.

Conceptual Framework

Astin's input-environment-output (IEO) model formed the basis for the conceptual framework in this study (Austin, 1993). Astin claimed that student outcomes were a function of three important components: inputs (student precollege background characteristics), environment (the various experiences offered on campus: programs, policies, education, and social experiences), and outcomes (student persistence, success, and satisfaction). Figure 1 shows the adapted conceptual model.

Figure 1

Conceptual Model for Student Satisfaction Adapted from Astin's I-E-O model



The Community of Inquiry Framework

The Community of Inquiry (CoI) framework was adopted for analyzing the environmental factors in this study. This framework is widely used in the design and study of online and blended learning environments (Garrison, 2017; Halverson et al., 2014). The Community of Inquiry model was designed to address important learning elements by focusing on the role of presence in online learning environments (Swan et al., 2009). Presence is a state of alert awareness, receptivity, and connectedness to an individual or a group and the ability to respond with a considerate and compassionate best next step (Rodgers & Raider-Roth, 2006). The term presence is used to convey how real the learning and the learning environment are (Hosler & Arend, 2013). The greater the presence, the more realistic the learning experience is perceived to be. Garrison et al. (2000) proposed cognitive presence, social presence, and teacher presence as the three essential elements of the Community of Inquiry framework. As depicted in Figure 2, the Community of Inquiry framework theorizes that meaningful online learning occurs at the intersection of social, teaching, and cognitive presence (Garrison et al., 2000).

Figure 2

Elements of an Educational Experience

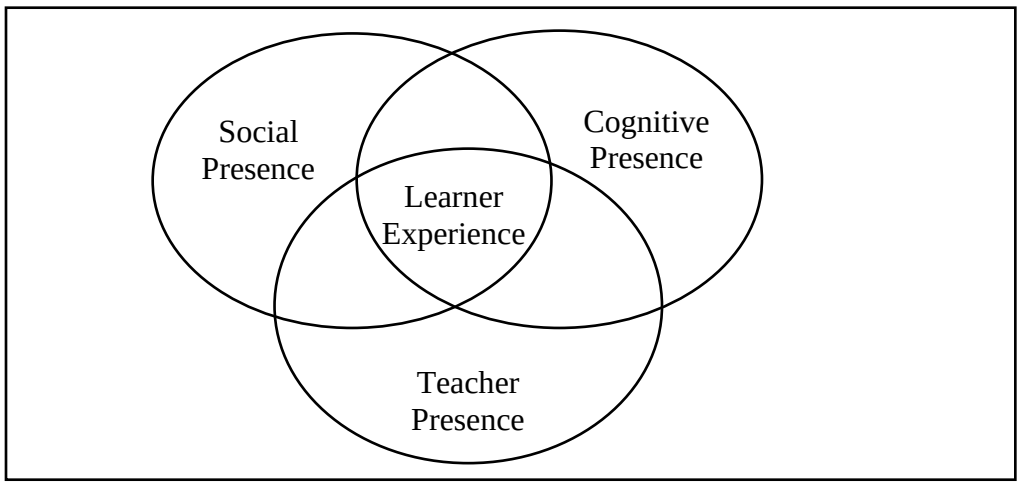


Table 4 illustrates the relationship among the three essential elements in a community of inquiry, as well as the indicators of those elements (Garrison et al., 2000).

Table 4

The Community of Inquiry Template

Elements	Categories	Indicator Examples
Social Presence	Emotional Expression	Emotions
	Open Communication	Risk-free expression
	Group Cohesion	Encouraging collaboration
Cognitive Presence	Triggering Event	Sense of puzzlement
	Exploration	Information exchange
	Integration	Connecting ideas
	Resolution	Apply new ideas
Teaching Presence	Instructional Management	Defining and initiating discussion topics
	Building Understanding	Sharing personal meaning
	Direct Instruction	Focusing discussion

Cognitive presence is the strongest indicator for success in higher education (Garrison et al., 2000); however, social presence is the most beneficial element in distance education (Whiteside et al., 2017).

Social Presence

Of the three elements, social presence has been shown to be the mediating factor between cognitive and teaching presence (deNoyelles et al., 2014; Joksimović et al., 2015; Whiteside et al., 2017). Social presence is a learner's ability to project themselves socially and emotionally in a community of learners (Garrison et al., 2000). Tu and McIssac (2002) defined social presence as the extent of the attitude of community learners' experience in an online learning environment. Social presence involves sharing personal characteristics that give the sense that students are interacting with authentic individuals (Garrison et al., 2000). Some have categorized it as a sense of community or feeling of connection with others that learners feel during the learning experience (Aragon, 2003; Picciano, 2002; Shutt et al., 2009; Tu & McIssac, 2002;

Wise et al., 2004). Richardson and Swan (2003) referred to the social presence in mediated instruction as the degree someone is perceived as real. Baker (2010) described social presence as a feeling that communications are with an actual person as opposed to an impersonal object. These interpretations are like that of Aragon (2003), who described social presence as establishing a level of comfort between the student and the instructor.

There are three main components used in the CoI framework to establish social presence, group connectedness, effective communication, and open communication (Garrison, 2007). Effective communication reflects the idea that social presence is about the projection and acceptation of the individual into and within the learning community. Open communication reflects the significance of a trusting environment to the process of critical discourse, while group cohesion reflects the role that shared commitment to the achievement of learning goals plays in the formation of a community of inquiry (Garrison, 2007). Swan (2002) found that social presence is important to the success of an online class and required an effective and open communication among the group to promote cohesion. In an online course, the concept of social presence can be integrated by designing group activities and collaboration, creating weekly check-in videos or announcements to recap the learning content and preview the course content for the following week, developing course activities to encourage the development of swift trust and modeling the use of verbal immediacy behaviors in interactions (Arbaugh et al., 2012; Garrison, 2017; Garrison et al., 2000; Huang, 2015).

Cognitive Presence

Recent studies have concluded that cognitive presence is most indicative of student satisfaction (Holser & Arend, 2012; Yang et al., 2016). Cognitive presence is defined as the student's connection to the course content (Akyol & Garrison, 2010). It is the extent to which

learners can construct and confirm meaning through sustained reflection and discourse (Garrison, 2017). Cognitive presence involves a deeper understanding and learning of content, as opposed to memorization of facts and information (Baran et al., 2011). Garrison et al. (2000) theorized that deep learning takes place through the triggering of an event, exploration, integration, and resolution of a problem.

Cognitive presence includes the use of self-testing, practice assignments, simulations, and other interactive activities to support skill development and convergent thinking. It also promotes the identification of course take always, the development of frequent opportunities for testing and feedback, the provision of multiple representations of knowledge and skills, and the use of experimentation, divergent thinking and open-ended questions (Arbaugh et al., 2012; Garrison, 2017; Garrison et al., 2000; Huang, 2015). Therefore, educators must purposefully steer these processes to engage learners in the process of critical assessment and regulation (Wittenbols, 2016).

Teacher Presence

Of the three elements, teaching presence provides the greatest value to students (Cowan & Hodges, 2012; Preisman, 2014) and is the most critical in establishing purposeful communities of inquiry (Borokhovski et al., 2016; Rockinson-Szapkiw et al., 2016; Rubin & Fernandes, 2013). In distance education literature, the terms teaching and teacher presence, have been used almost synonymously with instructor presence (Ekmekci, 2013; Lear et al., 2009; Sheridan & Kelly, 2010). Anderson et al. (2001) defined teaching presence as the design, facilitation, and direction of cognitive and social processes for the purpose of personally meaningful learning outcomes. Teaching presence includes the selection of resources, the development of learning activities and assessments and course facilitation and the delivery of instructions for all course

activities (Arbaugh et al., 2012; Garrison, 2017; Garrison et al., 2000; Huang, 2015). Direct instruction is the most common characteristic associated with teaching presence and includes characteristics of instructional leadership, content knowledge, feedback, and assessment of student performance (Wisneki et al., 2015).

Other researchers have categorized teaching presence as the intersection between social presence and teaching presence (Richardson et al., 2015). Moreover, teaching presence has been organized around the principles of design, facilitation, and direction, which have been identified as elements that support both social and cognitive presences (Garrison, 2016). Design involves the creation of communication and a plan to establish critical discourse, facilitation establishes community and inquiry, and direction sustains respect and responsibility through resolution (Gallego-Arrufat et al., 2015). Student satisfaction and success are best supported through the execution of these three essential presence principles (Preisman, 2014).

Student Satisfaction in Online Environments

Student satisfaction is essential in online higher education because it is the college student's perception of their college experience and the value of the education received while attending an educational institution (Astin, 1993). Oliver (1999) defined student satisfaction as the total individual subjective evaluation and experience of a service and the gap between what was expected and what was received from the service provider. It has been proven to be a significant factor in program persistence (Allen & Seaman, 2008; Rivera & Rice, 2002), motivation (Bolliger & Wasilik, 2009) higher levels of learning (Fredericksen et al., 2000), retention (Debourgh, 1999; Koseke & Koseke, 1991), course quality (Moore & Kearsley, 1996), and student success (Keller, 1983; Pike, 1993; Noel-Levitz, 2015) in online courses. Student satisfaction is important because it encourages the learner's level of motivation (Chute et al.,

1999). Bean and Bradley (1986) determined that satisfaction had a significant effect on performance. Researchers also agreed that satisfaction is a good predictor of academic success and retention (Astin, 1993; Bolliger & Wasilik, 2009; Fredericksen et al., 2000; Rivera & Rice, 2002).

A study conducted by Dabbagh (2007) suggested that the use of adequate instructional methods, support, course structure, and design can facilitate academic success and satisfaction in online courses. Later studies verified these observations. In fact, studies examining factors involved in student satisfaction and academic achievement in online environments found that teaching methods and characteristics of the learning technology were vital contributors to academic success and student satisfaction (Blau & Barak, 2011; Blau & Caspi, 2010; Kock & Garza, 2011; Kock et al., 2007). While some scholars agree with Dabbagh, other researchers propose that student satisfaction was based on the learner's past learning experience and their perceptions of interaction (Garrison & Cleveland-Innes, 2005; Humbert & Sener, 2003; Swan, 2001). DeBourgh (1999) noted that student satisfaction was highly correlated with the performance of the instructor, particularly with his or her availability and response time. Bower and Kamata (2000) added that instructor access was one of the most important factors influencing student satisfaction. On the other hand, Wegner et al. (1999) suggested that there may be a connection between a student's first online learning experiences and his or her satisfaction, however Stokes (2003) concluded that satisfaction with online learning was not influenced by the quantity of previous online learning experiences.

Demographic factors have also been examined to determine their effects on student satisfaction. In a study measuring student satisfaction in online Math courses, Davis (2014) found that satisfaction with online mathematics courses depended on age, with younger students

reporting more satisfaction with online courses than older students. Other factors, such as learning preferences and online environment, did not have any effects on satisfaction with online courses (Davis, 2014). Furthermore, Driver (2002) found that students' perceptions of interaction were positively related to their overall satisfaction with an online course. Similarly, Biner et al. (1997) identified instructor interaction, technology interaction, course management, onsite personnel, promptness of material delivery, support services, and out-of-class communication with the instructor as key factors of student satisfaction in online courses. Barbera et al. also found that learner satisfaction was positively and strongly correlated with social presence, direct instruction, learning content, and course design. In their findings, they reported that the perceived level of knowledge acquisition was positively and strongly correlated with course content and design (Barbera et al., 2013). The perceived ability to transfer was also positively and strongly correlated with learning content and course design.

Barbera et al. found evidence in their study suggesting that the most influential variables on student satisfaction were course design and learning content, while direct instruction and social presence were less influential. Prior studies have also suggested that course and instructional design factors contribute to effective online student satisfaction (Eom et al., 2006; Ke & Xie, 2009; Song et al., 2004). Song et al. (2004) examined factors related to online learning effectiveness and discovered that course design and time management were crucial components to successful online learning, while lack of community and technical problems were most challenging for online learners. Eom et al. (2006) sought to examine factors that contribute to perceived student satisfaction in an online university setting using a researcher-generated survey. Self-motivation, learning styles, instructor knowledge/facilitation, instructor feedback, interaction, and course structure were assessed. Results indicated that all of the factors were

significant predictors of online learner satisfaction (Eom et al., 2006). Ke and Xie (2009) also examined the effects of course design and perceptions of learning satisfaction among undergraduate and graduate students enrolled in online courses. Ten courses analyzed in the study were coded into one of three course design models:

(1) Integrated content was unstructured and adaptable; no textbook-weekly readings provided by instructor; online discussions/team projects with active facilitation by instructor.

(2) Content-support highly structured with pre-recorded lectures and assignments/quizzes; minimal interaction with other students.

(3) Wrap around moderately structured with weekly virtual lectures and assignments; 50% of time dedicated to participation in the discussion board moderately structured assigned online discussion tasks (combination of open- and closed-ended, open-ended or closed-ended).

Ke and Xie's results indicated that learners were significantly more satisfied with the integrated content model and were significantly less satisfied with the wrap around structure. Brandl et al. (2019) conducted a similar study to assess the changes in students' satisfaction and performance after a pharmacology course series revision. Students' suggestions for course improvements were analyzed based on 121 comments. The major themes that emerged from the comments included the need to improve integration, the need to improve examination quality, and the need to add application-based teaching and learning modalities. Additionally, students requested that goals and objectives be provided for every lecture, that the content be more consistent and delivery of lectures be improved. To address the three major shortcomings identified by students, several changes were made to the course series. With the redesign of the

course, the organization and methods of teaching were modified, the percentage of course lectures taught by course directors increased from 15% to 43%, examinations were rewritten to improve their validity, learning objectives were used to create examination blueprints, and active teaching modalities were introduced with the implementation of large-group problem-solving sessions. To determine the impact of the redesigned course on students' satisfaction, course evaluations were analyzed before and after the redesign. Results indicated that redesigning the course series significantly improved student satisfaction with the course. The final examination performance increased from an average of 81.9% before the redesign to an average of 83.6% after the course redesign. To ensure that the analyzed student cohorts were similar in their academic ability, students' demographics and overall undergraduate GPA were analyzed and did not reveal significant differences.

Chen et al. (2018) also explored the effects of course design elements for online courses in the science, technology, engineering, and mathematics (STEM) fields. The survey results indicated that student perceptions of learning and satisfaction were correlated with their perceptions of the efficacy of specific design elements, such as integrated active learning activities, interactive engagement strategies, and robust assessment design. Of the most frequently reported required activities, the top three active learning activities reported by students, included using special software or applications relevant to the course, solving real-world problems, and analyzing scenarios or case studies. In this study, students' perception of learning was correlated with their perception of the efficacy of assessment methods. Perception of assessment design efficacy was significantly correlated with students' self-perceived learning and learning satisfaction for students of all subpopulations. The most highly demanded instructor practices included offering more resources, sending reminders, and being clear and concise.

Students suggested a STEM program should invest resources to create online videos, offer face-to-face opportunities for them to meet their online instructors, teaching assistants and tutors, and offer face-to-face lab activities. Given the variety of factors that may influence student satisfaction, it is important to study the key factors likely to influence student satisfaction in online computer programming courses. The following section provides a literature review of these factors as well as other key factors know to affect student satisfaction in online courses.

Factors Affecting Student Satisfaction in Online Courses

To understand the challenges faced in online learning environments, it is important to examine the factors influencing student satisfaction in these environments. The research literature indicates that presence (Pelz, 2004; Thurmond et al., 2002), interaction (Settle & Settle, 2005), perceptions of technology (Drennan et al., 2010), course structure (Settle & Settle, 2005), feedback and assessments (Swan, 2003), and learner characteristics (Muilenburg & Berge, 2005) are reliable indicators of student satisfaction in the online learning environment.

Presence

Researchers agree that a lack of teaching and social presence in online courses results in negative learner satisfaction and achievement (Cobb, 2009; Olpak & Çakmak, 2009; Shin, 2003; Tu & McIssac, 2002). Aragon (2003), also revealed that a lack of comfort between students and instructors leads to a high level of dissatisfaction by students. Social presence is a significant predictor of both satisfaction and perceived learning outcomes (Chang et al., 2004; Delfino & Manca, 2007; Murphy & Rodríguez-Manzanares, 2008; Richardson & Swan, 2003; Shih & Swan, 2005). Students with high perceptions of social presence reported high levels of perceived satisfaction with the instructor (Christophel et al., 1996). Social presence appears to have also negated the negative effects of a lack of instruction interaction (Richardson & Swan, 2003),

however, the absence of facial expressions, nonverbal communication, and physical presence in online courses diminishes social presence in the online learning environment (Tu & McIssac, 2002). These disadvantages suggest that online instructors must find ways to increase social presence in the classroom. Tu (2001) found that clear objectives and guidelines for interaction signify educator friendliness and may offset the lack of students' nonverbal communication. The use of online interactive tools may also positively increase social presence in online courses (Chang et al., 2004; Chou & Min, 2009; Joyce & Brown, 2009; Mykota & Duncan, 2007; Weinel et al., 2011). Tu and McIssac (2002) recommended that educators teaching online courses should facilitate student communication in order to deal with the prospective lack of social presence in the online learning environment. They identified two main concepts of social presence established from the literature: intimacy and immediacy (Tu & McIssac, 2002). Intimacy refers to actions such as maintaining eye contact and physical proximity (Mehrabian, 1971). Immediacy refers to the psychological distance between the two parties conversing (Tu & McIssac, 2002). Tu and McIssac also reported three dimensions of social presence: social context, interactivity, and online communication. Interactivity includes the types of activities participants engage in, communication styles used, and immediacy (Tu & McIsaac, 2002). Presence and interaction were applied interchangeably in the literature (Battalio, 2007; Picciano, 2002). This indicates that there is an interaction occurring when presence exists in the online learning environment (Garrison et al., 2000; Richardson et al., 2012). Tu and McIssac suggest that social presence could be increased by increasing interactivity and communication in online courses. Online communication can improve social presence by developing a sense of identity and intimacy among participants (Walther, 1992). Interactive communication tools such as

discussion boards are examples of online communication tools that can be used to improve social presence (Tu, 2001).

Interaction

Interaction is an essential element in online learning (Burnett et al., 2007; Bruning, 2005; Fresen, 2007; Godwin &Thorpe, 2006; Kim et al., 2005; Picciano, 2002; Northrup, 2001; Sutton, 2001; Yildiz & Chang, 2003). Research suggests that interaction is one of the most critical factors in distance learning (Stein et al., 2005). Swan (2002) found that there was a positive relationship between levels of interaction among students and student satisfaction. Failing to cope with the challenges of reduced interaction in an online environment was one of the main reasons students cite for dropping out of online institutions (Perry et al., 2008).

Understanding the concept of interaction may provide better insight into the significance of this factor in online courses. Kearsley and Moore (2005) defined interaction as communication between the instructor and learners, and among other students. Vrasidas and McIsaac (1999) defined interaction as the joint actions of two or more persons in a situation. Berge (1999) defined learner interaction as two-way communication between teachers and students, or other interfaces in engaging learning activities. Wagner (1994) noted that interaction is an event that occurs between a student and a peer in the learning environment. This interaction also involves behavioral change and the meeting of objectives (Wagner, 1994). Henri (1995) acknowledged that actual interaction is comparable to communication, which is comprised of three actions that have responses to one another. For this study, interaction is considered a message that loops between the sender and receiver, student and teacher, student, and student (Yacci, 2000).

Interaction does not happen independently, and a message is not limited to verbal messages but can take place virtually via the Web and technological devices (Yacci, 2000). Additionally, there should be a distinction made between synchronous and asynchronous interaction. This distinction between immediate and delayed interaction is important because it influences the online learning experience. In synchronous interaction, students must participate at a fixed time, whereas in asynchronous interaction, students respond to each other according to their schedules. Moore (1989) categorized online learner interaction into three main types: student-instructor interaction, student-content interaction, and student-student interaction. These three types of interactions have also been identified as major constructs in online learning research (Moore & Kearsley, 2004; Rovai, 2002a, 2002b; Rovai & Downey, 2010; Swan, 2001; Wagner, 1994). Learner-content interaction provides the learner with an opportunity to construct new knowledge by incorporating the lesson information into previously existing cognitive structures. Learner-instructor interaction provides the instructor with the opportunity to assist students in their construction of new knowledge as well as providing guidance, support, and encouragement (Moore, 1989). Learner-learner interaction allows distance students to join and form a community of learners dealing with a common topic or course (Moore, 1989). Gunawardena et al. (1994) focused attention on another form of interaction for distance students, that of learner-technology. They noted that the interactions that took place between the learner and the learning technology strongly influenced the success of the online student (Gunawardena et al., 1994). Sutton (2000) suggested a fifth type of interaction, vicarious interaction, that occurs when a student actively observes and processes both sides of direct interaction between two other students or between another student and the instructor.

Ring and Mathieux (2002) suggested that online learning should have high authenticity, high collaboration, and high interactivity. High levels of interaction, particularly those that promote social engagement, can have positive effects on the learning experience (Ring & Mathieux, 2002). Swan (2001) found that interactivity was essential in designing online courses that positively affect student satisfaction. Kleinman (2005) reported that engaged learning and interactive support led to a satisfied learning community. Cole et al. (2014) and Johnson and Willging (2004) found that a lack of interaction with the institution and other students was the number one reason for students' dissatisfaction in online courses. Haywood and Murty (2018) found that online students at a historically black college perceived course format, peer networking and support, discussion groups, learning from others, interaction with faculty, prompt feedback from faculty, and academic advising as very important factors in online classes. In their study, all students perceived discussion groups, interaction with faculty, and prompt feedback from faculty to be very or somewhat important (Haywood & Murty, 2018).

Interaction between the student and the instructor, classmates, course content, and technology were also found to influence student satisfaction in online courses (Strachota, 2003). Sher (2009) found interactions between the student, instructor, and classmates to be the most significant factors influencing student satisfaction in online courses. Many researchers agreed with these findings (Ali et al., 2011; Jung et al., 2002; Lee & Rha, 2009; Murphy & Rodríguez-Manzanares, 2008; Stein et al., 2005), however, there were alternative findings that suggested otherwise (Rothman et al., 2011). In their study examining the criteria for assessing student satisfaction with online courses, Rothman et al.'s (2011) data reflected that students rated authentic, real-life activities and assignments, timeliness of instructor feedback, and technological issues as the lowest factors affecting student satisfaction in online courses.

Instructor Interaction

Researchers agree that the instructor is the primary influencer in student satisfaction (Finaly-Neumann, 1994; Williams & Ceci, 1997). Instructor interaction is the primary means of facilitating a sense of interaction and helping students stay engaged and motivated to learn (Gilbert et al., 2007; Thurmond & Wambach, 2004; Vonderwell, 2003). Student-instructor interaction occurs when the learner and the instructor communicate via seminars, email messages, correspondence through feedback on assignments, and during online office hours (Sher, 2009). Sher (2009) reported student-instructor interaction as one of the most critical factors in enhancing student satisfaction in an online course. Tello (2007) observed a strong, positive relationship between the use of asynchronous methods of interaction by the instructor within a course and positive student attitudes toward that course. Further analysis of the results suggested that instructor interaction accounted for 11% of the reasons students provided for dropping out or not enrolling in a future online course (Tello, 2007). In their study of the key factors determining student satisfaction, Bolliger and Martindale (2004) examined the responses of 507 students enrolled in online courses in the Southeastern United States. The results of their study indicated that instructor communication, feedback, preparation, content knowledge, teaching methods, encouragement, accessibility, and professionalism were the most important factor influencing student satisfaction in the online environment. Finaly-Neumann (1994) reported a similar conclusion, selecting instructor feedback as the most important factor in online student satisfaction.

Moreover, student satisfaction has a strong positive correlation with the performance of the instructor, particularly with his or her availability and response time (DeBourgh, 1999; Hiltz, 1993). Instructor subject matter competency was also an important indicator of student

satisfaction in these courses. Adult learners want to take courses from faculty who have a depth of knowledge about the content, are keeping up with developments in the field, can explain and clarify difficult concepts, can organize course content, and come to class prepared (Howell & Buck, 2012). Researchers also concede that a timely response by the instructor plays an important role in the satisfaction of online students (Dziuban et al., 2015). In a survey study of 120 students enrolled in online nursing courses in three separate universities, Thurmond et al. (2002) found student satisfaction to be significantly positively correlated with receiving timely comments from the instructor, having a variety of ways of being assessed, and knowing the instructor. Tello (2007) reported that feedback from instructors and the degree to which students and lecturers communicate within the online course affect student satisfaction. McVey (2008) suggested that the most effective interaction is that which is instant and provides precise information on how performance can be improved. Thurmond et al. (2002) emphasized that timely interaction from the instructor can contribute to the learners' satisfaction with online-based courses. Hara and Kling (1999) reported that lack of timely interaction can result in learners' uncertainty about their performance in online courses and can contribute to their disappointment. Likewise, Arbaugh (2000) found that interaction difficulties were negatively related to the prediction of the students' satisfaction.

Content Interaction

Course design is an essential factor for creating a satisfactory learning environment in an online course (Gray & DiLoreto, 2016; Ilgaz & Gülbahar, 2015). Course design involves the creation of individual and group activities, developing lectures and course curriculum, setting expectations and course objectives, and administering assessments (Garrison et al., 2001). In general, research on online learning reports high levels of association between students'

perceptions of learning and their satisfaction with the courses in which they enroll (Fredericksen et al., 2000; Jiang & Ting, 1998; Motiwalla & Tello, 2010; Oliver & Omari, 2001). Weber and Farmer (2012) found that students consider satisfaction regarding course delivery and content as a major reason for choosing to continue or withdraw from an online class. Students appear to exhibit greater motivation when course content interests them, and when they perceive some personal relevance in the content (Weber & Farmer, 2012). This may account for why students taking elective courses were more positive in their attitudes than those enrolled in required courses (Adler et al., 2001; Benbunan-Fich & Starr, 2003; Brass, 2002; Burke & Moore, 2003; Geiger & Cooper, 1996). Lee (2014) noted that clear assignment guidance, rubrics, and constrictive feedback, as well as the instructor's knowledge of the material, were closely associated with course satisfaction. AlHamad et al. (2014) found that easy course navigation resulted in better course interaction and satisfaction. In their study, almost 73% of the students indicated their preference for course material to be posted by topic or in advance for the entire course (AlHamad et al., 2014).

Students also report positive interaction, learner control, course clarity (Cole et al., 2014; Price et al., 2016), and the use of effective visual, written, and animated content, as important factors in online learning course satisfaction (Çallı et al., 2013). Kuo et al. (2014) reported online course design as the most significant factor in student satisfaction. Within the course design, Kuo et al. (2014) suggested that the learner-content and learner-instructor interactions were the strongest predictors of online course design satisfaction. In a similar study investigating students' satisfaction with online learning, Ilgaz and Gülbahar (2015) found instructional content, teaching process, delivery approach, and variety of instructional materials to be factors affecting students' satisfaction in online classes. Jaggars and Bailey (2010) reported that instructor-led and

collaborative instruction provide better results than independent course studies and that quizzes did not seem to be more effective than assigning homework. Eastmond (2000) noted that many of the advantages and features of online delivery, such as collaboration, interaction, self-paced study, and individualized experience, must be explicitly designed into the course content. Peslak (2005) suggested that the course design for an online course should start with a clearly developed syllabus. The syllabus must contain all the essential elements of the course, and the objectives and approach should be clearly detailed and drive the overall design of the course (Peslak, 2005). Kauffman (2015) concluded that online courses should be designed with clear goals in mind and with reading materials, lectures, and assignments organized in units.

Academic challenge is often considered a feature of a high-quality education (Graham & Essex, 2001) and may be a factor affecting student satisfaction in online courses. The term is often used by educators to describe instruction, learning experiences, and educational expectations that are academically rigorous, however, academic challenge is a difficult concept to define. Some define academic challenge as academically demanding (Wyatt, 2005), fast-paced (Winston et al., 1994), and needing a high degree of energy and time on behalf of the student (Winston et al., 1994). Fredickson (2015) found that when the curriculum is challenging, students perceive positive service quality and satisfaction. Others have reported that student perception of academic challenge appears to be unrelated to student learning and achievement (Cohen, 1981; Uttl et al., 2017). In certain contexts, challenging courses may receive lower course evaluations scores because students put forth more effort and may, therefore, perceive the course to be more challenging (Weinberg et al., 2007).

Course relevance may be an important factor in determining student satisfaction. Students' interest in the course content and students' perception of the relevance of the course

are among the most important factors that influence the motivation of students in a course (Adler et al., 2001; Benbunan-Fich & Starr, 2003; Brass, 2002; Burke & Moore, 2003; Geiger & Cooper, 1996). Howell and Buck (2012) surveyed faculty and students affiliated with the Consortium for the Advancement of Adult Higher Education (CAAHE) to determine the influence of course relevance on student satisfaction in online versus traditional courses. They collected data from a sample of 214 faculty and 1,725 students at five CAAHE institutions. The results of the survey indicated that adult students were satisfied with courses that contained content they perceived to be useful to their personal career development that could be applied, that helped them prepare for a job, and that they found personally relevant and useful. Sawang et al. (2013) found that students were most satisfied with interactive online courses that incorporated context relevant to their course objectives. DeShields et al. (2005) suggested that courses relevance to the real-world influence students' positive college experience. In a somewhat different approach, Frymier and Houser (1998) trained a guest lecturer to deliver high-relevance (familiar, local examples) and low-relevance (unfamiliar, abstract examples) versions of a public speaking lecture but found no differences in motivation between the two groups. A follow-up experiment by Behrens (1999) discovered no significant learning differences between high relevance and low-relevance contents. Alternatively, Deuren and Lhaden (2017) compared factors of student satisfaction in a private and public state college and found that the increase in perceived relevance was associated with a significant increase in students' course satisfaction. In that same study, Deuren and Lhaden (2017) reported that higher course satisfaction was associated with better course achievement.

Interface Interaction

Success or failure in an online course can be determined to a great degree by the selection of appropriate navigation structures (Su & Chan, 2006). Consistent navigation can support and maintain learner satisfaction (Seong, 2006). Drennan et al. (2010) found that student satisfaction was influenced by positive perceptions of technology in online learning environments. Online access was one of the most important technological factors reported to influence student satisfaction in online courses (Bower & Kamata, 2000). Technology self-efficacy was also found to be an important factor affecting a student's learning experience, course satisfaction, and intent to continue with online learning (Sawang et al., 2013; Wang, 2013). Palmer and Holt (2009) found that a student's comfort level with technology was critical to satisfaction with online courses. Overestimating the technological readiness of online students was a common mistake in online education (Clark-Ibanez & Scott, 2008). Students who reported frustration with technology in the course reported lower satisfaction levels (Chong, 1998; Hara & Kling, 2000). Kuo et al. (2014) reported that students' confidence in using the Internet and other technology affect their learning experience and satisfaction with online learning. Similarly, Wang (2013) found that students with previous online learning experience had higher technology self-efficacy and were more likely to receive higher grades in online courses.

Feedback and assessments are also key components of student satisfaction with online courses. Researchers report that online students benefit from more regular and detailed course feedback compared to face-to-face students (Zachery & Jensen, 2005). Face-to-face students can often get informal feedback or indicators of their performance from class sessions. This is not possible in online learning environments. Hillesheim (1998) recommended using specific

methods to provide fast, effective feedback, including direct individual feedback, collective feedback, asynchronous discussions, and discussion monitoring.

Important considerations that can make navigation more fluid are decreasing the number of touches by users and changing the text input method by selecting the text from a menu list (Buchanan et al., 2001). Consistency is also an important and fundamental principle to consider when designing a usable interface (Nielsen, 1993). Consistency is defined by Kellogg (1987) as a cover for interface design and the task usefulness structure of a learning application. Thus, information needs to be in the same locations in the interface to trigger consistent user actions (Seong, 2006). Finally, the online user interface must be designed in a simple way without any complexity.

Student - Student Interaction

Sher (2009) defined student-student interaction as the exchange of information and ideas that occurs among students in a course in the presence or absence of the instructor. Jung et al. (2002) found that learner satisfaction was more strongly related to the amount of student-student interaction than to interactions with the instructor. They found that the students who collaborated with each other expressed the highest level of satisfaction. These findings have been echoed throughout the literature. In a cross-sectional survey of 207 online doctoral students, Ivankova and Stick (2007) found that students who successfully completed the program received more meaningful and constructive student feedback than those who dropped out. In a separate qualitative interview study, Hollenbeck et al. (2011) found that participants indicated they relied on student-student connectivity because it reduced the perceived threat of poor performance in a course. Although there is research outlining the importance of student-student interaction (Choi et al., 2002; Hollenbeck et al., 2011; Ivankova & Stick, 2007), preference for this type of

interaction is not universal. In fact, Grandzol and Grandzol (2010), noted that student-student interaction was significantly, but negatively associated with course completion rates.

Similarly, Arbaugh and Rau (2007) found student-student interaction to be significantly, negatively correlated with satisfaction in online courses. In a mixed-methods study of adult learners in a self-paced online program, Rhode (2009) found that learners were willing to forgo interpersonal interactions with peers in exchange for the flexibility of self-paced learning. These findings suggest that satisfaction with student-student online course interactivity varies according to level and type of learner, with undergraduate students giving greater value to this type of interaction than graduate students and adult learners (Rhode, 2009). The findings of also suggest that finding the right balance of student-student interaction is critical to both student satisfaction and online course completion.

Learner Characteristics

Several learner characteristics have been found to increase student satisfaction with online learning. Students' personalities could impact their levels of interactions, engagement, and involvement in online learning environments (Bolliger & Erichsen, 2013). Among all personality traits, introverts were found most likely to be dissatisfied with interactive course content (Bolliger & Erichsen, 2013), while extroverts preferred to be engaged in discussion forums (Blau & Barak, 2012). Blau and Barak (2012) also found that the amount of participation and the quality of the discussions was higher in extroverts. Sawang et al. (2013) found that openness significantly contributed to students' satisfaction with an online course. Engagement was also found to be an important contributor to student satisfaction with an online course and their motivation to learn (Martin & Bolliger, 2018). Çallı et al. (2013) studied how perceived playfulness, ease of use, and multimedia content affected student's satisfaction in an online

learning environment and found that all three factors affected satisfaction with an online course. Liu et al. (2008) found that cognitive style did not affect online learning performance. Muilenburg and Berge (2005) examined perceived barriers to learning online for adult learners engaged in a variety of web-based learning settings (university courses, community college courses, business/corporate courses) and found time management and lack of motivation to be significant underlying barriers to online learning (Muilenburg & Berge, 2005). Similar studies demonstrated the important role that self-regulation and motivation play in online learning (Choi & Park, 2009; Lim & Kim 2003; Waschull, 2005; Yukselturk & Bulut, 2007), however Thurmond et al. (2002) reported that student satisfaction was influenced by instructional decisions and actions in the online environment rather than by learner characteristics. Given the variance in these findings, it is beneficial to look at the factors affecting student satisfaction in online computer programming courses.

Student Satisfaction in Online Computer Programming Courses

Computer programming is one of the most effective courses for learning high-level problem-solving skills (Askar & Davenport 2009; Sorva, 2013; Wu & Yan, 2009), however, it is among the hardest courses for students enrolled in Computer Science, and beginners generally report low levels of self-efficacy (Altun & Mazman, 2012). One of the main challenges in learning computer programming for novice students is understanding the abstraction of computers in the role of a program executor (Du Boulay, 1986). Programming requires the student to know the structural specifications of the programming language and to have high-level thinking skills (Du Boulay, 1986). Programming constructs and concepts such as object-oriented programming, recursion, reference parameters, and object instantiation have been found to be especially difficult to grasp for novice students. These programming concepts are often not

directly visible in program codes, making them difficult to visualize (Eckerdal & Thuńe, 2005). Students experience problems in understanding programming concepts because these concepts are not adequately used in concrete real-world applications (Altun & Mazman, 2012; Ersoy et al., 2011). Many of these concepts remain intangible for the students, and they have difficulty putting the information they learn to use (Ersoy et al., 2011). Successful implementation of programming concepts requires the correct execution of all programming steps in the right order. Students who encounter problems with a step may develop a negative attitude towards programming.

Given the challenges in learning computer programming, one of the precautions that may be taken to avoid these negative attitudes is to allow for the active participation of students in online learning environments (Sönmez, 1997). The use of online technologies can help students increase active participation (Sönmez, 1997). Kop (2011) suggested that a high amount of cognitive presence is needed for producing deep and meaningful learning results in programming courses and found prior computer programming experience to be a significant factor in student satisfaction in computer programming courses. Course interaction was also found to be a significant factor in increasing student satisfaction in online computer programming courses. Kop et al. (2011) discussed the important role of the course instructor in online programming courses. Their findings suggest that the course instructor may increase student motivation to learn by facilitating self-directed studies with well-organized instructions and timely feedback (Kop et al., 2011; Xia, 2015). Schramm (1977) suggested that learning computer programming was influenced more by the content and instructional strategy in the learning materials than by the type of technology used to deliver instruction. Fini (2009) found that the deeper the level of engagement, the better students participated in programming courses. Alternatively, Williams

and Kessler (2000) found that collaboration in programming environments enhanced productivity while Bri et al. (2009) reported that the use of social software for educational purposes in online learning deepened the interaction between the course instructors and programming students. Durlak et al. (2011) and Shana (2009) also suggested incorporating social, and emotional communication systems in online computer programming courses, concluding that social and emotional communication systems, such as simulation software, wikis, social networks and messaging systems have a positive impact on student achievement in technology courses.

In addition to social communication, programming exercises have been found to be effective in engaging students and increasing retention in computer programming classes (Ali, 2005), however, this may be a challenge in online learning environments. Another area that is particularly challenging for online programming courses is providing hands-on lab activities with timely and personal feedback (Jaggars, 2014; Kearsley, 2002; Steinbronn & Merideth, 2008). Molstad (2001) described uses of various types of distance education technology in an online introductory programming course, including the use of two-way audio-video capabilities that were used to allow students to access recordings of lectures. Students could ask questions about the recordings, but no synchronous capability was available. Molstad (2001) concluded that clarity, feedback, and technical skills were essential factors in online computer programming courses. In a similar study describing an online C++ programming course, Thomas (2000) found that face-to-face meetings with a teaching assistant proved useful even though the course was geared toward mature students with at least a year of programming experience. Students in the study reported feeling isolated and wishing for better contact with the instructor. Thomas (2000) concluded that online courses require some level of compensation for the lack of face-to-face

interactions, even among mature and motivated students. Zachery and Jensen (2005) suggested that graded assignment feedback and interaction would be more beneficial if students' progress was monitored regularly. They suggested the integration of synchronous learning sessions as a potential for improving learning experiences and engaging students in online programming courses.

Varying results regarding the quality of online versus face-to-face programming courses also exist in the literature. Ury (2004) concluded that the performance of online students was satisfactory, but that their final grade was significantly lower than that of face-to-face students who took the same class. Kleinman and Entin (2002) arrived at a different conclusion, reporting that there were no significant differences in the overall outcomes and achievements of online and face-to-face computer programming students. These findings corroborated the results of Maki and Maki (2007). Other studies have indicated the need to find ways to improve retention rates in online computer programming courses. El-Sheikh et al. (2007) reported relatively little difference in outcomes between face-to-face and online students in an introductory programming course but noted that dropout rates were much higher in the online section of the course. These findings were corroborated by Reeves et al. (2002). In their study on online programming utilizing WebCT, Reeves et al. (2002) reported that the online section of the course had double the attrition rate of the face-to-face section. The implementation of effective learning strategies can help reduce attrition and promote the creation and sustainability of a more effective online learning communities.

Conclusion

The discussion in this section highlights several factors that may contribute to student satisfaction in online computer programming courses. The findings suggest that online computer

programming courses present the same challenges that all online courses face. There is a need for fast and clear feedback on assignments (El-Sheikh, 2009; Thomas, 2000), social presence and interaction (Bower & Kumar, 2015; Wang, 2011), interactive course content (El-Sheikh, 2009; Karsten et al., 2005; Thomas, 2000; Wang, 2011; Zachery & Jensen, 2003), and incremental course design (Entin & Kleinman, 2002; Bower & Kumar, 2015; Vihavainen et al., 2012; Zachery & Jensen, 2003). These factors may have positive impacts on student satisfaction in online courses, but as demands for computer programmers and programming courses continue to increase, it will be important to research the effectiveness of these factors in online computer programming courses. Additional factors, not commonly examined in online computer programming courses, may also play a significant role in student satisfaction within these courses. More research in the area of online computer programming courses is required to adapt these courses to meet the needs of this student population.

Summary

This section provided an overview of factors that may influence student satisfaction in online computer programming courses. The literature review section was divided into the following parts: a description of the adult learner, an overview of online learning, the community of inquiry framework, student satisfaction in online courses, factors affecting student satisfaction, and student satisfaction in online computer programming courses. Student satisfaction in an online course is an important part of the online learning process (Astin, 1993; Bolliger & Wasilik, 2009; Fredericksen et al., 2000; Rivera & Rice, 2002; Yukselturk & Bulut, 2007). The lack of satisfaction in an online classroom can result in less than optimal learning experiences for online learners (Allen & Seaman, 2008; Barone et al., 1997; Keller, 1983; Koseke, & Koseke, 1991). By examining student satisfaction in online computer programming

courses, instructors and institutions can initiate future initiatives on preferred techniques for improving retention in these courses. Data on student satisfaction can also allow course designers, educators, and administrators to identify areas where improvement is needed in a course (Reinhart & Schneider, 2001).

The presentation of the research in this literature review indicates that there is a positive relationship between instructor interaction, content interaction, interface interaction, and student satisfaction in the online learning environment. Further examination of the relationships between these factors is warranted to determine if these positive relationships exist in online computer programming courses.

CHAPTER 3. METHODS

Introduction

This study examined the factors that may have an influence on student satisfaction in computer programming courses at an online Midwestern university. The rise in demand for computer programming jobs has created a significant need for computer programming training, however, computer programming courses are often seen as challenging and unattractive to students (Butler & Ahmed, 2016; Fotaris et al., 2016; Pineda-Corcho & Moreno-Cadavid, 2017). The National Center for Education Statistics reported that retention rates for computer programming courses declined by 17% from 2005-2011 (National Center for Education Statistics, 2018). The problems encountered by students in first-year computer programming courses were the most common concern. Computer programming competencies are based on knowledge and skills; knowledge consists of definitions, facts, language constructs and programming knowledge whereas skills consist of certain required actions and strategies in applying programming knowledge (Caspersen, 2007). Computer programming is a mandatory fundamental component of the computer science curriculum. It is also one of the most challenging courses for new students and they often drop out as a consequence of having failed or performed poorly in an introductory programming course. Studies suggest that student satisfaction could positively predict student retention and learning outcomes in these courses (Lyke & Frank, 2012) and that interaction is necessary for student satisfaction to occur (Ryan et al., 2004; Brown, 2004; Oblinger et al., 2001).

This chapter explains the methods used to determine if selected variables (instructor interaction, content interaction, and interface interaction) affect students' satisfaction in online computer programming courses. The first section provides an overview of the setting of the

study. The second section describes the sample used for this study. The third section discusses the instrument used to collect data for this study. The fourth and final section provides an overview of the data analysis procedures used.

Purpose of the Study

The purpose of this study was to determine if selected variables (instructor interaction, content interaction, and interface interaction) affect students' satisfaction in online computer programming courses. This study extends the work of Kauffman (2015) and Khalid (2014) by examining instructor interaction, content interaction, interface interaction, and their effects on student satisfaction in online computer programming courses. Identifying additional factors that contribute to student satisfaction in online courses may aid in predicting possible learning outcomes and assist universities in designing quality online courses to meet students' needs. It was anticipated that information obtained from this research will provide a foundation for future assessments of computer programming online courses by identifying the factors that may positively affect student satisfaction in these courses.

Research Questions

The research questions were structured within the framework of best practices identified within distance education and Computer Science education. The literature review identified best practices within the framework of instructor interaction, content interaction, and interface interaction. According to the literature, these elements may have an influence on student satisfaction in online computer programming classes. To validate these claims, the following research questions will be addressed in this study:

1. What is the relationship between student satisfaction and different instructor interaction?

2. What is the relationship between student satisfaction and content interaction?
3. What is the relationship between student satisfaction and interface interaction?
4. Are there differences in student satisfaction based on age, gender, and race?
5. Are there differences in content interaction based on age, gender, and race?
6. Are there differences in interface interaction based on age, gender, and race?
7. Are there differences in different instructor interaction based on age, gender, and race?
8. Do independent variables: instructor interaction, content interaction, and interface interaction, predict student satisfaction?

Setting of the Study

The current study was conducted at a 4-year for-profit online university in the Midwestern region of the United States. The university began offering degree programs exclusively online in the 1990s and has a current enrollment of approximately 6,525 students, of whom 97% are undergraduate students. The undergraduate programs offer a balanced curriculum across the arts, sciences, and professions in more than 50 disciplines including Computer Science and Computer Engineering. The university's online program attracts many active and former military students, adult learners, and first-generation college students. The students enrolled are of mixed gender, age, and ethnicity.

Students surveyed in the study were enrolled in the CS192 Programming Essentials course. All course materials were offered remotely through the Blackboard LMS. The CS192 Programming Essentials course is the first programming course taken in the Computer Science and Computer Engineering degree programs and is a prerequisite for enrolling in all future Computer Science and Computer Engineering major courses. This course introduces students to

problem-solving and critical thinking skills through the use of the Python programming language. It covers fundamental programming control structures, such as sequential structures, selection structures, and repetition structures, file manipulation, and the use of logic to design programs. Elements of the course include a weekly discussion post, a weekly quiz, and a weekly programming exercise. Students also complete a midterm exam in week 4 and a final exam in the final week of the course, week 8. Students are responsible for researching the weekly discussion topics, quizzes, and programming exercises. Video lectures and presentations are provided in each week of the course and instructors can post additional supplemental materials and guides to assist students in completing weekly activities. Instructors can also provide synchronous meetings to deliver direct instruction and students have access to 24-hour online tutors. Each student is allotted 4 hours of online tutor time for the duration of the course, with the ability to request additional time with the approved of a university administrator.

Participants

In this study, the participants in this study were undergraduate students enrolled in an asynchronous course, CS192 Programming Essentials, at an online university in the Midwest region of the United States (n = 115) in Fall 2019 and Spring 2020. The majority of students were enrolled in the undergraduate Computer Science and Computer Engineering programs. Participation in the study was voluntary and students did not receive any compensation for participation. To be considered for participation in the study, students had to meet three criteria: they had to (1) be at least 18 years of age, (2) be enrolled students at the university, and (3) be enrolled in a CS192 Programming Essentials course for the Fall 2019 or Spring 2020 quarter.

Instrument

The study utilized a survey methodology to examine the relationship between student satisfaction and the predictor variables (instructor interaction, content interaction, and interface interaction). A survey was identified as an appropriate instrument for this research study (Sheridan & Kelly, 2010). The instrument entitled End of Course (EOC) survey was used for the study (see Appendix A). The EOC survey was designed and developed by the university. The original survey was divided into four main sections and included 17 items using four scales. The first scale of the EOC survey contained 3 questions measuring course preparation. The second scale contained 3 questions which allowed students to indicate the degree of content and interface interaction. The third scale contained 7 Likert scale questions which allowed students to rate the level of interaction they experienced with their instructor. The forced-choice statements presented were in order of Strong Agree, Agree, Disagree, Strongly Disagree and Not Appropriate. The last scale contained 4 questions targeting students' overall experience and satisfaction with the online course. Students' demographic information such as gender, age, and race, were collected from respondent profile accounts.

In order to address the research questions, focal variables regarding overall student satisfaction were used. Due to a lack of consistency with the research study, some of the initially focal variables used in the original EOC survey were ultimately omitted from the analysis. The specific focal variables selected to be analyzed included instructor interaction (Appana, 2008; Finaly-Neumann, 1994; Sher, 2009; Thurmond & Wambach, 2004), course interaction (Bolliger & Martindale, 2004; Fredickson, 2015; Sawang et al., 2013), and interface interaction (Bower & Kamata, 2000; Drennan et al., 2010; Sawang et al., 2013; Wang, 2013) (see Table 5). General

demographic characteristic variables (gender, age, and race) were also analyzed (Astin, 1993; Ko & Roseen, 2001; Kuh et al., 2008; Pascarella & Terenzini, 2005; Park, 2007).

Table 5

Instrument Factors

Factors	Items
Instructor Interaction	6, 7, 8, 9, 10, 11, 12
Content Interaction	5
Interface Navigation	4
Course Satisfaction	15

The validity of survey questions used in this study was established based on empirical evidence or references that closely reflect each of the components. The survey items used in this study are displayed in Table 6.

Data Collection

The data used for this study was archival data selected from the CS192 Programming Essentials course sections taught in Fall 2019 and Spring 2020. Survey questions were made available to students within the final two weeks of the course via the university's Blackboard learning management system. Participation in the survey was voluntary and questions were developed and administered by the university. Permission was requested and received from university administrators for the researcher to obtain the survey results. After obtaining Auburn University Institutional Review Board (IRB) (see Appendix C) approval, data on characteristics of students and perceptions of student satisfaction in the course were obtained from 115 students. Additional covariates (gender, race, and age), generated from institutional data, were also obtained to evaluate their influence on student satisfaction in the online computer programming courses. To preserve privacy, all collected and analyzed data were digitally stored in a secured location with restricted access.

Table 6

EOC 10 Item Evidence of Validity

Item	Description	Reference
4	The course content was organized in a way that was easy to navigate.	Hixon et al., 2016; Ralston-Berg & Nath, 2008
5	The materials helped me achieve the learning objectives for the course.	Al-Sheeb et al., 2018; Hixon et al., 2016; Young & Norgard, 2006; Ralston-Berg & Nath, 2008
6	Throughout the course, the instructor posted and held office hours	Ralston-Berg & Nath, 2008; Shute, 2008
7	Throughout the course, the instructor responded to emails and/or phone calls within 48 hours	Al-Sheeb et al., 2018; Bangert-Drowns et al., 1991; National Survey of Student Engagement, 2019; Ralston-Berg & Nath, 2008; Shute, 2008
8	Throughout the course, the instructor answered my questions effectively	Fieger, 2012; Hostetter & Busch, 2006; National Survey of Student Engagement, 2019; Ralston-Berg & Nath, 2008; Shute, 2008
9	Throughout the course, the instructor posted individualized, helpful feedback to assignments and discussion forums	Fieger, 2012; Lam et al., 2002; Ralston-Berg & Nath, 2008; Shute, 2008
10	Throughout the course, the instructor engaged with students, contributing to a healthy learning environment	Al-Sheeb et al., 2018; Gunawardena, 1995; Ralston-Berg & Nath, 2008
11	Throughout the course, the instructor treated students with respect and professionalism	Fieger, 2012; Ralston-Berg, 2008
12	Throughout the course, the instructor demonstrated knowledge related to the course content	Fieger, 2012; Ralston-Berg & Nath, 2008
15	All things considered, were you satisfied with your studies with us?	Al-Sheeb et al., 2018; Astani et al., 2010; Fieger, 2012; National Survey of Student Engagement, 2019; Ralston-Berg & Nath, 2008

Data Analysis

Data were analyzed using IBM SPSS v. 26. The raw web-based survey data were submitted to the researcher in a Microsoft Excel file. Data collected from the Likert scale and nominal responses were recoded to numeric values. First, descriptive statistics were generated to gain an overall idea of the sample collected. Analysis methods were selected based on each research question. Spearman's correlation coefficient was used to answer research questions one, two and three, to investigate the relationship between instructor interaction, content interaction, interface interaction, and student satisfaction in online computer programming courses. Spearman's correlational analysis is a process for analyzing, testing, and representing associations between variables (Onwuegbuzie & Daniel 2002). It is appropriate when one or both variables are interval, ratio level, or ordinal. Chi-Square analysis was used to investigate the differences in student background variables (age, gender, and race) on student satisfaction, instructor interaction, content interaction and interface interaction for research questions four, five, six, and seven. A Chi-Square Test of Independence is used to determine whether there is a significant association between the two categorical variables (Lavrakas, 2008). Binary logistic regression analysis was performed to answer the eighth research question and determine if the three independent variables (instructor interaction, content interaction and interface interaction) are significant predictors of the dependent binary variable (student satisfaction). Binary logistic regression is the appropriate regression analysis used to explain the relationship between a dependent binary variable and one or more nominal, ordinal, interval or ratio-level independent variables (Elliott &Woodward, 2007). The following section presents respondent data and results according to the eight research questions.

CHAPTER 4. FINDINGS

Introduction

This study examined the factors that may have an influence on student satisfaction in computer programming courses at an online Midwestern university.

In this study, the participants were undergraduate students enrolled in an asynchronous course, Programming Essentials, at an online university in the Midwest region of the United States (n = 115 students). Most students were enrolled in undergraduate Computer Science and Computer Engineering programs. Participation in the study was voluntary and students did not receive any compensation for participation. To be considered for participation in the study, students had to meet three criteria: they had to (1) be at least 18 years of age, (2) be enrolled students at the university, and (3) be enrolled in a Programming Essentials introduction to Python programming course for the Fall 2019 or Spring 2020 quarter. This chapter provides an overview of the findings of the End of Course (EOC) student satisfaction survey. The survey contained 17 questions for participants to consider, 10 of those questions were used for this study. The 10 questions were organized across four categories: content interaction, interface interaction, instructor interaction, and student satisfaction. Demographic data on age, gender, and race were collected from respondent profile accounts. Data were collected following the guidelines of the Auburn University Institutional Review Board (IRB) (see Appendix C). Statistical analysis and descriptive findings were obtained using IBM SPSS, v. 26.

Purpose of the Study

The purpose of this study was to determine if selected variables (instructor interaction, content interaction, and interface interaction) affect students' satisfaction in online computer programming courses. This study extends the work of Kauffman (2015) and Khalid (2014) by

examining instructor interaction, content interaction, interface interaction, and their effects on student satisfaction in online computer programming courses. Identifying additional factors that contribute to student satisfaction in online courses may aid in predicting possible learning outcomes and assist universities in designing quality online courses to meet students' needs. It was anticipated that information obtained from this research will provide a foundation for future assessments of computer programming online courses by identifying the factors that may positively affect student satisfaction in these courses.

Research Questions

The research questions were structured within the framework of best practices identified within distance education and Computer Science education. The literature review identified best practices within the framework of instructor interaction, content interaction, and interface interaction. According to the literature, these elements may have an influence on student satisfaction in online computer programming classes. To validate these claims, the following research questions will be addressed in this study:

1. What is the relationship between student satisfaction and different instructor interaction?
2. What is the relationship between student satisfaction and content interaction?
3. What is the relationship between student satisfaction and interface interaction?
4. Are there differences in student satisfaction based on age, gender, and race?
5. Are there differences in content interaction based on age, gender, and race?
6. Are there differences in interface interaction based on age, gender, and race?
7. Are there differences in different instructor interaction based on age, gender, and race?

8. Do independent variables: instructor interaction, content interaction, and interface interaction, predict student satisfaction?

Demographic Data

This study examined the factors that may have an influence on student satisfaction in computer programming courses at an online Midwestern university. End of course student satisfaction surveys were made available to students enrolled in introductory Python computer programming courses in the Fall 2019 and Spring 2020 quarters. One hundred and fifteen participants completed the EOC survey. Demographic data on age, gender, and race were collected from respondent profile accounts in Blackboard (see Table 7). The vast majority of respondents were males (n = 89, 77%) and the largest category for ethnicity was white (n = 57, 50%). The average age of the students was 32 years of age with the largest group of students ranging from 18 - 35 years old (n = 77, 67%).

Table 7

Summary of Demographic Data

Baseline characteristic	Total	Percentage
	n	*%*
Gender		
Male	89	77%
Female	26	23%
Races		
White	57	50%
Race and Ethnicity Unknown	24	21%
Black or African American	13	11%
Hispanic/Latino	11	9%
Two or more races	8	7%
Asian	1	1%
American Indian/Alaskan Native	1	1%
Age Groups		
Young Adults (18 - 35)	77	67%
Adults (36 - 55)	32	28%
Older Adults (56 and older)	6	5%

Note. N=115.

A summary of the mean and standard deviation for student satisfaction and each group of interaction (instructor interaction, content interaction, interface interaction) is provided below (see Table 8).

Table 8

Summary of Mean and Standard Deviation for Student Satisfaction and Interactions

	M	*SD*
Student Satisfaction		
All things considered, were you satisfied with your studies with us?	.90	2.95
Instructor Interaction		
Posted and held office hours	3.07	1.303
Responded to emails and/or phone calls within 48 hours	2.79	1.513
Answered my questions effectively	2.85	1.476
Posted individualized, helpful feedback to assignments and discussion forums	3.40	.804
Engaged with students, contributing to a healthy learning environment	3.46	.798
Treated students with respect and professionalism	3.62	.696
Demonstrated knowledge related to the course content	3.64	.595
Course Content		
Demonstrated knowledge related to the course content	3.24	.812
Interface Interaction		
The course content was organized in a way that was easy to navigate	3.42	.688

Note. N=115.

Survey question 4 asked participants if the course content was organized in a way that was easy to navigate. Survey question 5 asked participants if the materials helped me achieve the learning objectives for the course. Survey questions 6-12 asked participants about different instructor interactions in the course. The interactions which found to be most important to students were as follows: instructor interaction - demonstrated knowledge related to the course content (98% (cumulatively agree), 68% (strongly agree)), instructor interaction - treated

students with respect and professionalism (97% (cumulatively agree), 69% (strongly agree)), interface interaction (92% (cumulatively agree), 51% (strongly agree)), instructor interaction - engaged with students, contributing to a healthy learning environment (91% (cumulatively agree), 59% (strongly agree)), instructor interaction - posted individualized helpful feedback to assignments and discussion forums (88% (cumulatively agree), 56% (strongly agree)), interface interaction (83% (cumulatively agree), 44% (strongly agree)), instructor interaction - posted and held office hours (81% (cumulatively agree), 51% (strongly agree)), instructor interaction - answered my questions effectively (73% (cumulatively agree), 49% (strongly agree)), and instructor interaction - responded to emails and/or phone calls within 48 hours (69% (cumulatively agree), 49% (strongly agree)). Survey question 15 asked participants if they were satisfied with their studies. Most participants responded that they were satisfied with the course (n = 104 or 90%). Males were more satisfied with the course (n = 84 or 94%) compared to females (n = 20 or 77%). Blacks or African Americans were the least satisfied with the course (n = 10 or 77%), whereas older adults were most satisfied with the course (n = 6 or 100%).

Cronbach's Alpha was computed to analyze the reliability of the instructor interaction survey questions. The Cronbach Alpha reliability was .869, providing evidence of reliability and high internal consistency for the instructor interaction score. The frequencies and percentages of the responses are displayed in Table 9.

Table 9

Summary of Frequencies and Percentages for Student Satisfaction and Interactions

	Participants	
	f	%
The course content was organized in a way that was easy to navigate.		
	59	51%
	47	41%
	7	6%
	2	2%
The materials helped me achieve the learning objectives for the course.		
Strongly Agree	51	44%
Agree	45	39%
Disagree	15	13%
Strongly Disagree	4	3%
Throughout the course, the instructor posted and held office hours		
Strongly Agree	59	51%
Agree	34	30%
Disagree	6	5%
Strongly Disagree	3	3%
Not Applicable	13	11%
Throughout the course, the instructor responded to emails and/or phone calls within 48 hours		
Strongly Agree	56	49%
Agree	23	20%
Disagree	13	11%
Strongly Disagree	2	2%
Not Applicable	21	18%
Throughout the course, the instructor answered my questions effectively		
Strongly Agree	56	49%
Agree	28	24%
Disagree	8	7%
Strongly Disagree	4	3%
Not Applicable	19	17%
Throughout the course, the instructor posted individualized, helpful feedback to assignments and discussion forums		
Strongly Agree	64	56%
Agree	37	32%
Disagree	11	10%
Strongly Disagree	2	2%
Not Applicable	1	1%
Throughout the course, the instructor engaged with students, contributing to a healthy learning environment		
Strongly Agree	68	59%
Agree	37	32%
Disagree	7	6%

Table 9—*Continued*

Strongly Disagree	1	1%
Not Applicable	2	2%
Throughout the course, the instructor treated students with respect and professionalism		
Strongly Agree	79	69%
Agree	32	28%
Disagree	2	2%
Strongly Disagree	0	0%
Not Applicable	2	2%
Throughout the course, the instructor demonstrated knowledge related to the course content		
Strongly Agree	78	68%
Agree	35	30%
Disagree	1	1%
Strongly Disagree	0	0%
Not Applicable	1	1%
All things considered, were you satisfied with your studies with us?		
Yes	104	90%
No	11	10%

Note. N=115.

Discussion of Findings

Spearman's correlation was used to examine the first three research questions. Chi-Square Test of Independence was applied to investigate the following four research questions, and binary logistic regression analysis was used to address the last research question. Alpha level was set at p equals to .05.

Research Question 1: What is the relationship between student satisfaction and different instructor interaction?

To address Research Question 1, items 6-12 and 15 on the EOC surveys were analyzed. Respondents were asked to rate these items using a 4-point Likert-type scale. The responses to items 6-12 were coded as follows: 0 = Not Applicable, 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, and 4 = Strongly Agree. Item 15 was coded as: 0 = No and 1 = Yes.

Spearman's correlation coefficient was performed to examine the correlation between different instructor interaction and the students' overall student satisfaction. Weak positive correlations were found in instructor interactions where the instructor posted and held office hours, $r_s = .214$, $p = .022$, answered questions effectively, $r_s = .205$, $p = .028$, treated students with respect and professionalism, $r_s = .240$, $p = .007$, demonstrated knowledge related to the course content, $r_s = .230$, $p = .013$, provided individualized, helpful feedback to assignments and discussion forums, $r_s = .274$, $p = .003$, and engaged with students, contributing to a healthy learning environment, $r_s = .335$, $p < .001$. In these interactions, the p value was less than $\alpha = 0.05$. Responding to emails and/or phone calls within 48 hours, $r_s = .076$, $p = .417$, was not statistically significantly correlated with overall student satisfaction. The results of the correlation analysis are displayed in Table 10 below.

Table 10

Spearman's Correlation of Different Instructor Interactions and Student Satisfaction

Variable	Student Satisfaction
Student Satisfaction	-
Posted and held office hours	.214*
Responded to emails and/or phone calls within 48 hours	.076*
Answered my questions effectively	.205*
Posted individualized, helpful feedback to assignments and discussion forums	.274**
Engaged with students, contributing to a healthy learning environment	.335**
Treated students with respect and professionalism	.240**
Demonstrated knowledge related to the course content	.230*

Note. N=115.
*p<.05. **p<.01

Research Question 2: What is the relationship between student satisfaction and content interaction?

To address Research Question 2, items 5 and 15 on the EOC surveys were analyzed. Respondents were asked to rate these items using a 4-point Likert-type scale. The responses to

items 4 were coded as follows: 0= Not Applicable, 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, and 4 = Strongly Agree. Item 15 was coded as: 0 = No and 1 = Yes.

Spearman's correlation coefficient was performed to examine the correlation between content interaction and the student's overall satisfaction rating. There was a moderate positive correlation between content interaction and student satisfaction, $r_s = .458$, $p < .001$. In this interaction, the p value was less than $\alpha = .05$. The results of the correlation analysis are displayed in Table 11 below.

Table 11

Spearman's Correlation of Content Interaction and Student Satisfaction

Variable	Student Satisfaction
Student Satisfaction	-
The materials helped me achieve the learning objectives for the course.	.458**

Note. N=115.
**p<.01

Research Question 3: What is the relationship between student satisfaction and interface interaction?

To address Research Question 3, items 4 and 15 on the EOC surveys were analyzed. Respondents were asked to rate these items using a 4-point Likert-type scale. The responses to items 4 were coded as follows: 0= Not Applicable, 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, and 4 = Strongly Agree. Item 15 was coded as: 0 = No and 1 = Yes.

Spearman's correlation coefficient was performed to examine the correlation between interface interaction and the student's overall satisfaction rating. There was a moderate positive correlation between interface interaction and student satisfaction, $r_s = .418$, $p < .001$. In this interaction, the p value was less than $\alpha = 0.05$. The results of the correlation analysis are displayed in Table 12 below.

Table 12

Spearman's Correlation of Interface Interaction and Student Satisfaction

Variable	Student Satisfaction
Student Satisfaction	-
The course content was organized in a way that was easy to navigate.	.418**

Note. N=115.
**p<.01

Research Question 4: Are there differences in student satisfaction based on age, gender, and race?

To address Research Question 4, demographic variables and item 15 on the EOC surveys were analyzed. A Chi-Square Test of Independence was performed to examine the correlation between age, gender, race, and the overall student satisfaction rating. This test was found to be statistically significant, $\chi^2(1) = 7.090$, $p = .008$ (V =.248). According to Cohen (1988), Phi and Cramer's V effect size magnitude can be interpreted as 0.1 being a small effect size, 0.3 being a medium effect size, and 0.5 being a large effect size. These results indicated that gender had a small to medium effect on overall student satisfaction. No association was found between age, $\chi^2(31) = 27.912$, $p = .626$, and overall student satisfaction or race, $\chi^2(6) = 3.020$, $p = .806$, and overall student satisfaction. The results of this Chi-Square analysis are displayed in Table 13 below.

Table 13

Chi-Square Tests for Demographic Variables and Student Satisfaction

Variable	Pearson Chi-Square Value	*df*	Asymptotic Significance (2-sided)
Age	27.912	31	.626
Gender	7.090	1	.008
Race	3.020	6	.806

Note. N=115

Research Question 5: Are there differences in content interaction based on age, gender, and race?

To address Research Question 5, demographic variables and item 5 on the EOC surveys were analyzed. A Chi-Square Test of Independence was performed to examine the correlation between age, gender, race, and the content interaction rating. No association was found between gender, $\chi^2(3) = 6.695$, $p = .082$, and content interaction, age, $\chi^2(93) = 106.591$, $p = .159$, and content interaction or race, $\chi^2(18) = 17.948$, $p = .459$, and content interaction. The results of this Chi-Square analysis are displayed in Table 14 below.

Table 14

Chi-Square Tests for Demographic Variables and Content Interaction

Variable	Pearson Chi-Square Value	*df*	Asymptotic Significance (2-sided)
Age	106.591	93	.159
Gender	6.695	3	.082
Race	17.948	18	.459

N=115

Research Question 6: Are there differences in interface interaction based on age, gender, and race?

To address Research Question 6, demographic variables and item 4 on the EOC surveys were analyzed. A Chi-Square Test of Independence was performed to examine the correlation between age, gender, race, and the interface interaction rating. There was a significant association between gender, $\chi^2(3) = 14.608$, $p = .002$ (V =.356). and interface interaction. No association was found between age, $\chi^2(93) = 106.189$, $p = .165$, and interface interaction or race, $\chi^2(18) = 8.926$, $p = .961$, and interface interaction. The results of this Chi-Square analysis are displayed in Table 15.

Table 15

Chi-Square Tests for Demographic Variables and Interface Interaction

Variable	Pearson Chi-Square Value	*df*	Asymptotic Significance (2-sided)
Age	83.736	93	.743
Gender	14.608	3	.002
Race	8.926	18	.961

Note. N=115

Research Question 7: Are there differences in the different instructor interaction based on age, gender, and race?

To address Research Question 7, demographic variables and items 6 - 12 on the EOC surveys were analyzed. A Chi-Square Test of Independence was performed to examine the correlation between age, gender, race, and the interface interaction rating. There was a significant association between gender and treating students with respect and professionalism, $\chi^2(3) = 8.597$, $p = .035$ (V=.273). No association was found between race, age, gender, and the remaining instructor interactions. The results of the Chi-Square analysis are displayed in Table 16 below.

Table 16

Chi-Square Tests for Demographic Variables and Instructor Interactions

Variable	Pearson Chi-Square Value	*df*	Asymptotic Significance (2-sided)
Age			
Posted and held office hours	107.618	124	.852
Responded to emails and/or phone calls within 48 hours	112.272	124	.766
Answered my questions effectively	95.608	124	.973
Posted individualized, helpful feedback to assignments and discussion forums	99.640	124	.947
Engaged with students, contributing to a healthy learning environment	86.257	124	.996
Treated students with respect and professionalism	55.010	93	.999
Demonstrated knowledge related to the course content	93.229	93	.474
Gender			
Posted and held office hours	1.413	4	.842
Responded to emails and/or phone calls within 48 hours	2.624	4	.623
Answered my questions effectively	4.424	4	.352
Posted individualized, helpful feedback to assignments and discussion forums	3.139	4	.535
Engaged with students, contributing to a healthy learning environment	6.545	4	.162
Demonstrated knowledge related to the course content	3.861	3	.277
Treated students with respect and professionalism	8.597	3	.035
Race			
Posted and held office hours	107.618	124	.852
Responded to emails and/or phone calls within 48 hours	112.272	124	.766
Answered my questions effectively	95.608	124	.973
Posted individualized, helpful feedback to assignments and discussion forums	99.640	124	.947
Engaged with students, contributing to a healthy learning environment	86.257	124	.996
Treated students with respect and professionalism	55.010	93	.999
Demonstrated knowledge related to the course content	93.229	93	.474

Note. N=115.

Research Question 8: Are the predictor variables, instructor interaction, content interaction, and interface, interaction, significant predictors of student satisfaction?

To address Research Question 8, items 4 - 12 and 15 on the EOC surveys were analyzed. Respondents were asked to rate these items using a 4-point Likert-type scale. The responses to items 4-12 were coded as follows: 0= Not Applicable, 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, and 4 = Strongly Agree. A total score was determined for each respondent by adding the code for each response. Using this method, the lowest score could be 8 and the highest could be 32. Item 15 was coded as: 0 = No and 1 = Yes.

A binary logistic regression analysis test was performed to determine if the interaction variables were a significant predictor of student satisfaction. Binary logistic regression is a predictive analysis used to describe data and explain the relationships between the dependent binary variable and the other independent variables. The data were examined to assess the multicollinearity between the predictors. As can be seen in Table 17, none of the interactions were a significant predictor of student satisfaction in the online computer programming courses (course content was organized in a way that was easy to navigate (p =.166), the instructor posted and held office hours (p =.743), responded to emails and/or phone calls within 48 hours (p =.084), the instructor answered my questions effectively (p =.261), the instructor posted individualized, helpful feedback to assignments and discussion forums (.267), the instructor engaged with students, contributing to a healthy learning environment (p =.634), the instructor treated students with respect and professionalism (p =.260), and the instructor demonstrated knowledge related to the course content (p =.733)), however, course content interaction was close to being statistically significant (p =.057). The Hosmer & Lemeshow test of the goodness of fit indicated the model was a good fit to the data as p=.876 (>.05).

Table 17

Summary of Binary Logistic Regression Analyses for Variables Predicting Student Satisfaction

Variable	*B*	*SE*	Wald	*df*	*p*	Exp(B)	95% CI for *B*	
							LL	UL
The course content was organized in a way that was easy to navigate	1.453	1.049	1.918	1	.166	4.275	.547	33.405
The materials helped me achieve the learning objectives for the course	1.877	.987	3.617	1	.057	6.536	.944	45.243
Posted and held office hours	.065	.649	.010	1	.920	1.068	.299	3.807
Responded to emails and/or phone calls within 48 hours	-.463	.789	.344	1	.557	.629	.134	2.955
Answered my questions effectively	-.212	.945	.050	1	.822	.809	.127	5.153
Posted individualized, helpful feedback to assignments and discussion forums	1.145	.846	1.830	1	.176	3.142	.598	16.508
Engaged with students, contributing to a healthy learning environment	-.750	.892	.708	1	.400	.472	.082	2.712
Treated students with respect and professionalism	1.231	1.168	1.111	1	.292	3.423	.347	33.754

Table 17—*Continued*

Demonstrated knowledge related to the course content	-.892	1.222	.533	1	.465	.410	.037	4.496
Constant	-7.697	3.406	5.107	1	.024	.000		

Note. N =115; CI = confidence interval; *LL* = lower limit; *UL* = upper limit.

Summary

The quantitative data addressed the eight research questions of the present study. Numerous analyses were performed to satisfy the research questions (summary statistics, descriptive, correlation, and regression). There were 115 respondents categorized according to age, gender, and race.

The findings of this study indicated that there was a significant positive relationship between student satisfaction and instructor interactions where the instructor posted and held office hours, answered questions effectively, treated students with respect and professionalism, demonstrated knowledge related to the course content, provided individualized, helpful feedback to assignments and discussion forums, and engaged with students, contributing to a healthy learning environment. There was no significant relationship between student satisfaction and instructor interactions where the instructor responded to emails and/or phone calls within 48 hours. Additionally, data suggested that there was a significant positive relationship between student satisfaction and content interaction and between student satisfaction and interface interaction. There were also significant differences in student satisfaction and interface interaction based on gender. Furthermore, there were significant differences in instructor interactions where instructors treated students with respect and professionalism based on gender. There were no differences in content interaction or other instructor interactions based on age,

gender, and race. Finally, results implied that none of the observed interactions were accurate predictors of student satisfaction in these courses in the online programming courses.

CHAPTER 5. DISCUSSION, IMPLICATIONS, LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

Introduction

This study examined the factors that may have an influence on student satisfaction in computer programming courses at an online Midwestern university. The introduction, research, methods, and results of this study are outlined in the previous chapters. Chapter I presented an overview of the problem, the purpose, research questions, limitations, and overall significance of this research. Chapter II defined the theoretical framework for this study and provided a review of the related literature. Chapter III described the method adopted for conducting this study and measures used for the collection and analysis of the research data. Chapter IV described the analysis and interpretation of the data obtained for this study to answer the research questions outlined. This chapter presents a discussion of the study, implications of the findings, limitations, and recommendations for future research.

Purpose of the Study

The purpose of this study was to determine if selected variables (instructor interaction, content interaction, and interface interaction) affect students' satisfaction in online computer programming courses. This study extends the work of Kauffman (2015) and Khalid (2014) by examining instructor interaction, content interaction, interface interaction, and their effects on student satisfaction in online computer programming courses. Identifying additional factors that contribute to student satisfaction in online courses may aid in predicting possible learning outcomes and assist universities in designing quality online courses to meet students' needs. It was anticipated that information obtained from this research will provide a foundation for future

assessments of computer programming online courses by identifying the factors that may positively affect student satisfaction in these courses.

Research Questions

The research questions were structured within the framework of best practices identified within distance education and Computer Science education. The literature review identified best practices within the framework of instructor interaction, content interaction, and interface interaction. According to the literature, these elements may have an influence on student satisfaction in online computer programming classes. To validate these claims, the following research questions will be addressed in this study:

1. What is the relationship between student satisfaction and different instructor interaction?
2. What is the relationship between student satisfaction and content interaction?
3. What is the relationship between student satisfaction and interface interaction?
4. Are there differences in student satisfaction based on age, gender, and race?
5. Are there differences in content interaction based on age, gender, and race?
6. Are there differences in interface interaction based on age, gender, and race?
7. Are there differences in different instructor interaction based on age, gender, and race?
8. Do independent variables: instructor interaction, content interaction, and interface interaction, predict student satisfaction?

Discussion

The rise in demand for computer programming jobs has created a significant need for computer programming training: however, computer programming courses are often seen as challenging and unattractive to students (Butler & Ahmed, 2016; Fotaris, Mastoras, Leinfellner, & Rosunally, 2016; Pineda-Corcho & Moreno-Cadavid, 2017). The National Center for Education Statistics reported that retention rates for computer programming courses declined by 17% from 2005-2011 (National Center for Education Statistics, 2018). The problems encountered by students in first-year computer programming courses were the most common concern. Computer programming competencies are based on knowledge and skills. Knowledge consists of definitions, facts, language constructs, and programming knowledge, whereas skills consist of certain required actions and strategies in applying programming knowledge (Caspersen, 2007). Computer programming is a mandatory fundamental component of the computer science curriculum. It is also one of the most challenging courses for new students, and they often drop out as a consequence of having failed or performed poorly in an introductory programming course. Studies suggest that student satisfaction could positively predict student retention and learning outcomes in these courses (Lyke & Frank, 2012) and that interaction is necessary for student satisfaction to occur (Ryan, Carlton, & Ali, 2004; Brown, 2004; Oblinger, Barone, & Hawkins, 2001).

Student satisfaction in an online course is an important part of the online learning process (Astin, 1993; Bolliger & Wasilik, 2009; Fredericksen et al., 2000; Rivera & Rice, 2002; Yukselturk & Bulut, 2007). The lack of satisfaction in an online classroom can result in less than optimal learning experiences for online learners (Allen & Seaman, 2008; Barone et al., 1997; Keller, 1983; Koseke, & Koseke, 1991). By examining student satisfaction in online computer

programming courses, instructors and institutions can initiate future initiatives on preferred techniques for improving retention in these courses. Data on student satisfaction can also allow course designers, educators, and administrators to identify areas where improvement is needed in a course (Reinhart & Schneider, 2001).

Implications

Implications derived from the findings suggest that content interaction and interface interaction are significant factors of student satisfaction in online computer programming courses. These findings are consistent with prior studies on student satisfaction (El-Sheikh, 2009; Karsten et al., 2005; Thomas, 2000; Wang, 2011; Zachery & Jensen, 2003) and provide insight into the interactions that instructors should focus on to develop satisfactory online programming courses. Though none of the interactions were significant predictors of student satisfaction, content interaction was the closest to being significant. This suggests that satisfactory course content might compensate for the absence of instructor interaction and interface interaction in an online programming course.

Interactions where instructors posted and held office hours, answered questions effectively, treated students with respect and professionalism, demonstrated knowledge related to the course content, provided individualized, helpful feedback to assignments and discussion forums, and engaged with students, contributing to a healthy learning environment, were the most important instructor interactions influencing student satisfaction in these online courses. These results imply that there is a need for fast and clear feedback on assignments and instructor interactions.

A third important implication of the study was the influence of gender on student satisfaction, interface interaction, and instructor interactions where instructors treated students

with respect and professionalism. The study found that male students tended to be more satisfied with online programming courses than female students. Males also significantly outnumber the number of females in these courses. These findings may serve as a call for instructors and universities to be more attentive to gender bias when they design course navigation elements and communicate with students in online computer programming courses.

Limitations

There were several limitations to this study. First, the present study involves the use of archival data retrieved from institutionally designed and administered surveys. Thus, additional factors known to influence student satisfaction in online programming courses were excluded from the study. Second, the researcher did not have any influence soliciting responses for the study which may have had some impact on the response size. Third, information was collected from participants in a small midwestern university, which may not represent all adult learners in the U.S. Gender, races, and subgroups not equally represented may have different viewpoints that were not captured by this study. Selection bias may have also impacted the results of this study. It is possible that those who volunteered to participate in the study differed in significant ways from students that choose not to participate. Furthermore, this study only involved adult learners in the Computer Science and Computer Engineering fields enrolled in Python programming courses. Traditional learners of different majors enrolled in different programming courses may have different perceptions of student satisfaction and interaction. Lastly, limited studies have investigated the factors that may influence student satisfaction in online computer programming courses, specifically whether these interactions could predict student satisfaction, as well as how those variables differed between race, gender, and age.

Recommendations for Future Research

The study findings demonstrate the need for additional research in this area and with this population, with more refined measurement tools. More research is necessary to validate the reliability and validity of the EOC instrument since it was developed by the administering university and was designed to be a general measure of satisfaction with any online course. This instrument needs to be modified within the context of computer programming education. Because of the tentative nature of the results, there is a need for future researchers to replicate studies concerning the relationship among all interaction variables and satisfaction in online computer programming courses as well as individual learner characteristics in these environments. Future research should recruit a more diverse, representative sample to achieve a better portrayal of student satisfaction in these courses. Future studies may include different factors that are descriptive of learner characteristics, learning preferences, different online learning environments, interaction types, and regions. This would determine if there is a difference between learners, regions, and universities.

Another suggestion for future research would be to analyze different computer programming courses and languages. This study focused on the introductory programming essentials Python course, but it would be beneficial to explore potential ways to improve student satisfaction and interaction across a wider range of computer programming courses. More research will also be necessary to refine and further elaborate on the correlation between gender and overall students' satisfaction and interaction in online programming courses. Although the present study found that student satisfaction and other interaction factors are associated with gender, it is not equipped to investigate the reasons why there are differences based on gender. Future research can investigate possible reasons. Also, online institutions can conduct further

research to identify characteristics of students who feel successful with their online learning experiences to provide necessary information for university advisors to either encourage or discourage a student from registering for an online programming course. Additional research could lead to the development of evidence-based courses that would be of value to course developers, course designers, instructors, administrators, and students.

REFERENCES

Adler, R. W., Milne, M. J., & Stablein, R. (2001). Situated motivation: An empirical test in an accounting class. *Canadian Journal of Administrative Sciences*, *18*(2), 101-116.

Akyol, Z., & Garrison, D. (2009). *The Relationship between Instructor Socio-Epistemological Orientations and Student Satisfaction with Indicators of the Online Community of Inquiry Framework* [Paper presentation]. The 7th Annual Hawaii International Conference on Education, Honolulu, HI.

Alamri, A., & Tyler-Wood, T. (2017). Factors Affecting Learners with Disabilities–Instructor Interaction in Online Learning. *Journal of Special Education Technology*, *32*(2), 59-69.

AlHamad, A., Al Qawasmi, K., & AlHamad, A. (2014). Key Factors in Determining Students' Satisfaction in Online Learning Based on Web Programming course within Zarqa University. *International Journal of Global Business*, *7*(1), 7.

Ali, S. (2005). Effective Teaching Pedagogies for Undergraduate Computer Science. *Mathematics and Computer Education*, *39*(3), 243-257.

Ali, A., Ramay, M. I., & Shahzad, M. (2011). Key Factors for Determining Student Satisfaction in Distance Learning Courses: A Study of Allama Iqbal Open University (AIOU) Islamabad, Pakistan. *Turkish Online Journal of Distance Education*, *12*(2), 114-127.

Allen, I. E., & Seaman, J. (2008). *Staying the course: Online education in the United States.* The Online Learning Consortium. http://www.sloanc.org/publications/survey/pdf/staying_the_course.pdf

Al-Sheeb, B., Hamouda, A. M., & Abdella, G. M. (2018). Investigating Determinants of Student Satisfaction in the First Year of College in a Public University in the State of Qatar. *Education Research International*.

Altun, A., & Mazman, S. G. (2012). Developing computer programming self-efficacy scale. *Journal of Measurement and Evaluation in Education and Psychology*, *3*(2), 297-308.

Anastasiadou, S., & Karakos, A. S. (2011). The Beliefs of Electrical and Computer Engineering Students' Regarding Computer Programming. *International Journal of Technology, Knowledge and Society*, *7*, 37-51.

Anderson, T. (2004). Teaching in an online context. In T. Anderson & F. Elloumi (Eds.), *Theory and practice of online learning*. Creative Commons.

Anderson, T., Rourke, L., Garrison, D. R., & Archer, W. (2001). Assessing teaching presence in a computer conferencing context. *Journal of Asynchronous Learning Networks*, *5*(2).

Appana, S. (2008). A review of benefits and limitations of online learning in the context of the student, the instructor, and the tenured faculty. International *Journal on E-Learning*, *7*(1), 5-22.

Arbaugh, J. B. (2000). Virtual Classroom versus Physical Classroom: An Exploratory Study of Class Discussion Patterns and Student Learning in an Asynchronous Internet-Based MBA Course. *Journal of Management Education*, *24*, 213-233.

Arbaugh, J. B. (2005). Is there an optimal design for on-line MBA courses? *Academy of Management Learning & Education*, *4*, 135-149.

Arbaugh, J. B., & Rau, B. L. (2007). A study of disciplinary, structural, and behavioral effects on course outcomes in online MBA courses. *Decision Sciences Journal of Innovative Education*, *5*(1), 65-95.

Aragon, S. (2003). Creating social presence in online environments. *New Directions for Adult and Continuing Education*, *100*, 57-68.

Askar, P., & DavenPort, D. (2009). An investigation of factors related to self-efficacy for java programming among engineering students. *The Turkish Online Journal of Educational Technology*, *8*(1).

Astani, M., Ready, K. J., & Duplaga, E. A. (2010). Online course experience matters: investigating students' perceptions of online learning. *Issues in Information Systems*, *10*(2), 14-21.

Astin, A. W. (1993). *What matters in college: Four critical years revisited*. Jossey-Bass.

Bain, Y. (2006). Do online discussions foster collaboration? Views from the literature. *Proceedings of the PICTAL Conference* (pp. 1-11). Aberdeen, SCT.

Baker, C. (2010). The Impact of Instructor Immediacy and Presence for Online Student Affective Learning, Cognition, and Motivation. *Journal of Educators Online*, *7*(1), 1-30.

Bangert-Drowns, R. L., Kulik, C. C., Kulik, J. A., & Morgan, M. T. (1991). The instructional effect of feedback in test-like events. *Review of Educational Research*, *6*1(2), 213-238.

Baran, E., Correia, A. P., & Thompson, A. (2011). Transforming Online Teaching Practice: Critical Analysis of the Literature on the Roles and Competencies of Online Teachers. *Distance Education*, *32*(3), 421-439. https://www.learntechlib.org/p/110462/

Barbera, E., Clarà, M., & Linder-Vanberschot, J. (2013). Factors Influencing Student Satisfaction and Perceived Learning in Online Courses. *E-Learning and Digital Media*, *10*, 226.

Baser, M. (2013). Developing attitude scale toward computer programming. *International Journal of Social Science*, *6*(6), 199-215.

Battalio, J. (2007). Interaction Online: A Reevaluation. *Quarterly Review of Distance Education, 8*.

Bean, J. P., & Bradley, R. K. (1986). Untangling the satisfaction performance relationship for college students. *Journal of Higher Education*, *57*(4), 393-412.

Becker, G. (2000). Creating comparability coefficients: The case of Cronbach alpha and Cohen kappa. *Psychological Reports*, *87*, 1171-1182.

Behrens, U. (1999). *Teleteaching is easy!?: Pädagogisch-psychologische Qualitätskriterien und Methoden der Qualitätskontrolle für Teleteaching-Projekte*. Verlag Empirische Pädagogik.

Benbunan-Fich, R., & Starr, R. H. (2003). Mediators of the effectiveness of online courses. *IEEE Transactions on Professional Communication, 46*(4), 296-312.

Berenson, R., Boyles, G., & Weaver, A. (2008). Emotional Intelligence as a Predictor for Success in Online Learning. *The International Review of Research in Open and Distributed Learning, 9*(2), 1-17. https://www.learntechlib.org/p/77656/

Berge, Z. L. (1999). Interaction in post-secondary web-based learning. *Education Technology, 39*, 5-11.

Biner, P., Barone, N., Welsh, K., & Dean, R. (1997). Relative academic performance and its relation to facet and overall satisfaction with interactive telecourses. *Distance Education, 18*, 318-326.

Blau, I., & Barak A. (2011). Optimization of e-learning: The contribution of personality traits. In D. Hen & G. Kurtz (Eds), *Integration of knowledge technologies into Israeli education systems.* Center for Academic Studies.

Blau, I., & Barak, A. (2012). How do personality, synchronous media, and discussion topic affect participation? *Educational Technology & Society, 15*(2), 12-24.

Blau, I., & Caspi, A. (2010). Studying invisibly: media naturalness and learning. In N. Kock (Ed.), *Evolutionary psychology and information systems research: A new approach to studying the effects of modern technologies on human behavior* (pp. 193-216). Springer.

Bocchi, J., Eastman, J. K., & Swift, C. O. (2004). Retaining the online learner: Profile of students in an online MBA program and implications for teaching them. *Journal of Education for Business*, *79*(4), 245-53.

Bolliger, D. U., & Erichsen, E. A. (2013). Student satisfaction with blended and online courses based on personality type. *Canadian Journal of Learning and Technology, 39*(1).

Bolliger, D. U., & Martindale, T. (2004). Key factors for determining student satisfaction in online courses. *International Journal on E-Learning*, *3*(1), 61-67.

Bolliger, D. U., & Wasilik, O. (2009). Factors Influencing Faculty Satisfaction with Online Teaching and Learning in Higher Education. *Distance Education, 30,* 103-116.

Borokhovski, E., Bernard, R. M., Tamim, R. M., Schmid, R. F., & Sokolvskaya, A. (2016). Technology-supported student interaction in post-secondary education: A meta-analysis of designed versus contextual treatments. *Computers & Education, 96,* 15-28.

Boston, W., Ice, P., & Burgess, M. (2012). Assessing student retention in online learning environments: A longitudinal study. *Online Journal of Distance Learning Administration, 15*(2).

Bower, B. L., & Kamata, A. (2000). Factors influencing student satisfaction with online courses. *Academic Exchange Quarterly*, *4*(3), 52-56.

Bowers, J., & Kumar, P. (2015). Students' perceptions of teaching and social presence: A comparative analysis of face-to-face and online learning environments. *International Journal of Web-Based Learning and Teaching Technologies*, *10,* 27-44.

Brandl, K., Schneid, S., Tsunoda, S., & Awdishu, L. (2019). Assessing Students' Satisfaction with a Redesigned Pharmacology Course Series. *American Journal of Pharmaceutical education*, *83*, 69-71.

Brass, K. (2002). Pushing E-learning. *Sales and Marketing Management*, *154*(3), 56.

Brey, R. (1991). *U.S. Postsecondary Distance Learning Programs in the 1990's: a Decade of Growth* (report no. JC 920 023), Instructional Telecommunications Consortium, American Association of Community and Junior Colleges, Washington DC.

Bri, D., Garcia, M., Coll, H., & Lloret, J. (2009). A study of virtual learning environments. *WSEAS Transactions on Advances in Engineering Education*, *1*(6), 33-43.

Broderick, G. G. (1956). *Radio and Television Bibliography*. US Department of Health, Education, and Welfare, Office of Education.

Brooks, C., Greer, J., Melis, E., & Ullrich, C. (2006). Combining ITS and eLearning Technologies: Opportunities and Challenges. *Proceedings of the 8th International Conference on Intelligent Tutoring Systems* (pp. 278-287). (pp. 89-93). ACM Digital Library. https://doi/10.1007/11774303_28

Brown, K. (2004). Technology: Building interactions. *TechTrends*, *48*(5), 36-38.

Bruning, K. (2005). The role of critical thinking in the online learning environment. International *Journal of Instructional Technology and Distance Learning*, *2*(5), 21-31.

Buchanan, G., Farrant, S., Jones, M., Thimbleby, H., Marsden, G., & Pazzani, M. (2001). Improving mobile Internet usability. *Proceedings of the 10th International Conference on the World Wide Web* (pp. 673-680). ACM Press.

Burke, L. A. & Moore, J. E. (2003). A perennial dilemma in OB education: Engaging the traditional student. *Academy of Management Learning & Education*, *2*(1), 37-53.

Burnett, K., Bonnici, L. J., Miksa, S. D., & Kim, J. (2007). Frequency, intensity and topicality in online learning: An exploration of the interaction dimensions that contribute to student satisfaction in online learning. *Journal of Education for Library & Information Science, 48*(1), 21-35.

Butler, S., & Ahmed, D. T. (2016). Gamification to engage and motivate students to achieve computer science learning goals. *Proceedings of the 2016 International Conference on Computational Science and Computational Intelligence* (pp. 237–240). IEEE. https://doi.org/10.1109/CSCI.2016.52

Bye, D., Pushkar, D., & Conway, M. (2007). Motivation, interest, and positive affect in traditional and nontraditional undergraduate students. *Adult education quarterly, 57*(2), 141-158.

Çallı, L., Balçıkanlı, C., Çallı, F., Cebeci, H., & Seymen, O. (2013). Identifying factors that contribute to the satisfaction of students in e-learning. *Turkish Online Journal of Distance Education, 14*, 85-101.

Campbell, M. C., Floyd, J., & Sheridan, J. B. (2002). Assessment of student performance and attitudes for courses taught online versus onsite. *Journal of Applied Business Research, 18*(2), 45-51.

Carliner, S. (1999). *Overview of online learning*. Human Resource Development Press.

Caspersen, M. E. (2007). Educating novices in the skills of programming. Aarhus, Denmark: University of Aarhus, Department of Computer Science.

Chang, N. (2011a). *Formative assessment and feedback with teacher immediacy behaviors in an e-text-based context*. IGI Global.

Chen, B., Bastedo, K., & Howard, W. (2018). Exploring design elements for online STEM courses: Active learning, engagement & assessment design. *Online Learning*, *22*(2), 59-75. https://doi.org/10.24059/olj.v22i2.1369

Chong, S. M. (1998). Models of asynchronous computer conferencing for collaborative learning in large college classes. In C. J. Bonk & K. S. King (Eds.), *Electronic collaborators: Learner-centered technologies for literacy, apprenticeship, and discourse* (pp. 157-182). Lawrence Erlbaum.

Chou, S. W., & Min, H. T. (2009). The impact of media on collaborative learning in virtual settings: The perspective of social construction. *Computers & Education*, *52*(2), 417-431.

Choudhury, H., & Khataniar, G. (2016). Features Based Comparison and Evaluation of Elearning Platform in Academic Environment. *International Journal of Digital Application & Contemporary Research*, *4*(6), 166-181.

Chute, A., Thompson, M., & Hancock, B. (1999). *The Mc-Graw-Hill handbook of distance learning*. McGraw-Hill.

Clark, R. C., & Mayer, R. E. (2003). *E-learning and the science of instruction*. Jossey-Bass.

Clark-Ibanez, M., & Scott, L. (2008). Learning to Teach Online. *Teaching Sociology*, *36*(1), 34-41.

Clinefelter, D. L., & Aslanian, C. B. (2016). *Online college students 2016: Comprehensive data on demands and preferences*. The Learning House, Inc.

Cobb, S. C. (2009). Social presence and online learning: a current view from a research perspective. *Journal of Interactive Online Learning*, *8*(3), 241-254.

Coffield, F. J., Moseley, D. V., Hall, E., & Ecclestone, K. (2004). Learning styles and pedagogy in post-16 learning: A systematic and critical re-view. Learning and Skills Research Centre. https://www.lsda.org.uk/files/pdf/1543.pdf

Cohen, P. A. (1981). Student Ratings of Instruction and Student Achievement: A Meta-analysis of Multisection Validity Studies. *Review of Educational Research*, *51*(3), 281-309.

Cole, M., & Shelley, D., & Swartz, L. (2014). Online Instruction, E-Learning, and Student Satisfaction: A Three Year Study. *International Review of Research in Open and Distance Learning*, *15*, 111-131.

Collins, M., & Berge, Z. (1996). *Facilitating interaction in computer mediated online courses* [Paper presentation]. FSU/AECT Distance Education Conference, Tallahassee, FL. http://penta.2.ufrgs.br/edu/teleduc/wbi/flcc.htm

Compton, J. I., Cox, E., & Laanan, F. S. (2006). Adult learners in transition. *New directions for student services*, *2006*(114), 73-80. http://dx.doi.org/10.1002/ss.208

Computing Research Association (2017). *Generation CS: Computer Science Undergraduate Enrollments Surge Since 2006*. Computing Research Association. http://cra.org/data/Generation-CS/

Cooke, G. (2018). *LCMS vs LMS*. Elucidat. https://www.elucidat.com/blog/learning-content-management-systems/

Creswell, J. W. (2002). *Educational research: Planning, conducting, and evaluating quantitative*. Prentice Hall.

Dabbagh, N. (2007). The online learner: Characteristics and pedagogical implications. *Contemporary Issues in Technology & Teacher Education, 7*(3), 217-226.

Davis, A. M. (2014). *Measuring Student Satisfaction in Online Math Courses* [Doctoral Dissertation, University of Kentucky]. Semantic Scholar. https://pdfs.semanticscholar.org/5c4c/ceb7dcc12a6f73dceaa92591032d4897f472.pdf?_ga=2.136409200.1379660669.1576777442-1996909747.1574267614

DeBourgh, G. A. (1999, February 28-March 4). *Technology is the tool, teaching is the task: Student satisfaction in distance learning* [Paper presentation]. Society for Information Technology & Teacher Education International Conference, San Antonio, TX.

De Freitas, S., Morgan, J., & Gibson, D. (2015). Will MOOCs transform learning and teaching in higher education? Engagement and course retention in online learning provision. *British Journal of Educational Technology*, *46*.

Delfino, M., & Manca, S. (2007). The expression of social presence through the use of figurative language in a web-based learning environment. *Computers in Human Behavior*, *25*(5), 2190-2211.

Dennen, V. P., Darabi, A. A., & Smith, K. J. (2007). Instructor-learner interaction in online courses: The relative perceived importance of particular instructor actions on performance and satisfaction. *Distance Education, 28*, 65-79.

deNoyelles, A., Zydney, J.M., & Chen, B. (2014). Best practices for creating a community through online discussions. *Journal of Online Learning and Teaching*, *10*(1).

DeShields O.W., Kara, A., & Kaynak, E. (2005). Determinants of business student satisfaction and retention in higher education: applying Herzberg's two factor theory**.** *International Journal of Educational Management, 19*(2), 28-139.

Deuren, R., & Lhaden, K. (2017). Student Satisfaction in Higher Education: A comparative study of a Public and a Private college. *Bhutan Journal of Research & Development*, *6*(1).

Diaz, D. P. (2002). *Online drop rates revisited*. The Technology Source. http://technologysource.org/article/online_drop_rates_revisited/

Draves, W. A. (2000). *Teaching online*. LERN Book.

Drennan, J., Kennedy, J., & Pisarski, A. (2010). Factors Affecting Student Attitudes Toward Flexible Online Learning in Management Education. *The Journal of Educational Research*, *98*.

Driscoll, M. (2002). How People Learn (and What Technology Might Have to Do with It). *ERIC Digest*. https://files.eric.ed.gov/fulltext/ED470032.pdf

Driver, M. (2002). Exploring student perceptions of group interactions and class satisfaction in the web-enhanced classroom. *The Internet and Higher Education, 5*, 35-45.

Du Boulay, B. (1986). Part II: Logo confessions. In R. Lawler, B. Du Boulay, M. Hughes & H. Macleod (Eds.), *Cognition and computers: Studies in learning* (pp. 81-178). Ellis Horwood.

Dupin-Bryant, P. (2010). Teaching Styles of Interactive Television Instructors: A Descriptive Study. *American Journal of Distance Education, 18*, 39-50.

Dunlap, J. C., Sobel, D., & Sands, D. I. (2007). Designing for deep and meaningful student to content interactions. *Tech Trends, 51,* 20-31.

Durlak, J., Weissberg, R., Dymnicki, A., Taylor, R., & Schellinger, K. (2011). The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions. *Child development, 82*, 405-32.

Dziuban, C., Moskal, P., Thompson, J., Kramer, L., DeCantis, G., & Hermsdorfer, A. (2015). Student Satisfaction with Online Learning: Is It a Psychological Contract? *Journal of Asynchronous Learning Networks, 19*(2).

Eastmond, D. V. (1998). Adult learners and internet-based distance education. *New Directions for Adult and Continuing Education, 78*, 33-41.

Eastmond, D. V. (2000). Enabling Student Accomplishment Online: An Overview of Factors for Success in Web-Based Distance Education. *Journal of Educational Computing Research, 23*(4).

Eckerdal, A. & Thuńe, M. (2005). Novice java programmers´ conceptions of 'object' and 'class', and variation theory. *Proceedings of the 10th Annual SIGCSE Conference on Innovation and Technology in Computer Science Education* (pp. 89-93). ACM Digital Library. https://doi/10.1145/1151954.1067473

Ekmekci, O. (2013). Being There: Establishing Instructor Presence in an Online Learning Environment. *Higher Education Studies, 3*.

Elliott, K., & Shin, D. (2002). Student Satisfaction: an alternative approach to assessing this important concept. *Journal of Higher Education Policy and Management, 24*(2), 197-209.

Elliott, A. C. & Woodward, W. A. (2007). Logistic regression. In Elliott, A. C. & Woodward, W. A. (Eds.), *Statistical analysis quick reference guidebook* (pp. 208-223). SAGE Publications. https://dx.doi.org/10.4135/9781412985949.n8

El-Sheikh, E. (2009). Techniques for engaging students in an online computer programming course. *Journal of Systemics, Cybernetics and Informatics, 7*(1), 1-12.

El-Sheikh, E., Coffey, J., & White, L. (2007). *Reflections in Uncharted Waters: Teaching Foundational Programming Online* [Paper presentation]. The EISTA 2007 Fifth International Conference on Education and Information Systems, Technologies and Applications, Orlando, FL.

Ely, E. E. (1997, April). *The non-traditional student* [Paper presentation]. The American Association of Community Colleges annual conference, Anaheim, CA.

Eom, S. B., Wen, H. J. & Ashill, N. (2006). The Determinants of Students' Perceived Learning Outcomes and Satisfaction in University Online Education: An Empirical Investigation. *Decision Sciences Journal of Innovative Education, 4*(2), 215-235.

Ersoy, M. H., Madran, R. O., & Gülbahar, Y. (2011). *A Model Proposed for Teaching Programming Languages: Robotic Programming. XIII* (pp. 731-736). Malatya, Turkey: Academic Computing Conference.

Fieger, P. (2012). *Measuring student satisfaction from the student outcomes survey*. National Centre for Vocational Education Research.

Finaly-Neumann, E. (1994). Course work characteristics and students' satisfaction with instructions. *Journal of Instructional Psychology, 21*(2), 14-19.

Fini, A. (2009). The Technological Dimension of a Massive Open Online Course: The Case of the CCK08 Course Tools. *The International Review of Research in Open and Distributed Learning, 10*(5).

Fotaris, P., Mastoras, T., Leinfellner, R., & Rosunally, Y. (2016). Climbing up the leaderboard: An empirical study of applying gamification techniques to a computer programming class. *The Electronic Journal of E-Learning, 14*(2), 94-110.

Frankola, K. (2001). *Why online learners drop out*. Find Articles. http://www.findarticles.com/p/articles/mi_m0FXS/is_10_80/ai_79352432

Fredrickson, J. (2015). Online learning and student engagement: Assessing the impact of a collaborative writing requirement. *Academy of Educational Leadership Journal, 19*(3), 127-140.

Fredericksen, E., Pickett, A., Pelz, W., Swan, K., & Shea, P. (2000). Factors influencing faculty satisfaction with asynchronous teaching and learning in the SUNY Learning Nework, *Journal of Asynchronous Learning Networks, 4*(3), 245-278.

Fresen, J. (2007). A Taxonomy of factors to promote quality web-supported learning. *International Journal on E-Learning*, *6*(3), 351-362.

Frey, L., Botan, C., & Kreps, G. (1999). *Investigating communication: An introduction to research methods* (2nd ed.). Allyn & Bacon.

Frymier, A., & Houser, M. (1998). Does making content relevant make a difference in learning? *Communication Research Reports*, *15*, 121-129.

Gallego-Arrufat, M. J., Gutiérrez-Santiuste, E., & Campaña-Jiménez, R. (2015). Online distributed leadership: a content analysis of interaction and teacher reflections on computer-supported learning. *Technology, Pedagogy and Education*, *24*, 81-99.

Garman, J. F., Crider, D. A., & Teske, C. J. (1999). Course selection determinants: A comparison of "distance learning" and "traditional" wellness and physical education programming.

Garrison, D. R. (1993). A cognitive constructivist view of distance education: An analysis of teaching-learning assumptions. *Distance Education, 14*, 199-211.

Garrison, D. R. (2007). Online community of inquiry review: Social, cognitive, and teaching presence issues. *Journal of Asynchronous Learning Networks, 11*.

Garrison, D. R. (2016). *Thinking collaboratively: Learning in a community of inquiry*. Routledge.

Garrison, D. R. (2017). *E-Learning in the 21st century: A community of inquiry framework for research and practice (*3rd ed.). Routledge/Taylor and Francis.

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, *2*, 87-105.

Garrison, D. R., & Cleveland-Innes, M. (2005). Facilitating cognitive presence in online learning: Interaction is not enough. *American Journal of Distance Learning, 19*, 133-148.

Gaytan, J. (2015). Comparing Faculty and Student Perceptions Regarding Factors That Affect Student Retention in Online Education. *American Journal of Distance Education*, *29*(1), 56-66.

Geiger, M. A. & Cooper, E. A. (1996). Using expectancy theory to assess student motivation. *Issues in Accounting Education, 11*(1), 113-125.

Gilbert, J., Morton, S., & Rowley, J. (2007). E-Learning: The student experience. *British Journal of Educational Technology, 38*.

Gilmore, M., & Lyons, E. M. (2012) NURSING 911: An Orientation Program to Improve Retention of Online RN-BSN Students. *Nursing Education Perspectives, 33,* 45-47.

Graham, C., & Essex, C. (2001). *Defining and ensuring academic rigor in online and on-campus courses: Instructor perspectives* [Paper presentation]. The National Convention of the Association for Educational Communications and Technology, Atlanta, GA.

Grandzol, C. J., & Grandzol, J. R. (2010). Interaction in online courses: More is not always better. *Online Journal of Distance Learning Administration, 13*, 1-18.

Grant, M., & Thornton, H. (2007). Best practices in undergraduate adult-centered online learning: Mechanisms for course design and delivery. *Journal of Online Learning and Teaching*, *4*(3), 346-356.

Gray, J. A., & DiLoreto, M. (2016). The effects of student engagement, student satisfaction, and perceived learning in online learning environments. *International Journal of Educational Leadership Preparation*, *11*(1), 1.

Grebennikov, L., & Shah, M. (2013). Monitoring trends in student satisfaction. *Tertiary Education and Management*, *19*(4), 301-322.

Gunawardena, C. N. (1995). Social Presence Theory and Implications for Interaction and Collaborative Learning in Computer Conferences. *International Journal of Educational Telecommunications, 1*(2), 147-166.

Halverson, L. R., Graham, C. R., Spring, K. J., Drysdale, J. S., & Henrie, C. R. (2014). A thematic analysis of the most highly cited scholarship in the first decade of blended learning research. *The Internet and Higher Education*, *20*, 20-34.

Hara, N., & Kling, R. (1999). An Ethnographic Study of Participants' Experiences. *Information, Communication & Society*, *3*(4), 557-579.

Harasim, L. (1987) Teaching and learning on-line: issues in designing computer-mediated graduate courses. *Canadian Journal of Educational Communications*, *16*, 117-135.

Harrington, R., & Loffredo, D. (2010). MBTI personality type and other factors that relate to preference for online versus face-to-face instruction. *The Internet and Higher Education*, *13*, 89-95.

Hawi, N. (2010). Causal attributions of success and failure made by undergraduate students in an introductory-level computer programming course. *Computers & Education*, *54*(4), 1127-1136.

Haywood, J. L., & Murty, K. S. (2018). Undergraduate Student Perceptions and Student Perceptions and Satisfaction Toward Online Psychology Courses at an HBCU. *Race, Gender & Class*, *25*(1/2), 131-146.

Henri, F. (1995). Distance learning and computer-mediated communication: interactive, quasi interactive or monologue? In C. O'Malley (Ed.), *Computer supported collaborative learning* (pp 145-164). Springer.

Heyman, E. (2010). *Overcoming student retention issues in higher education online programs: A Delphi study* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (ProQuest document ID: 748309429).

Hillesheim, G. (1998). Distance learning: Barriers and strategies for students and faculty. *Internet and Higher Education*, *1*(1), 31-44.

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. (1993). Correlates of Learning in a Virtual Classroom. *International Journal of Man-Machine Studies, 39,* 71-98.

Hixon, E., Barczy, C., Ralston-BergPenn, P., & Buckenmeyer, J. (2016). The Impact of Previous Online Course Experience and Students' Perceptions of Quality. *Online Learning*, *20*(1), 25-40.

Hoey, R. (2017). Examining the characteristics and content of instructor discussion interaction upon student outcomes in an online course. *Online Learning*, *21*(4), 263-281. https://doi.org/10.24059/olj.v21i4.1075

Hollenbeck, C. R., Mason, C. H., & Song, J. H. (2011). Enhancing student learning in marketing courses: An exploration of fundamental principles for website platforms. *Journal of Marketing Education*, *33*(2), 171-182.

Hosler, K. A., & Arend, B. D. (2012). The importance of course design, feedback, and facilitation: student perceptions of the relationship between teaching presence and cognitive presence. *Educational Media International*, *49*(3), 217-229.

Hostetter, C., & Busch, M. (2006). Measuring up online: The relationship between social presence and student learning satisfaction. *Journal of the Scholarship of Teaching and Learning*, *6*(2), 1-12.

Howell, G. F., & Buck, J. M. (2012). The adult student and course satisfaction: What matters most? *Innovative Higher Education,* 37, 215-226.

Huang, S. (2015). Understanding learners' self-assessment and self-feedback on their foreign language speaking performance. *Assessment & Education in Higher Education*, 1-20. https://doi.org/10.1080/02602938.2015.1042426

Ilgaz, H., & Gülbahar, Y. (2015). A Snapshot of Online Learners: eReadiness, e-Satisfaction and Expectations A Snapshot of Online Learners: e-Readiness, e-Satisfaction and Expectations. *The International Review of Research in Open and Distributed Learning*, *16*(2).

Ivankova, N., & Stick, S. (2007). Students' Persistence in a Distributed Doctoral Program in Educational Leadership in Higher Education: A Mixed Methods Study. *Research in Higher Education*, *48*, 93-135.

Jaggars, S. S. (2014). Choosing Between Online and Face-to-Face Courses: Community College Student Voices. *American Journal of Distance Education*, *28*(1), 27-38. https://doi.org/10.1080/08923647.2014.867697

Jaggars, S. S., & Thomas B. (2010). *Effectiveness of Fully Online Courses for College Students: Response to a Department of Education Meta-Analysis.* Community College Research Center, Teachers College, Columbia University.

Jarvis, P. (2012). Adult learning: Andragogy versus pedagogy or from pedagogy to andragogy. In P. Jarvis & M. Watts (Eds.), *The Routledge international handbook of learning* (pp. 134–143).

Jiang, M. & Ting, A. 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.

Joksimovic, S., Gasevic, D., Kovanovic, V., Riecke, B., & Hatala, M. (2015). Social presence in online discussions as a process predictor of academic performance. *Journal of Computer Assisted Learning*, *31*, 638–654.

Joyce, K. M., & Brown, A. (2009). Enhancing Social Presence in Online Learning: Mediation Strategies Applied to Social Networking Tools. *Online Journal of Distance Learning Administration, 12*(4).

Jung, I., & Choi, S. (2002). Effects of different types of interaction on learning achievement, satisfaction and participation in web-based instruction. *Innovations in Education and Teaching International*, *39*(2), 153-162.

Jung, I., Choi, S., Lim, C., & Leem, J. (2002) Effects of Different Types of Interaction on Learning Achievement, Satisfaction and Participation in Web-Based Instruction. *Innovations in Education and Teaching International*, *39*(2), 153-162. https://doi.org/10.1080/14703290252934603

Karsten, R., Kaparthi, S., & Roth, R. M. (2005). Teaching Programming Via The Web: A Time-Tested Methodology. *College Teaching Methods & Styles Journal (CTMS)*, *1*(3), 73-82.

Kasworm, C. E., Polson, C. J., & Fishback, S. J. (2002). *Responding to Adult Learners in Higher Education. Professional Practices in Adult Education and Human Resource Development Series*. Krieger Publishing Company.

Kauffman, H. (2015). A review of predictive factors of student success in and satisfaction with online learning. *Research in Learning Technology, 23, 1-13.*

Ke, F., & Xie, K. (2009). Toward Deep Learning for Adult Students in Online Courses. *The Internet and Higher Education*, *12*(3), 136-145.

Kearsley, G. (2002). Is Online Learning for Everybody? *Educational Technology, 42*.

Kearsley, G. (2010). Andragogy (M. Knowles). *The theory into practice database*. http://tip.psychology.org

Keegan, D. (1996). Definition of distance education. In L. Foster, B. Bower & L. Watson (Eds.), *Teaching and learning in higher education, ASHE Reader Series*.

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

Kellogg, W. A. (1987). Conceptual consistency in the user interface: Effects on user performance. *Proceedings of IFIP INTERACT'87 2nd International Conference of Human Computer Interaction* (pp. 389-394). Science Direct. https://doi.org/10.1016/S1474-6670(17)53933-6

Kember, D. (2007). Reconsidering open and distance learning in the developing world: Meeting students' learning needs. https://doi.org/10.4324/9780203966549

Khalid, N. M. (2014). *Factors affecting course satisfaction of online Malaysian university students* (Doctoral dissertation). Colorado State University, Fort Collins, CO. https://mountainscholar.org/bitstream/handle/10217/88444/Khalid_colostate_0053A_12779.pdf?sequence=1

Khan, B. (1997). *Web-based training*. Educational Technology Publications.

Kidd, T. (2005). Key aspects affecting students' perception regarding the instructional quality of online and web based courses. *International Journal of Instructional Technology and Distance Learning*, *2*(10).

Kim, K. J., Liu, S., & Bonk, C. J. (2005). Online MBA students' perceptions of online learning: Benefits, challenges, and suggestions. *The Internet and Higher Education*, *8*(4), 335-344.

Kleinman, S. (2005). Strategies for encouraging active learning, interaction, and academic integrity in online courses. *Communication Teacher*, *19*(1), 13-18. https://doi.org/10.1080/1740462042000339212

Kleinman, J., & Entin, E. (2002). Comparison of In-Class and Distance-Learning Student Performance and Attitudes in Introductory Computer Science Courses. *Journal of Consortium for Computing Sciences in Colleges*, *17*(6).

Knowles, M. S. (1970). *The modern practice of adult education: Andragogy versus pedagogy.* Association Press.

Knowles, M. S. (1975). *Self-directed learning: A guide for learners and teachers.* Association Press.

Knowles, M. S. (1980). *The modern practice of adult education: From pedagogy to andragogy* (2nd ed.). Cambridge Books.

Knowles, M. S. (1989). *The making of an adult educator: An autobiographical journey*. Jossey-Bass.

Knowles, M. S., Holton, E. F., & Swanson, R. A. (2011). *The Adult Learner: The Definitive Classic in Adult Education and Human Resource Development* (7th ed.). Elsevier.

Kock, N., & Garza, V. (2011). Media Naturalness Reduction and Compensatory Channel Expansion: A Study of Online and Face-to-Face Sections of the Same Course. *IJDET, 9,* 1-12.

Kock, N., Verville, J., & Garza, V. (2007). Media Naturalness and Online Learning: Findings Supporting Both the Significant and No-Significant Difference Perspectives. Decision Sciences *Journal of Innovative Education, 5,* 333-355.

Koohang, A., & Durante, A. (2003). Learners' perceptions toward the Web-based distance learning activities/assignments portion of an undergraduate hybrid instructional model. *Journal Information Technology Education, 2,* 106-113.

Kop, R. (2011). The challenges to connectivist learning on open online networks: Learning experiences during a massive open online course. *The International Review of Research in Open and Distributed Learning*, *12*(3), 19-38.

Kop, R., Fournier, H., & Mak, J. S. F. (2011) A Pedagogy of Abundance or a Pedagogy to Support Human Beings? Participants Support on Massive Open Online Courses. *The International Review of Research in Open and Distance Learning*, *7*, 74-93.

Korkmaz, O. (2012). The impact of critical thinking and logical-mathematical intelligence on algorithmic content skills. *Journal of Educational Computing Research*, *46*(2), 173-193.

Korkmaz, O., & Altun, H. (2013). Engineering and CEIT student's attitude towards learning computer programming. *International Journal of Social Science*, *6*(2), 1169-1185.

Korpershoek, H., Kuyper, H., Bosker, R., & Van der Werf, M. (2013). Students' Preconceptions and Perceptions of Science-Oriented Studies. *International Journal of Science Education, 35*(14), 2356-2375.

Koseke, G. F., & Koseke, R. D. (1991). Student burnout as a mediator of the stress-outcome relationship. *Research in Higher Education, 32*(4), 415-431.

Kotey, B., & Anderson, P. (2006). Performance of distance learning students in a small business management course. *Education and Training, 48*(8-9).

Kuh, G. D., Cruce, T. M., Shoup, R., Kinzie, J., & Gonyea, R. M. (2008). Unmasking the effects of student engagement on first-year college grades and persistence. *Journal of Higher Education, 79*(5), 540-563.

Kulhavy, R. W., & Stock, W. A. (1989). Feedback in written instruction: The place of response certitude. *Educational Psychology Review, 1*(4), 279-308.

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

Lam, S., Yik, M., & Schaubroeck, J. (2002). Responses to Formal Performance Appraisal Feedback: The Role of Negative Affectivity. *The Journal of applied psychology,* 87, 192-201.

Lavrakas, P. J. (2008). Chi-Square. *Encyclopedia of survey research methods, 1*. Sage Publications. https://doi.org/10.4135/9781412963947.n64

Lear, J. L., Isernhagen, J. C., LaCost, B. A., & King, J. W. (2009). Instructor presence for web-based classes. *The Delta Pi Epsilon Journal, 51*(2), 86-98.

Lee, H. J. (2014). An exploratory study of effective online learning: Assessing satisfaction levels of graduate students of mathematics education associated with human and design factors of an online course. *International Review of Research in Open & Distance Learning, 15*(1).

Lee, H. J., & Rha, I. (2009). Influence of Structure and Interaction on Student Achievement and Satisfaction in Web-Based Distance Learning. *Educational Technology & Society, 12,* 372-382.

Levy, Y. (2007). Comparing dropouts and persistence in e-learning courses. *Computers & Education, 48,* 185-204. http://www.qou.edu/arabic/researchProgram/eLearnin-gResearchs/eLDropout.pdf

Lim, D. H., & Kim, H. J. (2003). Motivation and learner characteristics affecting online learning and learning application. *Journal of Educational Technology Systems, 31*(4), 423-439.

Lim, C. J., & Lee, S. (2007). Pedagogical usability checklist for ESL/EFL e-learning websites. *Journal of Convergence Information Technology*, *2*(3), 67-76.

Lint, A. (2013). E-learning student perceptions on scholarly persistence in the 21st century with social media in higher education. *Creative Education*, *4*(11), 718-725.

Liu, S. Y., Gomez, J., & Yen, C. (2009). Community college online course retention and final grade: Predictability of social presence. *Journal of Interactive Online Learning*, *8*(2), 165-182.

Locatis, C., & Weisburg, M. (1997). Distributed learning and the internet. *Contemporary Education*, *68*, 100-103.

Liu, X., Magjuka, R., & Lee, S. (2008). An examination of the relationship among structure, trust, and conflict management styles in virtual teams. *Performance Improvement Quarterly*, *21*, 77-93.

Lyke J., & Frank M. (2012). Comparison of student learning outcomes in online and traditional classroom environments in a psychology course. *Journal of Instructional Psychology, 39*, 245-250.

Lynch, O. (2002). Humorous Communication: Finding a Place for Humor in Communication Research. *Communication Theory*, *12*, 423-445.

Maki, R. H., & Maki, W. S. (2007). Online courses. In F. T. Durso, S. Dumais, S. Lewandowsky & T. J. Perfect (Eds.), *Handbook of Applied Cognition, Second Edition* (pp. 527-552). John Wiley and Sons.

Maki R. H., Maki W. S., Patterson M., Whittaker P. D. (2000). Evaluation of a web-based introductory psychology course: Learning and satisfaction in on-line versus lecture courses. *Behavior Research Methods Instruments Computer, 32*, 230-239. 10.3758/BF03207788

Marsh, G. E., Price, B. J., & McFadden, A. C. (2000). *An overview of online educational delivery applications* (ED444476). ERIC Document Reproduction. https://files.eric.ed.gov/fulltext/ED444476.pdf

Martin, F., & Bolliger, D. U. (2018). Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment. *Online Learning*, *22*(1), 205- 222. https://doi.org/10.24059/olj.v22i1.1092

Mason, B. J., & Bruning, R. (2001). Providing feedback in computer-based instruction: What the research tells us. *Center for Instructional Innovation*, *15*.

McKune, L. (1967). *National compendium of televised education* [Unpublished doctoral dissertation, Michigan State University].

McVey, D. (2008). Why all writing is creative writing. *Innovations in Education and Teaching International*, 45, 289-294.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies*. U.S. Department of Education Office of Planning, Evaluation, and Policy Development, Policy and Program Studies Service. https://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

Mehrabian, A. (1971). *Silent messages*. Wadsworth Publishing Company.

Menager-Beeley, R. (2004). *Web-based distance learning in a community college: The influence of task values on task choice, retention and commitment* (Publication No. *64*(9-A), 3191) [Doctoral dissertation, University of Southern California]. Dissertation Abstracts International.

Meyer, K., Bruwelheide, J., & Poulin, R. (2009). Why They Stayed: Near-Perfect Retention in an Online Certification Program in Library Media. *Journal of Asynchronous Learning Networks*, *10*.

Misanchuk, R. E. (1997). Print tools for distance education. In B. Khan (Ed.), *Web-based instruction*. Educational Technology Publications.

Molstad, L. (2001). Teaching computer programming using distance education technology. *Journal of Computing Sciences in Colleges*, *17*(1), 265-277.

Mood, T. A. (1995). *Distance education: An annotated bibliography*. Libraries Unlimited, Inc.

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

Moore, K., Bartkovich, J., Fetzner, M., & Ison, S. (2003). Success in cyberspace: Student retention in online courses. *Journal of Applied Research in the Community College, 10*(2), 107-118.

Moore, M. G., & Kearsley, G. (1996). *Distance education: A systems view*. Wadsworth Publishing Company.

Moore, M. G., & Kearsley, G. (2005). *Distance education: A systems view* (2nd ed.). Wadsworth Publishing Company.

Morris, L., Finnegan, C., & Wu, S. (2005). Tracking Student Behavior, Persistence, and Achievement in Online Courses. *The Internet and Higher Education, 8*, 221-231.

Motiwalla, L., & Tello, S. (2000). Distance Learning on the Internet: An Exploratory Study. *The Internet and Higher Education*, *2*, 253-264.

Muilenburg, L., & Berge, Z. (2005). Student Barriers to Online Learning: A Factor Analytic Study. *Distance Education, 26,* 29-48.

Murphy, E., & Rodríguez-Manzanares, M. (2008). Revisiting Transactional Distance Theory in a context of web- based high-school distance education. *Journal of Distance Education, 22*(2), 1-14.

Mykota, D., & Duncan, R. (2007). Learner characteristics as predictors of online social presence. *Canadian Journal of Education, 30*(1), 157-170.

National Survey of Student Engagement (2019). *Survey Instrument*. https://nsse.iub.edu/links/surveys.

Nielsen, J. (1993). *Usability Engineering*. Morgan Kaufman Publisher, Academic Press.

Noel-Levitz (2015). *2015-16 National Online Learners Satisfaction and Priorities Report*. Noel-Levitz. http://learn.ruffalonl.com/rs/395-EOG-977/images/2015-16OnlineLearnersReport.pdf.

Northrup, P. (2001). A framework for designing interactivity into Web-based Instruction. *Educational Technology, 41*(2), 31-39.

Oblinger, D. G., Barone, C. A., & Hawkins, B. L. (2001). *Distributed education and its challenges: An overview*. American Council on Education and EDUCAUSE. http://www.acenet.edu/bookstore/pdf/distributed-learning/distributed-learning-o1.pdf

Oliver, R. (1999). Exploring strategies for online teaching and learning. *Distance Education, 20*(2), 240-254.

Oliver, R., & Omari, A. (2001). Student responses to collaborating and learning in a Web-based environment. *Journal of Computer Assisted Learning, 17,* 34-47.

Olpak, Y. Z., & Kiliç Çakmak, E. (2018). Examining the reliability and validity of a Turkish version of the community of inquiry survey. *Online Learning, 22*(1), 147-161. https://doi.org/10.24059/olj.v22i1.990

Olson, T., & Wisher, R. (2002). The Effectiveness of Web-Based Instruction: An Initial Inquiry. *International Review of Research in Open and Distance Learning, 3.*

Onwuegbuzie, A. J., & Daniel, L. G. (2002). Uses and misuses of the correlation coefficient. *Research in the Schools, 9*(1), 73-90.

Packham, G., Jones, P., Miller, C., & Thomas, B. (2004). E-learning and retention: Key factors influencing student withdrawal. *Education & Training, 46*(6-7), 335-342.

Palmer, S., & Holt, D. (2009). Examining Student Satisfaction with Wholly Online Learning. *Journal of Computer Assisted Learning*, *25*.

Panagiotakopoulos, C., Pierrakeas, C., Xenos, M., & Vergidis, D. (2004). A comparative study of dropout rates and causes for two different distance education courses. *International Review of Research in Open and Distance Learning*, 5(2).

Park, J., & Choi, H. J. (2009). Factors Influencing Adult Learners' Decision to Drop Out or Persist in Online Learning. *Educational Technology & Society*, *12*, 207-217.

Parker, A. (1999). A study of variables that predict dropout from distance education. *International Journal of Educational Technology*, *1*(2).

Pascarella, E., & Terenzini, P. (2005). *How college affects students: A third decade of research*. Jossey-Bass.

Pelz, B. (2004). Three principles of effective online pedagogy. *Journal of Asynchronous Learning Networks*, *8*(3).

Perry, B., Boman, J., Care, W. D., Edwards, M., & Park, C. (2008). Why do students withdraw from online graduate nursing and health studies education? *The Journal of Educators Online*, *5*(1).

Peslak, A. (2005). The educational productivity paradox. *Association for Computing Machinery*, *48*, 111-114.

Picciano, A. (2002). Beyond student perceptions: Issues of interaction, presence, and performance in an online course. *Journal of Asynchronous Learning Networks*, *6*(1), 21-40.

Pike, G. R. (1993). The relationship between perceived learning and satisfaction with college: An alternative view. *Research in Higher Education*, *34*(1): 23-40.

Porter, D. (2004). *California adult education 2002-2004 innovation and alternative instructional delivery program*. California State University.

Powers, S., & Rossman, M. (1985). Student satisfaction with graduate education: Dimensionality and assessment in a college education. *Psychology*, *22*, 46-49.

Pineda-Corcho, A. F., & Moreno-Cadavid, J. (2017). Proposal of a gamified virtual learning environment for computer programming courses. *Proceedings of the 2017 IEEE Global Engineering Education Conference (EDUCON)* (pp. 1671-1675). Athens, Greece.

Preisman, K. (2014). Teaching Presence in Online Education: From the Instructor's Point-of-View. *Journal of Asynchronous Learning Network*, *18*.

Price, R. A., Arthur, T. Y., & Pauli, K. P. (2016). A Comparison of Factors Affecting Student Performance and Satisfaction in Online, Hybrid and Traditional Courses. *Business Education Innovation Journal*, *8*(2), 32-40.

Qureshi, E., Morton, L.L., & Antosz, E. (2002). An interesting profile – university students who take distance education courses show weaker motivation than on-campus. *Online Journal of Distance Learning Administration*, *5*(4).

Ralston-Berg, P., & Nath, L. (2008, August). What makes a quality online course? The student perspective. *Proceedings of the 24th annual conference on distance teaching and learning*.

Rashty, D. (1999). Traditional learning vs. eLearning. *Dostopno*.

Reeves, T., Baxter, P., & Jordan, C. (2002). Teaching Computing Courses – Computer Literacy, Business Microcomputer Applications, and Introduction to Programming Online Utilizing WebCT. *Proceedings of the 11th Annual Rocky Mountain Conference of the Consortium for Computing Sciences in Colleges* (pp. 290-300). Farmington, NM.

Reinhart, J., & Schneider, P. (2001). Student satisfaction, self-efficacy, and the perception of the two-way audio/video distance learning environment: A preliminary examination. *Quarterly Review of Distance Education*, *2*(4), 357-365.

Rhode, J. F. (2009). Interaction equivalency in self-paced online learning environments: An exploration of learner preferences. *International Review of Research in Open and Distance Learning*, *10*(1), 1-23.

Richardson, J. C., & Swan, K. (2003). Examining social presence in online courses in relation to students' perceived learning and satisfaction. *Journal of Asynchronous Learning Networks*, *7*(1).

Ring, G., & Mathieux, G. (2002). *The key components of quality learning* [Paper presentation]. ASTD Techknowledge 2002 Conference, Las Vegas, NV.

Rivera, J. C., & Rice, M. L. (2002). A comparison of student outcomes and satisfaction between traditional and web-based course offerings. *Online Journal of Distance Learning Administration*, *5*(3).

Rockinson-Szapkiw, A. J., Wendt, J., Wighting, M., & Nisbet, D. (2016). The predictive relationship among the community of inquiry framework, perceived learning and online, and graduate students' course grades in online synchronous and asynchronous courses. *International Review of Research in Open and Distributed Learning*, *17*(3), 20-34.

Rodgers, C. R., & Raider-Roth, M. B. (2006). Presence in teaching. *Teachers and Teaching: Theory and Practice*, *12*(3), 265-287. https://doi.org/10.1080/13450600500467548

Rohayani, A. H., Kurniabudi, K., & Sharipuddin, S. (2015). A literature review: Readiness factors to measuring e-learning readiness in higher education. *Procedia Computer Science, 59,* 230-234.

Rothman, T., Romeo, L., Brennan, M., & Mitchell, D. (2011). Criteria for assessing student satisfaction with online courses. *International Journal for e-Learning Security, 1*(1-2), 27-32.

Rovai, A.P. (2002a). Building sense of community at a distance. *International Review of Research in Open and Distance Learning, 3*(1).

Rovai, A.P. (2002b). Development of an instrument to measure classroom community. *Internet and Higher Education, 5*(3), 197-211.

Rovai, A.P. (2003). In search of higher persistence rates in distance education online programs. *Internet and Higher Education, 6,* 1-16.

Rovai, A. P., & Downey, J. R. (2010). Why some distance education programs fail while others succeed in a global environment. *The Internet and Higher Education, 13*(3), 141-147.

Rubin, B., & Fernandes, R. (2013). Measuring the community in online classes. *Journal of Asynchronous Learning Networks, 17*(3), 1-21.

Ryan, M., Carlton, K. H., & Ali, N. (2004). Reflections on the role of faculty in distance learning and changing pedagogies. *Nursing Education Perspectives, 25*(2), 73-77.

Sahin, I. (2007). *Predicting student satisfaction in distance education and learning environments* (ED496541). ERIC Document Reproduction. https://files.eric.ed.gov/fulltext/EJ1008076.pdf

Savicevic, D. (2008). Convergence or divergence of ideas on andragogy in different countries. *International Journal of Lifelong Education, 27*(4), 361-378. https://doi:10.1080/02601370802051504

Sawang, S., Newton, C., & Jamieson, K. (2013). Increasing learners' satisfaction/intention to adopt more e-learning. *Education and Training, 55,* 83-105.

Seaman, J. E., Allen, I. E., & Seaman, J. (2018). *Grade Increase: Tracking Distance Education in the United States*. The Babson Survey Research Group.

Seong, D. S. K. (Ed.) (2006). Usability Guidelines for Designing Mobile Learning Portals. *Proceedings of the 3rd International Conference on Mobile Technology, Application and Systems* (pp. 25-es). ACM Digital Library. https://doi/10.1145/1292331.1292359

Sener, J., & Humbert, J. (2003). Student satisfaction with online learning: An expanding universe. In J. Bourne & J. C. Moore (Eds.), *Elements of Quality Online Education: Practice and Direction* (pp 245-260). Sloan Center for Online Education.

Settle, A., & C. Settle (2007). Distance Learning and Student satisfaction in Java Programing Courses. *Journal of Universal Computer Science*, *13*(9), 1270-1286.

Shachar, M., & Yoram, N. (2003). Differences Between Traditional and Distance Education Academic Performances: A Meta-Analytic Approach. *International Review of Research in Open and Distance Learning*, *4*.

Shana, Z. (2009). Learning with Technology: Using Discussion Forums to Augment a Traditional-Style Class. *Educational Technology & Society*, *12*, 214-228.

Shea, J., Joaquin, M. E., & Wang, J. Q. (2016). Pedagogical Design Factors That Enhance Learning in Hybrid Courses: A Contribution to Design-Based Instructional Theory. *Journal of Public Affairs Education*, *22*(3), 381-397.

Shea, T., Motiwalla, L., & Lewis, D. (2001). Internet-Based Distance Education–The Administrator's Perspective. *The Journal of Education for Business*, *77*, 112-117.

Sheard, J., & Markham, S. (2005). Web-based learning environments: Developing a framework for evaluation. *Assessment and Evaluation in Higher Education*, *30*(4), 353-368.

Sher, A. (2009). Assessing the relationship of student-instructor and student-student interaction to student learning and satisfaction in Web-based Online Learning Environment. *Journal of Interactive Online Learning*, *8*(2), 102- 120.

Sheridan, K., & Kelly, M. A. (2010). The indicators of instructor presence that are important to students in online courses. *Journal of Online Teaching and Learning*, *6*(4), 767-779.

Shin, N., (2003) Transactional Presence as a Critical Predictor of Success in Distance Learning. *Distance Education*, *24*(1).

Shute, V. J. (2008). Focus on formative feedback. *Review of Educational Research*, *78*(1), 153-189.

Shutt, M., Allen, B., & Laumakis, M. A. (2009). The effects of instructor immediacy behaviors in online learning environments. *The Quarterly Review of Distance Education*, *10*(2), 135-148.

Song, L., Singleton, E.S., Hill, J.R., & Koh, M.H. (2004). Improving online learning: Student perceptions of useful and challenging characteristics. *Internet and Higher Education*, *7*(1), 59-70.

Sönmez, V. (1997). *Social Studies Instruction and Teacher Guide.* Ankara: Ani Publishing.

Sorva, J. (2013). Notional Machines and Introductory Programming Education. *ACM Transactions on Computing Education, 13*(8), 1-31.

Stein, D. S., Wanstreet, C. E., Calvin, J., Overtoom, C., & Wheaton, J. E. (2005). Bridging the Transactional Distance Gap in Online Learning Environments. *American Journal of Distance Education, 19*(2), 105-118.

Steinbronn, P., & Merideth, E. (2008). Perceived utility of methods and instructional strategies used in online and face-to-face teaching environments. *Innovative Higher Education, 32*(5), 265-278.

Steinman, D. (2007). Educational Experiences and the Online Student. *TechTrends, 51*, 46-52.

Stokes, S. P. (2003). *Temperament, learning styles, and demographic predictors of college student satisfaction in a digital learning environment* [Paper presentation]. The annual meeting of the Mid-South Educational Research Association, Biloxi, MS.

Strachota, E. (2003). *Student satisfaction in online courses: An analysis of the impact of learner-content, learner-instructor, learner-learner and learner-technology interaction* [Doctoral dissertation, University of Wisconsin-Milwaukee]. UMI Publishing.

Su, D. K. S., & Chan, F. C. (2006). Navigational patterns on usable mobile news portals. *Journal of Internet Technology, 7*, 230-237.

Sutton, L. A. (2000, April. 24-28). *Vicarious Interaction: A Learning Theory for Computer-Mediated Communications* [Paper presentation]. The Annual Meeting of the American Educational Research Association, New Orleans, LA.

Sutton, L. A. (2001). The principles of vicarious interaction in computer-mediated communications. *Journal of Interactive Educational Communications, 7*(3), 223-242.

Swan, K. (2001). Virtual interactivity: Designing factors affecting student satisfaction and perceived learning in asynchronous online courses. *Distance Education, 22*(2), 306-331.

Swan, K. (2002). Building learning communities in online courses: The importance of interaction. *Education, Communication & Information, 2*(1), 23-49.

Swan, K., Garrison, D. R., & Richardson, J. C. (2009). A constructivist approach to online learning: the Community of Inquiry framework. In C. R. Payne (Ed.), *Information Technology and Constructivism in Higher Education: Progressive Learning Frameworks* (pp. 43-57). IGI Global.

Tello, S. (2009). An Analysis of Student Persistence in Online Education. International *Journal of Information and Communication Technology Education, 3*, 47-62.

Thomas, R. (2000). Experiences Teaching C++ Online. *Journal of Computing Sciences in Colleges, 15*(5), 214-222.

Thompson, E. (1997). Distance education drop-out: What can we do? In R. Pospisil & L. Willcoxson (Eds.), *Learning Through Teaching* (pp 324-332). *Proceedings of the 6th Annual Teaching Learning Forum*. Murdoch University.

Thurmond, V., & Wambach, K. (2004). Understanding interactions in distance education: A review of the literature. *Journal of Instructional Technology and Distance Learning, 1*, 9-33.

Thurmond, V., Wambach, K., Connors, H., & Frey, B. (2002). Evaluation of Student Satisfaction: Determining the Impact of a Web-Based Environment by Controlling for Student Characteristics. *American Journal of Distance Education, 16*, 169-190.

Tu, C. H. (2001). How Chinese perceive social presence: An examine of interaction in online learning environment. *Education Media International, 38*, 45-60.

Tu, C. H., & McIsaac, M. (2002). The Relationship of Social Presence and Interaction in Online Classes. *American Journal of Distance Education, 16*, 131-150.

Tuovinen, J. E. (2000). Multimedia distance education interactions. *Education Media International*, *37*(1), 16-24.

Ury, G. (2004). A Comparison of Undergraduate Student Performance in Online and Traditional Courses. *Journal of Consortium for Computing Sciences in Colleges*, *19*(4).

U.S. Department of Education, National Center for Education Statistics. (2018). *Digest of Education Statistics, 2016* (NCES 2017-094), Table 311.15.

Uttl, B., White, C. A., & Gonzalez, D. W. (2017). Meta-analysis of faculty's teaching effectiveness: Student evaluation of teaching ratings and student learning are not related. *Studies in Educational Evaluation*, *54*, 22-42.

Varner B. (2013). Undergraduate perceptions of online coursework. *Journal of Applied Learning Technology*, *3*(1), 16-20.

Verduin, J. R., & Clark, T. A. (1991). *Distance education: The foundations of effective practice*. Jossey-Bass Publishers.

Vergidis, D., & Panagiotakopoulos, C. (2002). Student Dropout at the Hellenic Open University: Evaluation of the Graduate Program, "Studies in Education". *International Review of Research in Open and Distance Learning*, *3*(2), 205-216.

Vihavainen, A., Luukkainen, M., & Kurhila, J. (Eds.) (2012). Multi-faceted support for MOOC in programming. *Proceedings of the 13th annual conference on Information technology education* (pp.171-176). ACM Digital Library. https://doi/10.1145/2380552.2380603

Vonderwell, S. (2003). An examination of asynchronous communication experiences and perspectives of students in an online course: a case study. *Internet and Higher Education, 6*(1), 77-90.

Vrasidas, C. (2000). Constructivism versus objectivism: Implications for interaction, course design, and evaluation in distance education. *International Journal of Educational Telecommunications, 6*, 339-362.

Vrasidas, C., & McIsaac, M. (1999). Factors Influencing Interaction in an Online Course. American Journal of Distance Education. *American Journal of Distance Education, 13*(3), 22-36.

Wagner, E. D. (1994). In support of a functional definition of interaction. *The American Journal of Distance Education, 8*(2), 6-29.

Walther, J. B. (1992). Interpersonal effects in computer-mediated interaction: A relational perspective. *Communication Research, 19*(1), 52-90.

Wang, R. (2011). Education Paradise of International Students: Strategic Factors that Determine the Selection of Schools by International Students. *International Journal of Technology and Engineering Education*, *7*(3), 65-72.

Wang, X. (2013). Baccalaureate expectations of community college students: Sociodemographic, motivational, and contextual Influences. *Teachers College Record*, *115*(4).

Waschull, S. B. (2005). Predicting Success in Online Psychology Courses: Self-Discipline and Motivation. *Teaching of Psychology*, *32*(3), 190–192.

Weber, M. J., & Farmer, T. A. (2012). Online course offerings: Issues of retention and professional relationship skill development. In J. Tareilo & B. Bizzell (Eds.), *NCPEA handbook of online instruction and programs in education leadership*. Connexions Content Commons.

Weerasinghe, S., Lalitha, S., & Fernando, R. L. (2017). Students' Satisfaction in Higher Education Literature Review. *American Journal of Educational Research*, *5*(5), 533-539.

Wegner, S., Holloway, K. C., & Garton, E. M. (1999). The effects of Internet-based instruction on student learning. *The Journal of Asynchronous Learning Network, 3*(2).

Weinberg, B. A., Fleisher, B. M., & Hashimoto, M. (2007*). Evaluating methods for evaluating instruction: The case of higher education*. National Bureau of Economic Research. http://www.nber.org/papers/w12844

Weinel, M., Bannert, M., Zumbach, J., Hoppe, H. U., & Malzahn, N. (2011). A closer look on social presence as a causing factor in computer-mediated collaboration. *Computers in Human Behavior, 27*(1), 513-521.

Willging, P., & Johnson, S. (2004). Factors that influence students' decision to dropout of online courses. *Journal of Asynchronous Learning Network*, *8*.

Winston, R. B., Vahala, M. E., Nichols, E. C., Gillis, M. E., Wintrow, M., & Rome, K. D. (1994). A measure of college classroom climate: The college classroom environment scales. *Journal of College Student Development, 35*, 11-35.

White, K. W., & Weight, B. H. (2000). *The online teaching guide: A handbook of attitudes, strategies, and techniques for the virtual classroom*. Pearson Education.

Whiteside, A., Garrett D. A., & Swan, K. (2017). *Social presence in online learning multiple perspectives on practice and research* (pp. 180-190). Stylus.

Williams, W. M., & Ceci, S. J. (1997). "How am I doing?" Problems with student ratings of instructors and courses. *Change*, *29*, 12-23

Williams, L., & Kessler, R. (Eds.) (2000). The effects of pair-pressure and pair-learning on software engineering education. *Proceedings of the Software Engineering Education and Training Conference* (pp. 59-65). https://collaboration.csc.ncsu.edu/laurie/Papers/CSEET.PDF

Wise, A., Chang, J., Duffy, T., & del Valle, R. (2004). The effects of teacher social presence on student satisfaction, engagement, and learning. *Journal of Educational Computing Research*, *31*, 247-271.

Wisneski, J., Ozogul, G., & Bichelmeyer, B. (2015). Does teaching presence transfer between MBA teaching environments? A comparative investigation of instructional design practices associated with teaching presence. *The Internet and Higher Education*, *25*, 18-27.

Wittenbols, J. H. (2016). Empowering students to make sense of an information-saturated world: The evolution of information searching and analysis. *Communications in Information Literacy, 10*(1), 1-14.

Wojciechowski, A., & Palmer, L. B. (2005). Individual student characteristics: Can any be predictors of success in online classes? *Online Journal of Distance Learning Administration*, *8*(2).

Wu, M., & Yan, H. (2009). Simulation in software engineering with system dynamics: A case study. *Journal of Software*, *4*(10), 1127-1135.

Wyatt, G. (2005). Satisfaction, academic rigor and interaction: Perceptions of online instruction. *Education*, *125*(3), 460-468.

Xenos, M., Pierrakeas, C., & Pintelas, P. (2002). A survey on student dropout rates and dropout causes concerning the students in the Course of Informatics of the Hellenic Open University. *Computers & Education*, 39, 361-377.

Xia, B. S. (2015). Benefit and Cost Analysis of Massive Open Online Courses: Pedagogical Implications on Higher Education. *International Journal of Cyber Behavior, Psychology and Learning*, *5*(3), 47-55.

Yacci, M. (2000). Interactivity Demystified: A Structural Definition for Distance Education and Intelligent CBT. *Educational Technology*, *40*.

Yakin, I., & Gencel, I. E. (2013). The utilization of social media tools for informal learning activities: A survey study. *Mevlana International Journal of Education*, *3*(4), 108-117.

Yang, J. C., Quadir, B., Chen, N. S., & Miao, Q. (2016). Effects of online presence on learning performance in a blog-based online course. *The Internet and Higher Education*, *30*, 11-20.

Yildiz, S., & Chang, C. (2003). Case studies of distance students' perceptions of participation and interaction in three asynchronous web-based conferencing classes in the U.S. Turkish Online. *Journal of Distance Education*, *4*(2).

Young, A., & Norgard, C. (2006). Assessing the quality of online courses from the students' perspective. *Internet and Higher Education*, *9*, 107-115.

Yukselturk, E., & Bulut, S. (2007). Predictors for Student Success in an Online Course. *Educational Technology & Society*, *10*, 71-83.

Yukselturk, E., & Inan, F. (2006). Examining the factors affecting student dropout in an online certificate program. *Turkish Online Journal of Distance Education*, 7, 76-88.

Zachery, J. L., & Jensen, P.A. (2005). Exploiting Value-Added Content in Online Course: Introducing Programming Concepts with HTML and JavaScript. Proceedings from SIGCSE 2005: *The 36th ACM Technical Symposium on Computer Science Education* (pp. 396-400). Reno, NV: ACM Press, New York.

Zimmerman, T. D. (2012). Exploring learner to content interaction as a success factor in online courses. *International Review of Research in Open and Distance Learning*, *13*(4), 152-165. https://doi.org/10.19173/irrodl.v13i4.1302

Zimmerman, B. J., & Schunk, D. H. (Eds.) (2001). *Self-regulated learning and academic achievement: Theoretical perspectives* (2nd ed.). Lawrence Erlbaum

APPENDIX A – End of Course Survey

End of Course Student Satisfaction Survey Questions Used for Study

Survey Questions

1) The materials helped me achieve the learning objectives for this course: (Select ONE)

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

2) The content was organized in a way that was easy to navigate: (Select ONE)

- ◯ Strongly Agree
- ◯ Agree
- ◯ Disagree
- ◯ Strongly Disagree

3) Please help us understand the level of interaction you experienced with your instructor. Throughout the course, the instructor:

	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
Posted and held office hours	○	○	○	○	○
Responded to emails and/or phone calls within 48 hours	○	○	○	○	○
Answered my questions effectively	○	○	○	○	○
Posted individualized, helpful feedback to assignments and discussion forums	○	○	○	○	○
Engaged with students, contributing to a healthy learning environment	○	○	○	○	○
Treated students with respect and professionalism	○	○	○	○	○
Demonstrated knowledge related to the course content	○	○	○	○	○

4) All things considered, were you satisfied with your studies with us?

- ◯ Yes
- ◯ No

APPENDIX B – Research Authorization Letter

JANUARY 29, 2020

Grantham University
16025 W 113th St.
Lenexa, KS 66219

Auburn University Institutional Review Board
c/o Office of Research Compliance
115 Ramsay Hall
Auburn, AL 36849

Please note that Mrs. Belinda Casimir-Patton, an Auburn University Adult Education PhD Student, has the permission to conduct research at Grantham University for her study, "Factors Influencing Student Satisfaction in Distance Education Programming Courses."

Mrs. Patton will use existing student satisfaction survey data collected by the university to conduct her research. Mrs. Patton has agreed to provide to a copy of the approved Auburn University IRB stamped consent document once it has been approved.

If there are any questions, please contact my office.

Signed,

Dr. Anthony Petroy
President & Provost
Grantham University
Phone: 913-309-4738
Fax: 855-681-5201
Email: apetroy@grantham.edu

APPENDIX C – Institutional Review Board Approval

Auburn University Human Research Protection Program

EXEMPTION REVIEW APPLICATION

For information or help completing this form, contact: **THE OFFICE OF RESEARCH COMPLIANCE,**
Location: 115 Ramsay Hall **Phone:** 334-844-5966 **Email:**IRBAdmin@auburn.edu

Submit completed application and supporting material as one attachment to IRBsubmit@auburn.edu.

1. PROJECT IDENTIFICATION **Date** 02/05/2020

a. Project Title An Analysis of Factors that May Influence Student Satisfaction in Computer Programming Courses at an Online Midwestern University

b. Principal Investigator Belinda Casimir-Patton **Degree(s)** M.S.
Rank/Title Ph.D. Student **Department/School** Educational Foundations Leadership and Technology
Phone Number 334-676-0495 **AU Email** bac0015@auburn.edu

Faculty Principal Investigator (required if PI isa student) Dr. James Witte
Title Professor & Interim Department Head **Department/School** Educational Foundations Leadership and Technology
Phone Number 334-844-3060 **AU Email** witteje@auburn.edu

Dept Head Dr. James Witte **Department/School** Educational Foundations Leadership and Technology
Phone Number 334-844-3060 **AU Email** witteje@auburn.edu

c. Project Personnel (other PI) – Identify all individuals who will be involved with the conduct of the research and include their role on the project. Role may include design, recruitment, consent process, data collection, data analysis, and reporting. Attach a table if needed for additional personnel.

Personnel Name Dr. James Witte **Degree (s)** Ph.D.
Rank/Title Professor & Interim Department Head **Department/School** Educational Foundations Leadership and Technology
Role Faculty Primary Investigator
AU affiliated? ☒ YES ☐ NO If no, name of home institution
Plan for IRB approval for non-AU affiliated personnel?

Personnel Name Belinda Casimir-Patton **Degree (s)** M.S.
Rank/Title Ph.D., Student **Department/School** Educational Foundations Leadership and Technology
Role Primary Investigator (performs data analysis and reporting)
AU affiliated? ☒ YES ☐ NO If no, name of home institution
Plan for IRB approval for non-AU affiliated personnel?

Personnel Name **Degree (s)**
Rank/Title **Department/School**
Role
AU affiliated? ☐ YES ☐ NO If no, name of home institution
Plan for IRB approval for non-AU affiliated personnel?

d. Training – Have all Key Personnel completed CITI human subjects training (including elective modules related to this research) within the last 3 years? YES ☒ NO ☐

The Auburn University Institutional Review Board has approved this Document for use from
1/24/2020 to ----------
Protocol # 20-033 EX 2001