7-1-2014

The Relationship Between Socioeconomic Status, Course Delivery Method, and Student Success at a State College: A Single Institution Analysis

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DOI: 10.25148/etd.FI14071136

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THE RELATIONSHIP BETWEEN SOCIOECONOMIC STATUS, COURSE DELIVERY METHOD, AND STUDENT SUCCESS AT A STATE COLLEGE: A SINGLE INSTITUTION ANALYSIS

A dissertation submitted in partial fulfillment of the

requirements for the degree of

DOCTOR OF EDUCATION

in

HIGHER EDUCATION

by

Rolando García

2014

To: Dean Delia C. Garcia
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This dissertation, written by Rolando García, and entitled The Relationship Between Socioeconomic Status, Course Delivery Method, and Student Success at a State College: A Single Institution Analysis, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this dissertation and recommend that it be approved.

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Date of Defense: July 1, 2014

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DEDICATION

I dedicate this dissertation to my wonderful wife, Elizabeth, and my little boy, Adam. Thank you for your love, patience, and support. Your unparalleled faith in me motivates me to be the best person I can be. I would not be who I am without you. I will always love you.

DEDICACIÓN

Dedico esta tesis a mi maravillosa esposa, Elizabeth, y mi niño pequeño, Adam. Gracias por tu amor, paciencia y apoyo. Su fe sin igual en mí me motiva a ser la mejor persona que puedo ser. Yo no sería quien soy sin ti. Yo siempre los amaré.

ACKNOWLEDGMENTS

I would like to first sincerely thank my committee members, Dr. Benjamin Baez, Dr. Leonard Bliss, and Dr. M. O. Thirunarayanan for their valuable ideas, suggestions, guidance, and encouragement through this process. Dr. Leonard Bliss was especially insightful and supportive in sharing his knowledge and breadth of experience with me and getting me through the process.

I am also greatly indebted to Dr. Linda Bliss for her constructive feedback, support, expertise, and insight in organizing this dissertation. Thank you for your assistance in making this process much smoother.

I want to extend my sincerest appreciation and thanks to my dissertation committee chair, Dr. Joy Blanchard. Thank you for taking the time to help me when it would have been very easy to let me slip through the cracks. I know that I would not have made it to the finish line without your tenacious support and encouragement. Because you stood up and took responsibility for guiding me through, I was able to grow in my field and most importantly finish what I started. You have provided extremely valuable support and insight. Thank you for your professionalism and integrity.

I would like to thank my professional mentors, Dr. Robert Calabrese, Rhonda Berger, Victoria Florit, and Dr. Lourdes Oroza, for their guidance and support through the years. I have evolved into who I am from the time and effort they invested in a young man who was trying to find his niche in life. Thank you all for the opportunities for personal and professional growth you provided and the friendships that we now share. I

hope that I will be as successful as a mentor to others as you all have been with me. Thank you for everything.

I would like to thank everyone that I have had the pleasure of working with at Miami Dade College, Northern Virginia Community College, and Broward College. Additionally, I would like to thank my fellow doctoral cohort classmates. Finally, I would like to thank my family and friends for all their support and encouragement. Through the years I have been extremely fortunate to have met so many wonderful people that have provided encouragement, support, and friendship in this long and often time challenging process. Fortunately for me, I have too many people to name but I want each and every one of you to know how grateful I am for the time, support, and friendship that you have shared. I have been extremely fortunate in this life to have met so many kind and caring people that have encouraged and supported me. Thank you for making this moment possible.

ABSTRACT OF THE DISSERTATION

THE RELATIONSHIP BETWEEN SOCIOECONOMIC STATUS, COURSE DELIVERY METHOD, AND STUDENT SUCCESS AT A STATE COLLEGE: A SINGLE INSTITUTION ANALYSIS

by

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Miami, Florida

Professor Joy Blanchard, Major Professor

In an effort to improve instruction and better accommodate the needs of students, community colleges are offering courses delivered in a variety of delivery formats that require students to have some level of technology fluency to be successful in the course. This study was conducted to investigate the relationship between student socioeconomic status (SES), course delivery method, and course type on enrollment, final course grades, course completion status, and course passing status at a state college.

A dataset for 20,456 students of low and not low SES enrolled in science, technology, engineering, and mathematics (STEM) course types delivered using traditional, online, blended, and web enhanced course delivery formats at Miami Dade College, a large open access 4-year state college located in Miami-Dade County, Florida, was analyzed. A factorial ANOVA using course type, course delivery method, and student SES found no significant differences in final course grades when used to determine if course delivery methods were equally effective for students of low and not

low SES taking STEM course types. Additionally, three chi-square goodness-of-fit tests were used to investigate for differences in enrollment, course completion and course passing status by SES, course type, and course delivery method. The findings of the chi-square tests indicated that: (a) there were significant differences in enrollment by SES and course delivery methods for the Engineering/Technology, Math, and overall course types but not for the Natural Science course type and (b) there were no significant differences in course completion status and course passing status by SES and course types overall and SES and course delivery methods overall. However, there were statistically significant but weak relationships between course passing status, SES and the math course type as well as between course passing status, SES, and online and traditional course delivery methods.

The mixed findings in the study indicate that strides have been made in closing the theoretical gap in education and technology skills that may exist for students of different SES levels. MDC's course delivery and student support models may assist other institutions address student success in courses that necessitate students having some level of technology fluency.

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CHAPTER 1

INTRODUCTION

Key socioeconomic factors comprising the issue known as the digital divide are race, income, educational attainment, age, English as a second language, and geographical region (Attewell, 2001; Valadez & Duran, 2007; Warschauer, 2003). The disparity in the haves and have-nots in terms of access to technology and the knowledge of how to use it seems to be formed along the lines of socioeconomic status (Attewell, 2001; Enoch & Soker, 2006; Hawkins & Oblinger, 2006; Valadez & Duran, 2007). A 2013 survey conducted by K. Zickuhr of the Pew Research Center found that "groups that are significantly more likely to rely on internet access outside the home include blacks and Hispanics, as well as adults at lower levels of income and education." This stratification of society in terms of access to technology and the knowledge of how to use it is referred to as the digital divide.

The digital divide results from socioeconomic differences between groups, communities, nations, or even continents. These differences impact people's ability to access digital information. Digital information in this context not only refers to the Internet, but any and all media that is available in a digital format. Accessibility is not just the physical access and quality of that access to the Internet and digital media, but also to the ability of groups to effectively use the computing and information technology (DiMaggio, Hargittai, Neuman, & Robinson, 2001).

There is a great deal of research on the role that socioeconomic status (SES) plays in the attainment of a college education (Astin & Oseguera, 2004; Cabrera, Burkum,& La

Nasa 2005; Crosta, Leinbach, & Jenkins, 2006; Pascarella & Terenzini, 2005; Taniguchi & Kaufman, 2005). Research indicates that college students who attend institutions where the majority of the students come from the upper socioeconomic levels gain greater benefits than others who attend institutions where the majority of the students come from the lower socioeconomic levels (Astin & Oseguera, 2004; Pascarella & Terenzini, 2005). Compared to others, students of low SES are less likely to earn a degree from a four-year institution and more likely to drop out (National Center for Educational Statistics, 2003; Titus, 2006).

Community colleges are one of the few places that provide disadvantaged students from lower socioeconomic levels the opportunity to obtain a college education. This is the community college's role of democratizing higher education at work. However, the existence of the digital divide complicates this task because the students at community colleges have varying needs and different levels of exposure to technology. To help in the endeavor of educating these students and helping them succeed in their programs of study, community colleges need to provide students with access to technology and support for acquiring necessary technology skills for academic success.

One of the ways that community colleges provide students with access to education is by providing courses delivered through distance education. Distance education (DE) is a method for instructional delivery that has increased significantly in popularity. As the schedules of students become more hectic, instructional delivery methods have needed to adapt and be more flexible. Distance education is a nontraditional method of course delivery that enables people from different backgrounds to take courses and earn degrees

without having to set foot at an institution of higher learning. The most popular method of distance education delivery today is through the use of computers, digital media, and the Internet. While this may appear to grant a great deal of flexibility in educating learners, it may only be widening the gap between those individuals in our global society who have access to digital technologies and the technology skills to use it and those who do not.

A study in the area of how learners enrolled in courses delivered utilizing various levels of technology are impacted by a digital divide factor such as SES is necessary to understand how society can assist the less privileged better function in today's high tech educational environment. Technology is increasingly being infused into the curriculum and it is crucial that students have the tools and the training to participate. Not surprisingly, it is the students at the lower end of the socioeconomic scale that are being excluded the most in the current educational structure especially in regards to distance education. A study in this area will add to the existing literature on the digital divide and its impact on community college education by focusing on course delivery methods that utilize technology for instruction.

Definitions of Terms

Blended Course: a course delivered using web-based learning activities to complement reduced face-to-face "seat time" such that the course is designed to interact pedagogically to take advantage of the best features of each course delivery method.

Completion: a student completing a course by not withdrawing or being withdrawn.

Course Delivery Method: in this study, courses analyzed were delivered using four distinct course delivery methods. The course delivery methods were traditional, online, blended, and web-enhanced.

Course Type: in this study, courses were assigned one of three course type according to the academic discipline delivering the course. The natural science course type was used for natural science courses such as Introduction to Biology, the technology/engineering course type was used for technology/engineering courses such as Introduction to Microcomputers, and math course type was used for math courses such as College Algebra.

Cultural Capital: a non-financial social asset such as education or a skill that promotes social mobility.

Digital Divide: the separation of society into groups into that have access to technology and the knowledge of how to use it. The groups most affected are racial minorities, the disabled, those for whom English is a second language, the homeless, and those with low incomes (First & Hart, 2002).

Enrollment: a course section that a student enrolled in. A course section was assigned a course type and was delivered in one of the four course delivery methods.

Final Course Grade: the final course grade a student earned in a class.

Learning Management System (LMS): a web based software application that is used for course management and course content delivery.

Online Course: a course delivery method that utilizes an online web-based system for all communication and delivery of course content between students and instructors.

Passing: a student completing a course by earning a final letter grade of A, B, or C.

Socioeconomic Status (SES): a sociological and economic measure of an individual based on income, education, and/or occupation.

STEM: science, technology, engineering, and mathematics.

Traditional Course: a course taught by having face-to-face lecture based meetings between students and their instructor for all class sessions.

Web Enhanced Course: a traditional course that utilizes an online web-based system to supplement a face-to-face lecture based course.

Assumptions and Limitations/Delimitations

Several assumptions have been made for this study. First, I assumed that students had the necessary technology skills for success in the courses for which they registered. Second, I assumed that the instructors teaching all courses used in the study had the knowledge and experience to effectively teach their content area and had the necessary technology skills to effectively deliver their course in whatever course delivery format they were teaching. Third, I assumed all students and instructors put forth their best efforts for teaching and learning.

The current study had a number of delimiting factors. This study focused on students enrolled in STEM (science, technology, engineering, and mathematics) course

types that were offered in four course delivery methods during the 2011 – 2012 academic year (August 2011 – July 2012) at Miami Dade College. There is little SES variance in the population of students enrolled at MDC with almost 70% of the students being considered low SES. Results are limited to these specific groups. Additionally, this study was designed to analyze data for courses that were completed in a previous academic year.

The study was delimited to STEM course types to narrow the sample to course types for which there is a critical shortage of workers in the United States (U.S Department of Commerce, 2011). The U.S. Department of Commerce projects that STEM-related occupations will increase at a rate of 17% compared to occupation in non-STEM-related fields which are expected to grow at a 9% rate. While enrollment in science, technology, engineering, and mathematics (STEM) fields has increased (Huang, Taddese, & Walter, 2000; Seymour, 2002; Toulmin & Groome, 2007) in the last decade it is still not on pace to meet the demand of U.S. based companies for a STEM educated and trained workforce. Subsequently, I felt the current study would be more relevant to higher education and the U.S. job market if it focused on STEM course types at Miami Dade College in which 20,456 students from diverse backgrounds were enrolled.

Theoretical Base

The theoretical base used in this study is informed by cultural reproduction theory (Bourdieu, 1977; Bourdieu & Passeron, 1979), principles of the digital divide and the possession of necessary technology skills (Valadez & Duran, 2007; Martin, 2003), and the relationship between SES and college student performance (Lavin, 1965; Sirin, 2005).

In this study, the digital divide is discussed in terms of the relationship between low SES populations and their lack of technology skills. This concept is relevant to Bourdieu's concept of cultural capital in that education and skills such as technology skills are necessary for social mobility. With those concepts in mind I attempted to investigate the performance of students from different socioeconomic groups in courses that required some level of education (college) and skills (technology) to be successful. Within the context of SES and college performance, there is a great deal of correlational research demonstrating a relationship between SES and college student performance so I felt it was necessary to include those elements in the theoretical base for the current study.

Cultural Reproduction Theory

Cultural reproduction is the process in which aspects of society such as social class are transferred from generation to generation (Bourdieu, 1977; Bourdieu & Passeron, 1977). Cultural reproduction theory attempts to explain the link between the social class that an individual is born into and his or her ultimate social class membership. Social mobility in Bourdieu's theory is accounted for by the notion of cultural capital which includes an individual's skills and educational credentials. Acquisition of skills such as technology skills and the acquisition of educational credentials such as degrees and certificates facilitate a societal member's move from one social class to another and subsequently from one socioeconomic level to another. In many cases the acquisition of skills such as interpersonal and technology skills is necessary for the acquisition of educational credentials. This study investigated the

educational performance of students from different socioeconomic levels in courses that require some level of technology skills for success.

The Digital Divide and Student Technology Skills

The digital divide is a societal divide in terms access to technology (First & Hart, 2002) and the knowledge of how to use it (Martin, 2003) along the lines of age, gender, race, ethinicity, socioeconomic status, and disability status. In the United States, there have been great strides in making technology accessible to all societal groups. However, there continues to be a gap in terms of knowledge of how to use it (Valadez & Duran, 2007). The groups most impacted by this gap in technology skills are the poor and educationally underserved. SES plays a major role in development of technology skills because students from low SES backgrounds typically have less access to technology and technology training so subsequently they have reduced opportunities to develop technology fluency with the appropriate software and digital content to be successful in their academic coursework.

SES and College Student Success

SES has wide and varied impacts on many elements of students' lives. Similarly to how low SES impacts technology fluency, low SES also impacts college student success. Overall, SES is positively correlated with college student factors such accessibility (Perna, 2005), academic achievement/success (Sirin, 2005), and persistence (Shouping & St. John, 2001). A student of low SES is less likely to go to college, perform well in college coursework if they attend, and less likely to stay enrolled and complete college while high SES students are more likely to go to college, perform better

than their low SES peers in college coursework, and more likely to stay and complete college. SES is a student background characteristic that colleges need to be aware of when developing strategies targeting college accessibility and student success.

Statement of the Problem

In an effort to serve to improve instruction and better accommodate the needs of students, community colleges are offering courses delivered in a variety of course delivery formats. A number of these course delivery formats require that students have some level of technology fluency to be successful in the course. Based on the literature in the areas of student success in college and the digital divide, we know that SES theoretically impacts the acquisition of necessary technology skills and student success. This study was undertaken to better analyze the impact of SES on student success in courses delivered using technology that requires students to have some level of technology fluency to successfully participate.

Purpose of the Study

This study was conducted to better understand the impact of student SES on course delivery selection and student success at the community college. Student enrollments, final course grades, course completion status, and course passing status for students of two distinct SES levels, low and not low, and how they are impacted by the course delivery methods of the course types they have enrolled for were examined. A large body of literature exists demonstrating mixed findings of different student success measures for various course delivery methods. However, few studies have attempted to analyze student success findings for various course delivery methods by the SES of

students. This study was an attempt to find any impact that SES and course delivery method may have on enrollment and student success measures such as final course grades, course completion status, and course passing status. The study was aimed at helping educators better understand some of the factors associated with student success in courses utilizing a technology component. By helping educators understand how socioeconomic factors impact student success, this study can assist educators and administrators at community colleges focus their learning resources and course delivery strategies on bridging gaps in technology access and skills.

Site of the Study

Miami Dade College (MDC) is the largest institution of higher education in the United States. In 2011 – 2012, MDC served 166,660 students in South Florida. According to Canton (2012), 61% of the students who attended MDC were enrolled part-time, 67% were over the age of 20, 92% of the students enrolled were racial/ethnic minorities, and 69% were working part-time or full-time. Of the 166,660 students who attended MDC in the 2011 – 2012 academic year, 67% of them were considered of low SES (150% of the poverty threshold; Canton, 2012). Overall, 46% of MDC students lived below the poverty threshold for their household size. Forty percent of the students who attended MDC in 2011 - 2012 enrolled in Virtual College courses that were totally online. For 2011 - 2012, the number of students who enrolled in online courses was 38,436. The demographic data for these students indicated that 70% were women, 88% of the students were racial and ethnic minority, 67% were enrolled part-time, 71% of the

students were older than age 21, and 97% of the students resided in Miami-Dade County (Canton, 2012).

Research Questions

The current study analyzed enrollment rate, final course grade, course completion, and course passing for traditional, web enhanced, blended, and online courses at Miami Dade College during the 2011 – 2012 academic year. The study focused on these major research questions:

1. Does enrollment differ for students of low and not low SES enrolling for different course types delivered using different course delivery methods?
2. Are course delivery methods equally effective in terms of final course grades for students of low and not low SES taking different course types?
3. Are course delivery methods equally effective in terms of course completion status for students of low and not low SES taking different course types?
4. Are course delivery methods equally effective in terms of course passing status for students of low and not low SES taking different course types?

Significance of the Study

The practice of increasing online course offerings at community colleges may be having an "anti-democratizing" effect (Cox, 2005). While the overall body of educational technology research has demonstrated there is no significant difference in terms of student success between online and traditional face-to-face course delivery methods, limited research has been conducted specifically at community colleges comparing the effectiveness of online distance education to traditional face-to-face based instruction

(Cejda, 2007). In fact, a few studies focused on the effectiveness of online instruction at the community college demonstrate a trend indicating that online students in community colleges perform worse in terms of final course grades and course completion than community college students in traditional face-to-face courses (Bangurah, 2004; Wynegar & Fenster, 2009). With community colleges increasing their delivery of courses in formats (online, web enhanced, hybrid/blended) that require students to have technology skills to be successful, there is an increased need for these institutions to provide technology fluency support to ensure student success.

This study investigated the impact of SES and course delivery method on enrollment and student success and added to the fields of educational technology and higher education curriculum and instruction research. Community colleges can use the findings of this study to better understand some of the factors associated with student success in courses utilizing a technology component. Understanding how these factors affect student success can assist community colleges in focusing their academic resources and course delivery strategies to bridging the gap in student technology fluency and skills.

Organization of the Study

Chapter 1 discussed the background to the problem and the purpose of the study. This chapter included the definitions of key terms, assumptions/delimitations, theoretical framework, research questions, and significance of the study. Chapter 2 provides a review of the literature that supported this study. Chapter 3 describes the research methodology used in the study. Chapter 4 presents the findings and chapter 5 discusses the results and includes implications of the research for community college faculty and

administrators, limitations of the research, and recommendations for future research and practice.

CHAPTER 2

LITERATURE REVIEW

The current study examined the impact of socioeconomic status (SES) on student enrollment and performance (final course grade, course completion status, and course passing status) in different course types delivered in traditional, web enhanced, blended, and online course delivery formats. The impact of low SES is examined using Bourdieu's cultural reproduction theoretical framework within the context of the digital divide and college student performance. This chapter begins with an introduction to the history of distance education followed by an examination of the literature about the effectiveness of course delivery methods. Digital divide research and relevant literature about the impact SES on college student performance were then analyzed to identify elements that may explain the effectiveness of different course delivery methods for students with different SES levels.

History of Distance Education

Throughout history distance education has been defined in terms of the methodology and technology used for its delivery. However at its core, distance education can be defined as "education that takes place when the instructor and student are separated by space and/or time" (Oregonone, 2005). Distance education can also be identified as planned learning that occurs at a different location from its origin of teaching and as a result requires special techniques of course design, special instructional techniques, and special methods of communication. This second definition best describes distance education as it is implemented today within the technological delivery concept in

this day and age. Distance education describes the acquisition of knowledge and skills through mediated information and instruction encompassing all forms of learning at a distance.

The historical period of the late 20th and early 21st century has seen an enormous growth in the popularity of distance education courses and programs of study. The impetus for this growth has been the advent of technology that has complimented and expanded communication between teachers and learners. McGee and Diaz (2005) observed that "over the past decade, the use of technology to deliver courses in higher education has expanded rapidly" (p. 12). Advancements in technology over the last twenty years have made independent study more accessible for distance education students (Nasseh, 1997). Modern communication technologies now link educational institutions to homes, work-sites, and community centers and in turn this has expanded educational opportunity for all students, traditional and nontraditional alike. Nowadays there are a growing number of individuals who must learn at a distance because of ongoing obligations such as employment, familial responsibilities, handicaps, or because they live in geographically isolated areas. The modern era of distance education (1980s – Present) has redefined the concept "distance education" and altered the view of traditional independent study. In turn this paradigm shift in distance education is forcing a reexamination and redefinition of the place of independent study.

Today distance education is identified by the technology used for its delivery. Namely, computers, computer applications, the Internet, and related web applications and technology. In the current higher education environment, the term distance education is

automatically assumed to refer to the "online" course delivery method. An "online" course is one which is delivered via a computer network such as the Internet and the instructors and students use a computer to access and deliver course material. More and more frequently, the learning environment in which course material, assignments, exams, and presentations are delivered and stored is a learning management system (LMS). Collectively, the current era of distance education is highly dependent on computing technology to facilitate communication between instructors and students. As a result of advances in various communication technologies, communication in a distance education course can be asynchronous or synchronous. This means that if a participant in a distance education course wants to post a message to a discussion forum, send an e-mail, chat in a chat room, or instant message a classmate or instructor they are able to do so. Flexibility and enhanced opportunities for learning for learners with various learning styles are the trademarks of today's distance education environment.

Distance education has benefited from telecommunication breakthroughs because the ability to communicate and share ideas has been augmented significantly. Whereas in the past students and instructors had to wait days or even weeks to communicate through standard mail correspondence, that is not the case anymore. Communication can now take place in a synchronous, real time manner. Students and instructors can communicate in real time using voice, video, text, and data through such tools as instant messengers and online conferencing software such as Skype. This reduction in communication time allows for better feedback from instructors and peers, quicker turnaround time on the submission and grading of assignments, and introduces immediacy on personal

communication and group building that never existed prior to this modern era of distance education.

Positive opinions and acceptance of distance education programs and courses have grown since the advent of the first correspondence courses in the 1800s. Online courses and degree programs are an increasingly common feature of higher education (Vess, 2004). In today's era of distance education it is almost unheard of for a college or university not to have distance education courses and programs. Distance education courses serve to expand the sphere of influence and area of service for institutions of higher learning. "With the advancement of Internet technologies, online learning has emerged as a widely accepted and implemented instructional paradigm" (D'Silva & Reeder, 2005, p.1071).

The technology that exists today provides a college or university with a global reach for its programs and degrees. "Through the use of e-mail and online bulletin boards, students are able to participate in discussions with instructors and fellow students and in many cases work together on group projects with fellow learners who may live in completely different time zones" (Hons, 2002, p.28). Computing and telecommunication technology has served to reduce time and space and almost eliminate the distance aspect of distance education.

Beyond the benefit of reducing distance in terms of time and space, today's distance education delivery methods have increased accessibility to higher education. Many traditional and nontraditional students alike have been enrolling in more distance education courses because of the flexibility it gives them in attending courses. People are

living increasingly busier lives because of career and familial responsibilities. Distance education courses have helped busy individuals attend to their obligations while allowing them to continue their studies. The technological innovations that have been the trademark of the late 20th century and early 21st century have enabled students to stay connected with their coursework 24/7 from practically any location in the world with both wired devices (like desktop PCs) or wireless devices (like laptop PCs, tablets, or cell phones). Because the number of students taking distance education courses has grown so much, there is an increasing amount of acceptance for distance education programs and courses. The application of modern technologies to the distance education concept has given today's students in distance education programs and courses flexibility to manage their schedules and their studies, but also a greater measure of respect and credibility for their completion of said programs.

While acceptance of distance education has grown, there are still doubters and critics of this delivery method. Ironically the majority of the doubters and critics tend to be instructors and educators. The major criticism is that distance education technology poses a threat to the student-teacher relationship and to the profession of being a college or university professor in general. Instructors may feel that " technology glitches and phobias impede the learning process; but just as frequently students and teachers suffer a sort of instructional dissonance as a result of the absence of spontaneous classroom group interaction" (Winsboro, 2002, p.251). There are now a number of different course delivery methods that utilize elements of distance education such as a learning management, reduced face-to-face class time, and/or asynchronous communication. For

instructors to be truly successful in the 21st century teaching environment, they need to use different instructional strategies and tools to deliver courses effectively in the various course delivery methods that are available.

Delivering courses using different pedagogies does not mean that there is not the same amount of interaction between teacher and student. "The most effective online courses make some attempt to provide a suitable substitute for the give-and-take of face-to-face meetings; and they attempt to engage students creatively so they increase their mastery of fact and their analytical abilities in measurable ways" (Vess, 2004, p.386). In fact, a distance education course can actually increase class interaction because students that are normally shy in person often tend to be less shy online because they feel a sense on anonymity. E-mail, message boards, instant messengers, and chat rooms are all asynchronous communication tools made possible by today's technology that allow for increased communication and course dynamics. In this case, technology is an enabler for fostering better student-teacher relationships. Distance education technology is not the harbinger of the end of traditional college or university teachers, but another powerful tool to be deployed for use as part of the instructional toolkit.

With new technology comes the need for skills to be able to use it effectively. Another major criticism of distance education is that there is a greater need to be skilled and proficient in the use of computing technology to be able to teach and take those courses. Students need to have some computing skills to take a course that relies on computers and the Internet for its delivery. However, students and instructors alike need to be honest with themselves and evaluate if they have the skills necessary for engaging

in distance education courses. Computing skills needed for taking a distance education course can be acquired through practice or instruction, which most colleges and universities require as part of the general education curriculum. Instructors likewise need to acquire the skills necessary for teaching online before trying to teach an online course. Instructors can acquire these computing skills through practice or by obtaining training from their college or university. Most colleges and universities have staff development departments to assist with learning technology tools and instructional design. So while there is a greater need to have computing skills to partake of distance education courses, the skill level is not so high that it cannot be obtained through short workshops or practice. Computing technology changes rapidly and it is the responsibility of those who care to use it to be properly trained in its uses. It is important to remember that computing technology in education is a powerful tool that provides students and instructors with previously unheard of levels of accessibility to content, resources, and communication. It is important that instructors understand that the purpose of learning and implementing new technology is "to raise student achievement and help students become proficient in using tools of the 21st century" (Fletcher, 2005, p.6).

The face of distance education has changed significantly from its origins. "The communications revolution, which was still mobilizing half a century ago, now provides the context in which we teach and learn, and in education (and its analogues in industry, commerce, and the public services) it has raised up a professional cadre which can function systematically within it" (MacKenzie, 2005, p.722). The information age was ushered in by computers and the Internet as was the modern era of distance education.

While the technology and methodologies for distance education have evolved, its goal and purpose to provide quality instruction to students that cannot attend traditional face-to-face courses has remained steadfast and unchanged. As the present gives way to the future, the number of distance education courses, programs, and students will continue to rise. The increasing demand for distance education will be met by technological breakthroughs in the area of computing and telecommunication technology as well as the development of sound pedagogical practices in instructional design.

The evolution of distance education signifies a paradigm shift in education towards greater accessibility, flexibility, and learner control. Faculty and students now have an unprecedented number of choices in terms of how teaching and learning can take place. According to Hannan (2005), higher education (HE) institutions need a climate that: (a) encourages attempts to improve learning and teaching, (b) pedagogical and curriculum concerns drive technological developments rather than vice versa, and (c) the best about the old way of doing things is adapted to meet new challenges.

Empirical Findings on Course Delivery Methods

Limited research has been conducted comparing the effectiveness of online distance education to traditional lecture based instruction in the community college (Cejda, 2007). As the number of online learners has grown, there has been an increased need to study the effectiveness and success of online course delivery programs at colleges and universities. Current findings comparing the effectiveness of traditional face-to-face and online course delivery methods on student performance indicate mixed results.

Findings Favoring the Traditional Course Delivery Method

The traditional course delivery method is the standard model by which other course delivery methods are measured in terms of student success. Other course delivery methods must be at least as effective as the traditional face-to-face course delivery method to be implemented at colleges and universities. In many cases, the traditional course delivery method continues to demonstrate better results in terms of student success than other course delivery methods.

In 2001, Esmaeili. conducted a study at South Texas Community College to examine the difference in performance of Mexican American students enrolled in traditional face-to-face instruction and online web based instruction. In the study, Esmaeili analyzed the final grades of 148 students registered in six sections of a college algebra class. The courses were taught by two instructors using the same course content, text books, grading methodology, and exams for each delivery format. Keeping those factors constant, Esmaeili's findings indicated that students enrolled in traditional face-to-face sections of College Algebra performed significantly better than students enrolled in the online sections.

Bangurah (2004) conducted a quantitative study of completion and passing rates between traditional face-to-face and web based instruction taught by the same instructors at Walters State Community College. The study also compared overall grade point averages (GPA) between the course delivery formats and completion and passing rates between traditional students (22 years of age or younger) and non-traditional students (23 years of age or older). Bangurah's study analyzed data from over 3,600 students enrolled

in courses using both delivery methods across multiple academic divisions from 1998 through 2002. The study found that completion (83.9%) and passing rates (87.8%) were higher for traditional face-to-face delivery courses across all academic divisions. Overall GPAs were also higher for courses taught in the traditional format by instructors teaching face-to-face (2.73) and online (2.56) sections of the same class. There was also no significant difference in course completion rates for traditional and non-traditional students in web based instruction, but a significant difference was found for course completion rates for traditional and non-traditional students in identical courses offered in the traditional face-to-face setting.

Sapp and Simon (2005) performed a study comparing grades in online and face-to-face writing courses at a Fairfield University. Data from 108 students in three face-to-face and two online sections of First-Year Composition and three face-to-face and two online sections of Business Writing was used to compare final course grades. The results of the study indicated that students in online courses did not complete their courses at a higher rate than the face-to-face courses. In their study, online students failed to complete their courses 30% of the time compared to 0% for the face-to-face classes. Sapp and Simon noticed that students in face-to-face courses tended to receive higher final grades than their online counterparts. They also found that students in online courses were just as likely to get A, A-, or B+ (38%) as they were to receive a D, F, or W (33%) whereas in the face-to-face sections 83% were likely to get A, A-, or B+ and 17% were likely to receive a grade ranging from B to C- (17%).

Christopher Edmonds in 2006 conducted a study of exam scores for traditional and online delivery of General Psychology at Ursuline College between Fall 1998 and Fall 2003. In the study, Edmonds evaluated class performance for 175 students enrolled in online and classroom lecture sections. The results of the study, controlling for high GPA and SAT scores, indicated that students in the traditional classroom lecture sections performed significantly better (p <.001) than students in the online sections.

In 2007, Neil Terry conducted a study to compare student satisfaction and performance in on campus, online, and hybrid instructional formats. The study was conducted at a midsized (7,500 enrolled) public university in the southwest United States using data from 876 MBA students enrolled in campus, online, and hybrid sections of required graduate level computer information systems, corporate finance, and macroeconomics courses. The results of the study indicated that while the average enrollment in the online format was significantly greater than for the on campus and hybrid formats, it also had a significantly higher attrition rate. Additionally, students enrolled in course using the online course delivery format obtained significantly lower grades than their counterparts in the on campus or hybrid format courses.

Wynegar and Fenster (2009) evaluated the effect of alternative course delivery systems on academic performance in a college algebra class. Their study analyzed data compiled from sections of a college algebra class taught by eight different instructors delivering the same course using either traditional face-to-face course delivery, online course delivery, television, or computer aided instruction (CAI). All the sections were taught in the same community college in the southeast using the same course material and

controlled for instructor differences in grading. The result of their study indicated that students in traditional face-to-face courses performed significantly better ($p<.05$) than any alternative course delivery system. Students in the traditional face-to-face courses had better final grades and lower failure rates than students in any of the alternative course delivery format. Their results also demonstrated that instructional delivery systems have a modest impact in explaining the variation in student's grades with 13.5% of the variance in a student's grade being explained by the instructional delivery system when controlling for instructor grading difference.

No Significant Differences Course Delivery Method Findings

The use of course delivery methods other than the traditional method is supported by educational research indicating that there is no significant difference in student performance based on course delivery method. The proliferation of online and blended course offering at colleges and universities is driven by factors such as student demand, physical space constraints, and instructor course delivery preference. However, the justification for delivering courses in formats other than the traditional format is that there is a preponderance of research in the field that supports the theory that there are no significant differences in student success measures such as final course grade, completion rate, and passing rate for different course delivery formats.

A 2000 study by Leasure, Davis, and Thievon compared students' performance outcomes in an undergraduate research course taught in online and traditional course delivery formats at the College of Nursing at the University of Oklahoma. The researchers investigated whether or not there were differences in outcomes between

students who completed the course via the online course delivery format as compared to the traditional course delivery format. The findings of the study indicated that there was no significant difference in course grades for students who completed the online version of the course and the traditional version of the course.

A comparative study conducted by Dutton, Dutton, and Perry in 2001 at North Carolina State University compared course performance and completion rates of students enrolled in two sections of a computer science course taught by the same instructor in both the traditional and online course delivery formats. The findings of their study revealed a significant difference in performance between the two groups with students enrolled in the online version of the course having higher final examination scores and course grades than their counterparts in the traditional format. However, the researchers found that students in the traditional face-to-face format had a higher course completion rate (93.6%) than the students in the online version (79.4 %). The results of this study yielded mixed findings when investigating student performance and course delivery methods. The researchers demonstrated evidence that students in the online course obtained significantly higher scores on exams and overall for the class, but that they were also significantly less likely to complete the course.

Waschull (2001) examined student performance for 75 students enrolled in four sections of an undergraduate psychology course taught in two different formats in two different semesters (one face-to-face and one online each semester) at Athens Technical College in Athens, Georgia. All sections were taught by the same instructor using the same materials and assessments. The results of the study indicated that there was no

significant difference in attrition between instructional formats. Overall there was no significant difference in test performance between instructional formats. However, the data indicated that the proportion of students passing the course in the online format in the first semester was significantly lower than for the face-to-face format. In the second semester, the proportion of students passing the course in the online format was not significantly lower than for the face-to-face format. The results of this study are typical of the findings in the field.

A 2001 study by Thirunarayanan and Perez-Prado compared course achievement between 31 students enrolled in a traditional course setting and 29 students registered in online course setting for the same education course teaching students how to teach English to speakers of other languages at Florida International University. The results indicated that the online students scored significantly lower in their pretest scores when compared with the traditional face-to-face classroom students. Despite this pretest difference, there was no significant difference found in student achievement in the posttest scores for both groups. However, the researchers found that the online class performed better than the students in the lecture-based format when they analyzed the difference between the pretest and posttest scores of individual group. The higher overall performance was a result of a lower pretest score for the online group that would have required them to perform better just to obtain the same level of achievement as the face-to-face group. The findings of the study were mixed in the sense that overall there was no significant difference in overall performance between the groups, but the online students made greater gains in the course to achieve that result.

Bearden, Robinson, and Deis (2002) performed a study to determine if there was a difference in academic performance of undergraduate dental hygiene students enrolled in online and traditional on campus face-to-face nutrition courses at Clayton College & State University. The academic performance of 54 students registered in the Fall of 1998 for online and face-to-face sections of a nutrition class was measured by final grades and score on national exams. The two sections of the nutrition course were taught by the same instructor using the same course material, text, and grading methodology. Student age, course GPA, overall GPA, and National Board Dental Hygiene Examination (NBDHE) score data was correlated and analyzed via regression analysis and two sample t-test. The results of the data analysis revealed that there was no statistical difference for course GPA and NBDHE score for students enrolled in either on campus or online sections of the nutrition course.

Rivera and Rice (2002) compared the efficacy of three instructional formats. They used student performance results and data from a researcher-developed questionnaire completed by the students who enrolled in an undergraduate introductory management information systems course offered in three instructional formats (traditional face-to-face, online web based, and hybrid) at the University of Alabama. The traditional face-to-face classroom setting had 41 students enrolled while the web-based format had 53 students, and the third hybrid class had 40 students. Two different instructors using the same text, similar assignments, similar course material, and the same test bank of questions for examinations taught the course. The researchers found no significant difference in any of the three formats in which the course was offered when comparing students' mean scores

on three exams. However, student satisfaction results indicated that students enrolled in the online web-based version had a less favorable learning experience than their counterparts who enrolled in the other two formats.

Scheetz and Gunter (2004) evaluated outcome measures for 14 students enrolled in separate sections of a manual communication course taught by the same instructor at Valdosta State University. One section of the course was delivered in a traditional face-to-face classroom setting and the other section was taught online. Student performance was evaluated for expressive/content and receptive skills. The results of the study indicated that there was no significant difference in student performance between the traditional lecture and online section when looking at expressive/content knowledge. However, there was a small but significant difference in student performance when looking at the receptive skills. Overall, students in the traditional lecture section did slightly better (6%) on receptive interpretations of signed information. The mixed findings in this study support the notion that highly technical education can be delivered using the online course delivery method and it is nearly as effective as the traditional method.

Friday, Friday-Stroud, Green, and Hill (2006) compared student performance in undergraduate online and traditional sections of Organization and Management and Strategic Management courses. The study was conducted using data gathered in Spring, Summer, and Fall semesters of 1999 and 2000 from a major commuter university in the Southeastern United States. The sample of the study consisted of 380 students enrolled in the online sections of Organization and Management, 213 students enrolled in traditional

sections of Organization and Management, 298 students enrolled in the online sections of Strategic Management, and 456 students enrolled in traditional sections of Strategic Management. The course and exam content was the same for both the traditional and online sections of the courses. Findings from the study indicated that there were no significant differences in student performance between the online and traditional classes in both management courses.

Pribesh, Dickinson, and Bucher (2006) compared student performance on project based and content based activities in a graduate level School Library Media Specialist program delivered in online and face-to-face instructional formats. The sample of the study consisted of 33 students (19 online, 14 face-to-face) enrolled in Old Dominion University's Management and Evaluation of Libraries course. Project grades, final exam grades, and final aggregate points were quantitatively analyzed. The results of the analysis indicated that there was no significant difference in performance on content based activities between the online and face-to-face instructional formats. However, students in the face-to-face instructional format performed significantly better on project based activities than their cohorts in the online instructional format. Overall, there was no significant difference in final exam scores and final grades for the online and face-to-face instructional formats.

In 2008, a study by Daymont and Blau compared student final course grades and average quiz scores in face-to-face and online sections of an undergraduate management course. The study was conducted using seven sections of an undergraduate Organization and Management course taught during two semesters in the 2006 – 2007 academic year at

a large public university in a large metropolitan area in the eastern United States. The results of the study indicated that there was no significant difference in average final course grades when comparing students in face-to-face and online sections of the course. Students in the online sections of the course performed as well but not better than the students in the traditional course delivery sections on objective performance measures when factors such class, major, and GPA are controlled.

A 2009 study by Reuter compared the learning success of online and traditional on-campus students in a general education soil science course with lab and field components taught at Oregon State University by the same instructor. Ninety-seven students over two terms completed standardized pre and post assessments to test knowledge and skills gained from the course. The results of the study indicated that there was no significant difference in overall grade or lab grade between both course formats (online and traditional). Online students however outperformed their on campus counterparts on the pre assessment the first term and on the post assessment the second term. Online students also demonstrated a greater improvement from pre to post assessments overall (42% vs. 21%). The results of the study support the theory that there is no significant difference between online and on-campus learners in overall performance. The greater gains from pre to post assessments by online students support the findings in the 2001 study by Thirunarayanan and Perez-Prado.

Hills, Brallier, Palm, and Graham (2009) compared data from 289 undergraduate students at Coastal Carolina University enrolled in web-based and lecture-based sections of Gerontology and Psychology of Aging courses between Fall 1999 and Spring 2003.

The sections of the courses were compared in terms of student performance, demographics, and academic characteristics while books, study material, and exams were kept consistent for all web-based and lecture-based sections of each of the classes. The findings of the study revealed that students in the web-based sections of the courses were significantly older than students in the lecture-based sections but found no significant difference between the final mean percentage scores earned by students in the two course formats.

Findings Favoring the Online Course Delivery Method

The online course delivery method is one of the most used alternative course delivery methods at colleges and universities. However, faculty and students often debate the effectiveness of the online course delivery method. Opinions are often varied and supported by anecdotal evidence. Course delivery methods such as blended and web enhanced use elements of both face-to face and online delivery formats and fall somewhere in between in terms of the teaching pedagogies used for instruction. In some cases, the online course delivery method has demonstrated better results in terms of student success than other course delivery methods.

Connolly, MacArthur, Stansfield, and McLellan (2007) studied student performance in three master's level courses in computing which were delivered in full time traditional face-to-face, part-time face-to-face, and online formats. The study was conducted at the University of Paisley, Scotland using data from the Management of eBusiness, Web Technology, and eBusiness Streams courses of their Masters of Science in Information Technology program. Six semesters of data from 269 online, 796 part-

time, and 3619 full-time students was collected between Fall 2000 and Summer 2002. Student performance was measured by end of module grades, observable difference between coursework and examinations for the Fundamentals of Database Systems (FDBS) and Software Development (SD) modules, and observable differences in dropout rates between the course delivery formats. The results of the study indicated that students in the online format had significantly higher end of module grades than students in the part-time face-to-face and full time face-to-face formats. Students in the online format also scored higher grades in coursework and examinations for the technical FDBS and SD modules than students in the part-time face-to-face and full time face-to-face formats. Dropout rates for online students rose each year of the study, but were not significantly higher than the dropout rates for students in the full time face-to-face or part time face-to-face formats.

Detwiler (2008) conducted a comparative study of student performance and study habits for two groups of students taking a Geographical Information Systems (GIS) software programming and customization class at Penn State University. The students in the study registered for either an on-campus section (GEO 356) or an online section (GEO 485) of the course taught by the same instructor using the same materials and grading methodology. Data from 30 students, 19 online, and 11 on campus were collected during the Fall 2005 semester for the sections of the course. The results of the study indicated that students in the online cohort performed significantly higher than students in the on campus cohort. The online cohort also self-reported spending more time on coursework.

In 2009 the United States Department of Education released the Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies that analyzed the results of over 45 empirical studies comparing face-to-face and online course delivery (Angiello, 2010). The analysis was designed to compare the effectiveness of online learning to traditional face-to-face learning, examine if supplementing face-to-face learning with online instruction improved learning, and determine what practices and conditions most influenced online learning success. The meta- analysis was conducted by taking the effect size for each result of each study and dividing that number by the pooled standard deviation for all studies. The findings of the meta-analysis revealed that students in online learning performed modestly better than students receiving face-to-face instruction (Angiello, 2010).

Summary of Course Delivery Method Findings

While the overall body of educational technology research has demonstrated that online education is as effective as traditional face-to-face course delivery methods, limited research has been conducted specifically at community colleges comparing the effectiveness of online distance education to traditional lecture based instruction (Cejda, 2007). In the literature reviewed for this study, the findings indicate a trend towards online students in community colleges not performing as well as their peers enrolled in traditional face-to-face courses. This is in contrast to the research conducted using upper division college and university students, which seems to indicate that there is no significant difference in performance between traditional and online course delivery methods. Additionally, research on graduate students taking online courses seems to

indicate that online graduate students perform as well if not better than their peers enrolled in traditional face-to-face courses.

Theoretical Framework

The theoretical framework of this study was derived from cultural reproduction theory (Bourdieu, 1977), possession of necessary technology skills by low SES populations as discussed in digital divide research, and the impact of SES on college student performance. Using this frame of reference, it is possible to investigate what impacts if any SES had on student performance in course delivery methods that require students to possess technology skills to be successful. By conducting the study at a the community college level, it is also possible to see if low SES populations are being unintentionally deterred from taking courses in course delivery formats that require students to have some level of technology skills. Community colleges are well regarded for the second chance educational opportunities they provide to low SES populations, and it is important to see if those populations have the same level of access and success as the population of students that do not have a low SES level.

Cultural Reproduction Theory

The major theoretical framework guiding this study is cultural reproduction theory and the notion of cultural capital. Cultural reproduction is the process in which aspects of society such as social class are transferred from generation to generation (Bourdieu, 1977; Bourdieu & Passeron, 1977). Bourdieu's theory attempts to explain the link between the original class membership that an individual is born into and their ultimate class membership (Sullivan, 2001). According to Bourdieu (1977) the process of

schooling is one of the mechanisms of cultural and social reproduction that maintain the stratified structure of society. Being able to gain technology skills and knowledge through education are two ways individuals in society acquire the cultural capital needed for social mobility (Winkle-Wagner, 2010). However, applying the concepts of Bourdieu's theory of cultural reproduction to distance education suggests that technological innovation and change unwittingly reinforce existing societal power relations and modes of consciousness that legitimizes those relations (Bourdieu & Passeron, 1979; Morrow & Torres, 1995).

Cultural capital refers to non-financial assets such as education credentials and skills that an individual possesses that enable him or her to progress socially. Cultural capital is a currency that aids an individual with social mobility. Bourdieu's theory of cultural reproduction discusses other forms of capital such as economic capital, social capital, and symbolic capital, but this study is framed within the context of how not possessing the necessary cultural capital to be able to succeed in education disproportionately hinders students from lower classes (Bourdieu, 1989). The knowledge of how to use technology is necessary cultural capital for success in society. Individuals that possess knowledge of technology and the skills to use it can benefit more from today's methods of educational delivery, which increasingly infuse technology into the curriculum.

A substantial amount of research testing Bourdieu's theory of cultural reproduction has been conducted. Much of the research has attempted to support Bourdieu's notion that student cultural capital can account for the positive effects of SES on educational success (Moss, P. 2005). A number of studies researching the educational effects of unequal SES and student cultural have found that high SES and student participation in high culture activities have a significant positive relationship with student success measures such as grades and degree attainment (Moss, G. 2005; Dumais, 2002; Mohr and DiMaggio, 1995; DiMaggio and Mohr, 1985; DiMaggio 1982). Historically, high SES individuals comprise the first group in society that has access to new technology and acquires the skills to use it. Based on Bourdieu's theory of cultural reproduction and the cultural capital benefits of high SES, a conclusion can be drawn that there are unequal levels of educational success in distance education for students of unequal SES.

The Impact of SES on College Students

College accessibility and attainment are areas of concern for students of low SES and their families (St. John, 2006). Studies in the area of accessibility have consistently found substantial and significant associations between the income levels of students and educational opportunity (Fitzgerald, 2004; Lee, 2004; St. John, 2003). Even though college enrollment rates have generally been increasing for all SES groups there is still about a 30% gap in college enrollment between low and high-income students (Perna, 2005). This gap in enrollment means that student of low SES do not benefit from higher education at the same rate as their high SES counterparts. These benefits include but are

not limited to higher lifetime earnings, better health, longer life, and lower probability of unemployment (Baum & Payea, 2004; Bowen, 1997; Leslie & Brinkman, 1988, Perna, 2005).

In addition to accessibility and educational opportunities, SES is a factor in student performance and subsequently success in college. A number of psychological factors (Marsh & Roche, 2000; Zimmerman & Bandura, 1994) and background characteristics (Farkas & Hotchkiss, 1989; Van-Laar, Sidanius, Rabinowitz, and Sinclair, 1999) have been identified as contributors to student success. Background characteristics such as race, ethnicity, gender, and SES have an impact on student success in college (ASHE, 2005). Early studies on SES and student performance indicated that students of higher SES perform at higher levels than students of lower SES (Coleman et al., 1966; Lavin, 1965; White, 1982). More recent studies support previous research that students' SES is moderately associated with college grades (Robbins et al., 2004; Sirin, 2005). Overall, studies in the area of SES and college student success indicate SES is positively correlated with students' academic achievement and that the differences in SES are directly related to the students' academic achievement (Ming-Hsueh & Fu-Yu, 2013).

Besides the impact on student achievement, SES also impacts student persistence and subsequently college completion. Policy changes on college funding, tuition, and student financing at the national and state level in the United States have increased the burden of paying for college for individual students and their families (Callan & Finney, 1997; Mumper, 1996). These changes have not only impacted college access for low SES students as discussed earlier, but have also impacted student persistence and completion.

Research in the field has shown that low SES students are less likely to persist and complete than their high SES peers (ASHE, 2007, Shouping & St. John, 2001,) without additional assistance. Subsequently, student persistence has been shown to be positively impacted by receipt of financial aid for students enrolled at the community college (Bettinger, 2004; Cofer & Somers, 2001; Mckinney & Novak, 2013; Mendoza, Mendez, & Malcolm, 2009;).

The Digital Divide

Distance education is a valuable course delivery method for being able to continue one's education. In the face of today's financial and political constraints, the opportunity to continue learning and progressing in one's professional field remotely provides students a great deal of freedom and autonomy in pursuing and completing degrees, programs of study, and professional/licensing certifications. However, this opportunity is really only available for those fortunate individuals that can take advantage of the benefits of being able to access quality computing technology, software, and materials and know how to use them. Access to technology and knowledge of technology are the fundamental principles of the digital divide.

The digital divide has been defined by various researchers in different ways, but all touching on the areas of physical access to technology (DiMaggio et al, 2001; First & Hart, 2002; Tiene, 2004; Valadez & Duran, 2007; Warschauer, 2003) and knowledge of technology use (Martin, 2003; Valadez & Duran, 2007). First and Hart (2002) defined the digital divideas

> the separation of society into those with and those without access to computers and the Internet. In addition to opportunity for access, lack of opportunity to learn the skills to make use of this portal to the world is the reality for large numbers the poor and the educationally underserved. The groups most affected by the digital divide are similar to groups who have fought for civil rights in other areas of our society: racial minorities, the disabled, those for whom English is a second language, the homeless, and those with low incomes. (p.385)

In defining the digital divide, First and Hart (2002) also observed that

> people with a disability are half as likely to have access to the Internet as those without a disability: 21.6% compared to 42.1%. Only 23.6% of Hispanic households have access to the Internet compared with 41.5% of households nationally. Only 23.5% of African American households have access to the Internet. Also increasingly separated from the larger society and even from activity in their own communities, by the digital divide are those over the age of 50. (p.385)

Tiene (2004) defined the digital divide as "a problem with significant disparities in access to technology between the affluent and impoverished" (p.89). The digital divide reinforces the learning divide that already exists along socioeconomic and ethnicity lines (Vandenbroeck, Verschelden, Boonaert and Van Haute, 2007). However, Thomas (2005) describes the digital divide best when he states that "the digital divide is just one more manifestation of the economic, ethnic, cultural and geographical divides that rend American society" (p.340).

The Digital Divide in Distance Education

Research into the digital divide has highlighted the impacts that unequal access to technology and technology training has for individuals. In terms of educational attainment, it is important to see how the digital divide impacts student access and performance. Cox (2005) examined how the community colleges' environmental contexts affect the colleges' approaches to online education. Cox addressed the notion that community colleges are interpreting and responding to a set of taken-for-granted ideas about online education and that these ideas have taken on the status of myth. In that respect, the article examined how that myth has played a powerful role in guiding and legitimizing community colleges' online activity. In the article, the researcher found the notion of online education improving access for students to be a “myth” because online education has an anti-democratizing effect on community colleges. Since community colleges do not have the same resources as the high status institutions that they are basing their practices on, they cannot provide the same quality or service as those institutions. This in turn is only widening the gap in postsecondary education for the haves and have-nots. Since there is not much empirical data on exactly how and under what conditions online education facilitates learning, there is not much of a chance of improving online education at community colleges.

Community colleges are increasing the amount of courses and programs they offer online. A 2004 study by Johnson, Benson, & Duncan, indicated that community colleges are actively involved in the delivery of career and technical education (CTE) via distance learning. In their study, they found that Internet-based courses are the most

prominent form of distance learning in community college CTE programs, especially for credit courses. Distance learning courses are so vital that to make credit and noncredit CTE courses available to students some colleges have created their own online programs, while many others have partnered with external providers (e.g., commercial vendors) and other colleges and universities. Johnson et al. (2004) noted that community colleges were relying heavily on low-bandwidth technologies, although significant growth in all forms of Internet based CTE courses and technologies were expected. The study supported the research in the field regarding the continual growth of distance learning technologies and distance education courses and programs in general.

Student Success and Online Distance Education

Student enrollment in distance education courses has grown to over 3.2 million students enrolled nationally comprising over 17% of students enrolled in higher education in the United States (Bambara, Harbour, & Davies, 2009). Ninety-six percent of all higher education institutions now provide distance education opportunities for online learners (Allen & Seaman, 2006). Overall, the impact of distance education is larger at community colleges because 37% of the total student population attends community colleges with 50% of all online enrollments occurring at two-year institutions (Cejda, 2010). At the same time, the number of online courses and programs offered by colleges and universities continues to rise (Sikora & Carroll, 2002, McGinn, 2000) while the dropout and failure rates of online students continues be significantly higher than traditional face-to-face students (Carnevale, 2000; Carr, 2000; Pierrakeas, 2004; Scalese, 2001; Simpson, 2004; Stumpf, 2005; Tresman, 2002; Wojciechowski & Palmer, 2005)

exceeding 20% and ranging from 20 to 50% at some institutions (Frankola, 2001; Oblender, 2002). Dropout and failure rates however do not give us a complete picture. When we compare actual course performance in traditional face-to-face classes with distance education delivered in an online format, studies tend to indicate mixed results (Nash, 2005; Singh & Pan, 2004). Some studies indicate that online courses are as effective if not more so than traditional courses (Alavi,Yoo & Vogel, 1997; Driver, 2002; Dutton, Dutton & Perry, 2001; Thirunarayanan & Perez-Prado, 2001) and then others seem to indicate that online courses are not significantly more effective than traditional courses (Bangurah, 2004; Singh & Pan, 2004; Wynegar, 2009). The contradiction in the literature leads to confusion when trying to determine if an institution should expand, contract, or redesign the way they deliver courses. Blended or hybrid course delivery models, which add traditional face-to-face classroom interaction to courses that have online distance education components, further add confusion to the course delivery discussion debate.

Why are there institutional debates about which course delivery methods work best? One reason is that institutions are concerned about whether or not their students are learning course material and succeeding by passing courses, staying in their programs of study, and ultimately graduating. Another reason is financial. Namely, there are considerable costs savings to delivering courses online instead of in a traditional brick-and-mortar course delivery format. The economies of scale that distance education courses provide colleges and universities in absorbing large numbers of students reduces the cost of instruction (Guri-Rosenblit, 2009). Despite the fact that online courses hold

many challenges for learners and educators alike, institutions and students find them to be convenient because of the flexibility in terms of scheduling and finances that they provide (Wojciechowski & Palmer, 2005).

SES, Course Delivery Methods, and College Student Success

Despite all the literature available in terms of looking at the success of low SES learners in traditional college courses there is little research on how students of low SES perform in courses delivered using nontraditional methods. A possible reason for the limited availability to the general public of institutional research containing course passing rates for different course delivery methods is because institutions are not as open about reporting areas that need improvement as they are about areas that demonstrate success. The literature available on the efficacy of distance education through online courses has provided evidence of many factors such as institutional integration, college preparation, faculty contact/support, lack of academic guidance, and time management (Pierrakeas, 2004; Scalese, 2001; Tresman, 2002; Wojciechowski & Palmer, 2005) that contribute to student success but is bereft of information on the role that SES plays in factors like technology literacy, student confidence, or even time management. In fact most of the research done on distance education at the community college has focused on the student learning experience, student satisfaction, and student retention (Bambara, 2009).

Overall, the literature paints a picture that tells us that online students have a more difficult time passing courses, staying in school, and completing programs of study than students taking courses delivered in a traditional face-to-face manner. However, the

picture is unclear when it comes to analyzing how SES relates to performance in courses delivered using the online delivery method. Based on the findings of the current study, I found some relationships between SES and course delivery methods. Some of the findings in the current study indicated that: (a) There was a statistically significant relationship between enrollment in course types, course delivery methods, and student SES. (b) There was no statistically significant relationship between course delivery methods, final course grades, and SES for students enrolled in different course types. (c) There was no statistically significant relationship between course delivery methods, course completion status, and SES for students enrolled in different course types. (d) Overall, there was no statistically significant relationship between course delivery methods, course passing status, and SES for students enrolled in different course types but there were statistically significant relationships between course passing status, SES and course delivery methods for the online and traditional course delivery methods.

Addressing this gap in the current body of literature will assist faculty and administrators in community colleges determine what type of additional assistance if any should be provided to students that register for courses delivered in a nontraditional method. Community colleges in particular will find value in the findings because they focus a great deal of their resources in remediating essential skills students need to be successful in college, the workplace, and in life. This study was undertaken to examine if community colleges need to focus more resources to bridging the gap in technology and technology skills that theoretically exists between students of low and not low SES levels enrolled in different course delivery methods.

Summary

In Chapter 2 I examined the history of distance education followed by a review of the literature about the effectiveness of online course delivery methods. I then reviewed literature about the digital divide and its impact on education, cultural reproduction theory and cultural capital, as well as literature investigating the effect of SES on college student success. The literature in the study was analyzed to provide the context for the current study's investigation of the effectiveness of different course delivery methods for students of low and not low SES levels in terms of student success measures by tying in elements related to SES, course delivery methods, and student success.

CHAPTER 3

RESEARCH METHODS

This chapter presents the methodological framework of the study. The research questions of the study along with the research design, population, study variables, and data collection information are included. I developed the framework of the study based on the research literature on socioeconomic status (SES) and student success in college. The study had an ex post facto design utilizing chi-square and analysis of variance (ANOVA) as the statistical tools to answer the research questions. The research questions addressed in the study were: (a) Does enrollment differ for students of low and not low SES enrolling for STEM course types delivered using different course delivery methods? (b) Are course delivery methods equally effective in terms of final course grades for students of low and not low SES taking STEM course types? (c) Are course delivery methods equally effective in terms of course completion status for students of low and not SES taking STEM course types? (d) Are course delivery methods equally effective in terms of course passing status for students of low and not low SES taking STEM course types?

Hypotheses

This study examined the impact of SES and course delivery methods on enrollment and student success (final course grades, course completion status, and course passing status) in STEM course types. The independent variables were SES (low and not low), course delivery method (traditional, online, virtual blended, and web enhanced), and course type (natural science, technology/engineering, and mathematics) and the

dependent variables were the students' enrollment, final course grades, course completion status, and course passing status. The level of significance for all statistical tests was set at $\alpha < 0.05$.The following were the hypotheses of the study:

Research Question 1 - Enrollment

H_a: Student enrollment was not evenly distributed by student SES across all course types and course delivery methods

Research Question 2 – Final Course Grades

$H_{a(1)}$: There is a difference in final course grades for students enrolled in different course types; $H_{a(1)}$: $\mu_{1.} \neq \mu_{2.}$

$H_{a(2)}$: There is a difference in final course grades for students enrolled in different course delivery methods; $H_{a(2)}$: $\mu_{.1} \neq \mu_{.2}$

$H_{a(3)}$: There is a difference in final course grades for students of different SES levels; $H_{a(3)}$: $\mu_{.1} \neq \mu_{.2}$

$H_{a(4)}$: There is an interaction between course types, course delivery methods, and SES; all $(\mu_{jk} - \mu_{j.} - \mu_{.k} + \mu) \neq 0$

Research Question 3 – Course Completion Status

H_a: There is a difference in course completion status for students of different SES enrolled in different course types delivered using different course delivery methods

Research Question 4 – Course Passing Status

H_a: There is a difference in course passing status for students of different SES enrolled in different course types delivered using different course delivery methods

Research Design & Rationale

This study utilized a data set retrieved by the Miami Dade College (MDC) Office of Institutional Research from MDC's student information system, Odyssey, to conduct a secondary data analysis using an ex post facto design. Student final grades for all natural science, technology/engineering, and math (STEM) courses taught in traditional, online, blended, and web enhanced course delivery formats between August 2011 and the end of July 2012 were analyzed.

A secondary data set provided by MDC's Institutional Research department was used because of the accuracy, quality, and security that are associated with having the data retrieved directly from the student information system. The major advantage of working with secondary data was that the data was already collected and processed (Salkind, 2010). Having the data collected by MDC's Institutional Research department also ensured that student record confidentiality was best maintained.

The benefit of using an ex post facto design for the study was that the study could be conducted without impacting enrollments and course selection for current students. As the enrollment process works at MDC, it would not be possible to manipulate the independent variables (course delivery method, course type) without seriously compromising the ability of students to select courses that they need for their chosen

programs of study. The third independent variable, SES, would likewise be nearly impossible to manipulate without seriously impacting the student population (67% of all MDC students in 2011 – 2012 are of low SES) and it would be discriminatory to limit the courses students could register for based on their SES level. The weaknesses in conducting the study using an ex post facto design were:

1. The inability to manipulate the independent variables
2. The lack of power to randomize the population sample
3. The risk of improper interpretation due to lack of control of the independent variables (Kerlinger & Lee, 2000)

The Setting

MDC is the largest institution of higher education in the United States in terms of total enrollment. It is large four year state college located in Miami-Dade County, Florida that provides open access to students seeking vocational certificates, credit certificates, associates degrees, and baccalaureate degrees in limited areas of study. MDC currently has eight campuses and numerous outreach centers that offer over 150 academic programs with courses delivered in traditional, online, blended, and web-enhanced course delivery formats. Its' student body is diverse (69 %, Hispanic; 19 %, Black non-Hispanic; 8%, White non-Hispanic; 4 %, other; Canton, 2012) and over forty percent of the students in the 2011 - 2012 academic year enrolled in online courses. For the 2011 – 2012 academic year, that amounts to 38,436 students enrolled. Students in the study self-selected their courses for the 2011 - 2012 academic year that spanned from August 2011 through July 2012.

Study Variables

The independent variables found in the data set used in this study were course delivery method (traditional, online, blended, and web enhanced), course type (natural science, technology/engineering, and math), and SES (low versus not low), as determined by student Pell Grant eligibility based on the Federal TRIO Programs 2011 annual low income levels (U.S. Department of Education, 2012). The dependent variables were course enrollment, final course grade, course completion status, and course passing status for all students in the 2011 – 2012 academic year registered in courses that were delivered in traditional, online, blended, and web enhanced course delivery methods in the natural science, technology/engineering, and math course types.

Data Collection

The MDC Office of Institutional Research obtained the student data utilized for the analysis in the study. The data were collected through the use of MDC's Executive Information System (EIS) that is designed to mine data from the MDC student information system, Odyssey. A proposal for retrieval and use of the student data set was submitted and approved in the Fall 2013 semester by MDC's College Academic and Student Support Council (CASSC) Research and Testing Committee. The retrieved data set was downloaded and analyzed in the spring 2014 term.

Data Analysis

I formatted the data set provided by the MDC Office of Institutional Research using Microsoft's Excel 2010 software. The formatting entailed: (a) the filtering out of student data for students that were enrolled in STEM courses that were not delivered in

the four delivery methods offered at MDC, (b) coding the course completion status and course passing status for all students, (c) quantifying the final course grade data for all students, and (d) sorting the student data by course type, course delivery method, and SES. Once the data set was filtered, coded, and sorted it was entered into IBM SPSS Statistics 22. Using SPSS, I ran a series of chi-square goodness-of-fit tests to: (a) analyze student enrollment by SES in the three course types and four course delivery methods, (b) analyze student course completion status by SES in the three course types and four course delivery methods, and (c) analyze student course passing status by SES in the three course types and four course delivery methods.

Chi-square tests are designed to analyze nominal data such as the variables enrollment, course completion status, and course passing status in the current study (Hinkle, Wiersma, & Jurs, 2003). A chi-square test is often used to compare observed frequencies with expected frequencies (Hinkle et al., 2003). Such was the case with the current study. The chi-square tests in the current study were used to assess how closely the observed distribution matched the expected distribution by comparing observed with expected frequencies. The degrees of freedom (*df*) in a chi-square test provides information on how many data points were used to calculate a particular statistic and the *df* is usually one less than the number of variables. The *p* value is the probability that the deviation of the observed from that expected is due to chance alone (Creswell, 2005). The strength of the nominal association in a chi-square test that rejects the null hypothesis is gauged by the use of Phi and Cramer's V methods to eliminate the effect of the sample size on the relationship of the independent variables. This enables the researcher to

evaluate the results of the chi-square solely on the strength of the relationship of the independent variables. In the current study, the benefit of using Cramer's V was that it allowed the association of the variables to be interpreted as a percentage of their maximum possible variation.

A factorial analysis of variance (ANOVA) was conducted using IBM SPSS Statistics 22 to analyze the effects of course type, course delivery method, student SES, and their interactions on a student's final grade. The current study used a 3x4x2 factorial design to investigate the effect of three nominal independent variables on one continuous dependent variable. The numbers in the ANOVA test design represent the levels of the independent variables: 3 for course type, 4 for course delivery methods, and 2 for SES. The factorial ANOVA test was selected because it is efficient in the sense that it allows the researcher to carry out separate research studies concurrently (Hinkle et al., 2003) using the same sample size and effect size. This feature of the factorial ANOVA enabled me to conduct research on final courses grades for SES, course delivery methods, and STEM course types concurrently on a robust sample size. By including two additional independent variables in this manner, the factorial design provided a measure of additional control in the study (Hinkle et al., 2003). The most significant reason that the factorial design was chosen for the current study was that it enabled the investigation of the interaction of the three independent variables. This was of particular importance for the current study because rarely is the effect of a single independent variable unaffected by one or more other independent variables (Hinkle et al., 2003).

Summary

Chapter 3 detailed the research design rationale, setting, population, variables, and procedures used for data collection and analysis in the current study. The study utilized an ex post facto design to analyze a data set of students of two SES levels enrolled in three STEM course types delivered using four course delivery methods. Chi-square goodness-of-fit tests were used to analyze differences in enrollment, course completion status, and course passing status. Lastly, a factorial analysis of variance (ANOVA) was used to discover any relationships between final course grades and the three independent variables and their interactions.

CHAPTER 4

ANALYSIS OF DATA

The purpose of this study was to investigate how factors such as SES, course types, and course delivery method impact student performance in courses at a state college. The measures of student performance investigated in traditional, web enhanced, blended, and online sections of courses were enrollment, final grade, course completion status, and course passing status. The study consisted of 20,456 students in three course types (engineering/tech, math, and natural science) delivered in four course delivery formats (traditional, web enhanced, blended, and online) through the 2011 – 2012 academic year. Specifically, this study investigated whether (a) enrollment differs for students of low and not low SES enrolling in different course types delivered using different course delivery methods, (b) course delivery methods are equally effective in terms of final course grades for students of low and not low SES taking different course types , (c) course delivery methods are equally effective in terms of course completion for students of low and not low SES taking different course types, and (d) course delivery methods are equally effective in terms of passing for students low and not low SES taking different course types. This chapter presents a description of the sample and the tests of hypotheses concerning student enrollment, student performance (final grade, completion, passing), and SES, course types, and course delivery methods.

Description of the Sample

The student data obtained by Miami Dade College's (MDC) Office of Institutional Research was used to explore variables that educational research indicates

may impact student performance. These variables are SES, course type, and course delivery method. The findings of the study are based on the data for 20,456 students that were enrolled in natural science, technology/engineering, and math (STEM) courses that were delivered in traditional, online, blended, and web enhanced course delivery formats.

The demographic characteristics of the students in the study were consistent with that of the MDC student population, with the majority of the students being of low SES. More than 76% of the 20,456 students enrolled in STEM course types delivered in traditional, online, blended, and web-enhanced formats were of low SES (Table 1). The majority of the students in the study, more than 53%, were enrolled in math course types (Table 1). The lowest percentage of students, 17.3%, was enrolled in the engineering/tech course type. More than 74% of the students enrolled in courses delivered using the traditional course deliver format (Table 1). The lowest percentage of students, 2.5%, was enrolled in courses delivered in the blended format.

Test of Hypotheses

I used four research questions and their associated hypotheses to guide the study. To filter, code, sort, analyze the data, and test the significance of the variables for the research questions in the study, I used SPSS 22.0 and Excel 2010. A chi-square goodness-of-fit tests was used to test for the significance of course type, course delivery method, and SES on enrollment, student course completion, and student course passing. I used an analysis of variance (ANOVA) to analyze the effects and interactions of course type, course delivery method, and SES on student final course grades.

Enrollment

The first research question investigated differences in enrollment for students of low and not low SES in STEM course types delivered using different course delivery methods. I hypothesized that there were differences in enrollment in course types and course delivery methods for students of different SES. Table 1 displays the results for the chi-square goodness-of-fit test for the null hypothesis that for the given population student enrollment was evenly distributed by SES across all course types and course delivery methods. The enrollment numbers for each course type by course delivery method and SES are displayed in Table 1. The highest percentage of students of the not low SES (86.6%) and low SES (85.4%) groups enrolled in the math course type delivered in the traditional format. The lowest percentage of students of the not low SES (0.9%) and low SES (1.5%) groups enrolled in the engineering/technology course type delivered in the blended course delivery format.

Table 1

Student Enrollment in STEM Course Types by SES and Course Delivery Methods

		Delivery Method as *n* (row %)					
Course Types	SES	Online	Traditional	Blended	Web Enhanced	χ^2 (*p*)	*V*
Engineering/ Tech	Not Low	97 (12.9)	333 (44.3)	7 (.0.9)	315 (41.9)	27.13 (<.001)	.088
	Low	323 (11.6)	1505 (54.1)	42 (1.5)	914 (32.8)		
Mathematics	Not Low	151 (5.8)	2245 (86.6)	64 (2.5)	131 (5.1)	31.41 (<.001)	.054
	Low	351 (4.2)	7073 (85.4)	223 (2.7)	640 (7.7)		
Natural Science	Not Low	168 (11.6)	990 (68.3)	32 (2.2)	260 (17.9)	6.65 (.084)	
	Low	470 (10.2)	3080 (67.1)	141 (3.1)	901 (19.6)		

The result of the enrollment by course type and course delivery method chi-square goodness-of-fit tests indicate that there are significant differences in enrollment by SES

and course delivery methods for the engineering/technology (p<=.001), math (p<=.001), and overall (p=.003) course types, but not for the natural science (p=.084) course type.

The results of Cramer's V test for examining the strength of the relationship between the variables indicate that even though there is a significant relationship between enrollment, course delivery method, and SES for engineering/tech and math course types the relationships are weak in strength with only 8.8% of the enrollment variance in engineering/tech, 5.4% of the enrollment variance in math, and 2.6% of the enrollment variance in overall course types being accounted for by SES and course delivery method.

Final Course Grade

The second research question investigated the effectiveness of course delivery methods in terms of final course grades for students of low and not low SES enrolled in different course types. I hypothesized that there were differences in final course grades for students of low and not low SES enrolled in different course types delivered using different course delivery methods. Descriptive statistics for final course grade for students across the three course types and four course delivery methods are found in Table 2. The highest mean final course grade for both the not low SES group (3.3) and low SES group (3.3) was found in the natural science course type delivered in the blended course delivery format. The lowest mean final course grade for the not low SES group (1.9) was found in the math course type delivered in the blended course delivery format while the lowest mean final course grade for the low SES group (1.9) was found in the math course type delivered in the online course delivery format.

Table 2

Descriptive Statistics for Final Course Grade

Course Types	SES	Delivery Method: On Line *M*	On Line *S*	On Line *N*	Traditional *M*	Traditional *S*	Traditional *N*	Blended *M*	Blended *S*	Blended *N*	Web Enhanced *M*	Web Enhanced *S*	Web Enhanced *N*
Engineering/ Tech	Not Low	2.8	1.41	83	3.1	1.17	308	2.7	1.50	7	3.0	1.38	294
	Low	2.6	1.50	260	3.1	1.19	1415	2.8	1.09	34	2.9	1.33	842
Mathematics	Not Low	2.5	1.37	110	2.3	1.46	1949	1.9	1.39	54	2.4	1.38	115
	Low	1.9	1.41	256	2.4	1.38	6235	2.1	1.27	196	2.4	1.37	544
Natural Science	Not Low	2.5	1.15	149	2.9	1.24	905	3.3	0.94	30	3.0	1.11	238
	Low	2.5	1.38	395	2.8	1.23	2795	3.3	1.09	132	2.9	1.18	806

Table 3 displays the results of the factorial ANOVA testing the null hypotheses that in the population: (a) the mean final grades are equal for course types, (b) the mean final grades are equal for course delivery methods, (c) the mean final grades are equal for SES, and (d) there is no interaction between course types, course delivery methods, and SES. The ANOVA results indicate that there are significant differences in final course grade for the course type (p<=.001) and course delivery method (p<=.001) variables and the interactions of course type * course delivery method (p<=.001) and the course delivery method * SES (p=.038) variables. Even though significant differences were found, the amount of variance (less than 1%) attributed to each variable and their interactions was so low that the null hypotheses cannot be rejected and subsequently the conclusion is that there is no significant difference in final course grades for course types, course delivery methods, SES, and their interactions.

Table 3

Final Course Grade ANOVA

Variable	*df*	*MS*	*F*	*p*	η^2
SES	1	.955	.546	.460	
Delivery Method	3	23.748	13.581	<.001	.002
Course Type	2	147.017	84.077	<.001	.009
SES × Delivery Method	3	4.905	2.805	.038	<.001
SES × Course Type	2	.264	.151	.860	
Delivery Method × Course Type	6	12.605	7.207	<.001	<.001
SES × Delivery Method × Course Type	6	2.761	1.579	.149	
Within-cells error	18127	1.749			

Course Completion Status

The third research question investigated differences in course completion status for students of low and not low SES enrolled in different course types delivered using different course delivery methods. I hypothesized that there were differences in course completion status for students of different SES enrolled in different course types delivered using course delivery methods. Completion percentages for students in each course type by SES are displayed in Table 4. The highest completion percentage for the not low SES group (92.0%) and low SES group (91.6%) was found in the engineering/technology course type. The lowest percentage of completion for the not low SES group (86.0%) and low SES groups (87.3%) was found in the math course type.

The results for the chi-square goodness-of-fit test for the null hypothesis that for the given population student course completion status was evenly distributed by SES across all course types. The results of the chi-square test are presented on Table 4 and

indicate that the null hypothesis was not rejected and therefore there are no significant differences in course completion status by SES and course type

Table 4

Student Completion in STEM Course Types by SES

Course Type	SES		χ^2	*p*	*V*
	Not Low	Low			
Engineering/Tech	962 (92.0%)	2551 (91.6%)	.119	.730	.006
Mathematics	2228 (86.0%)	7231 (87.3%)	2.794	.095	.016
Natural Science	1321 (91.1%)	4128 (89.9%)	1.817	.178	.017

Table 5 displays completion percentages for each course delivery method by SES. The highest percentage of course completion for the not low SES group was in the web enhanced course delivery method with 91.6% of the students completing the course. The highest percentage of course completion for the low SES group was in the traditional course delivery format with 89.6% of the students completing the course. The lowest percentage of completing a course for the not low SES group was in the online course delivery format with 82.2% of the students not completing the course. The lowest percentage of completing a course for the low SES group was in the online course delivery format with 79.6% of the students not completing the course.

The results of the chi-square goodness-of-fit test for the null hypothesis that for the given population student course completion status was evenly distributed by SES across all course delivery methods. The results of the chi-square test are presented on Table 5 and indicate that there are no significant differences in course completion status by SES and course delivery method.

Table 5

Student Completion by Delivery Method by SES

	SES				
Delivery Method	Not Low	Low	χ^2	*p*	*V*
Online	342 (82.2%)	911 (79.6%)	1.283	.257	.029
Traditional	3161 (88.6%)	10445 (89.6%)	2.885	.089	.014
Blended	91 (88.3%)	362 (89.2%)	.055	.841	.010
Web Enhanced	647 (91.6%)	2192 (89.3%)	3.326	.068	.032

Course Passing Status

The fourth research question investigated differences in course passing status for students of low and not low SES levels enrolled in different course types delivered using different course delivery methods. I hypothesized that there were differences in course passing for students of low and not low SES enrolled in different course types delivered using course delivery methods. Course passing percentages for students in each course type by SES are displayed in Table 6. The engineering/technology course type had the highest percentage of students in the not low (79.1%) and low SES (79.1%) groups that passed. The math course type had the lowest percentage of students in both the not low (62.5%) and low SES (65.5%) groups that passed.

The results of the chi-square tests for course type by SES are presented on Table 6 and indicate that there are no significant differences in course passing status by SES and the engineering/tech, natural science, and overall course types. However, the results presented on Table 6 indicate that there is a significant difference in course passing status by SES and the math (p=.006) course type. The results of Cramer's V test for examining the strength of the relationship between the variables indicate that even though there is a

significant relationship between course passing status, the math course type, and SES the relationship is weak with only 2.6% of the passing variance in math course types being accounted for by SES.

Table 6

Student Passing in STEM Course Types by SES

Course Type	SES		χ^2	*p*	*V*
	Not Low	Low			
Engineering/Tech	595 (79.1%)	2202 (79.1%)	0.000	.987	.000
Mathematics	1620 (62.5%)	5425 (65.5%)	2.794	.095	.026
Natural Science	1339 (78.6%)	3501 (76.2%)	1.817	.178	.023

Passing percentages for each course delivery method by SES are displayed in Table 7. The highest percentage of course passing status for both SES groups was in the web enhanced course delivery format with 77.2% of the students in the not low SES group passing and 74.7% of the students in the low SES group passing. The lowest percentage of course passing status for the not low SES group was in the blended course delivery format with 65% of the students passing. The lowest percentage of course passing status for the low SES group was in the online course delivery format with 56.5% of the students passing.

Table 7 displays the results for the chi-square goodness-of-fit test for the null hypothesis that for the given population student course passing status was evenly distributed by SES across all course delivery methods. The results of the chi-square tests for course delivery method by SES indicate that there are no significant differences in

course passing status percentage by SES and course delivery method for blended, web enhanced, and overall course delivery methods.

Even though the results presented on Table 7 indicate there are significant differences in course passing status percentage by SES and course delivery method for traditional (p=.003) and online (p=.001) course delivery formats. The results of Cramer's V test for examining the strength of the relationship between the variables indicate that even though the relationship between course passing status, the traditional course delivery, and SES is significant the relationship is weak with only 2.4% of the passing variance in the traditional course delivery method being accounted for by SES. The relationship between course passing status, the online course delivery method, and SES was also weak with 8.7% of the passing variance in the online course delivery method being accounted for by SES.

Table 7

Student Passing by Delivery Method by SES

Delivery Method	SES		χ^2	p	V
	Not Low	Low			
Online	275 (66.1%)	646 (56.5%)	11.716	.001	.029
Traditional	2467 (69.1%)	8363 (71.7%)	8.950	.003	.014
Blended	67 (65.0%)	2844 (70.0%)	.922	.337	.010
Web Enhanced	545 (77.2%)	1835 (74.7%)	1.769	.154	.032

Summary

Results of this study partially support the hypotheses proposed in this study. The independent variables SES, course type, and course delivery method were all

significantly associated with enrollment. Overall, SES, course type, and course delivery method were not significantly associated with final course grade, course completion status, and course passing status. However, there were significant differences in course passing status for the math course type and SES, the traditional course delivery method and SES, and the online course delivery method and SES. Even though significant differences were observed, the relationships between SES, course type, and course delivery method were weak.

CHAPTER 5

DISCUSSION AND RECOMMENDATIONS

This chapter presents a summary of the current study, a discussion of the findings, and recommendations based on the findings. The overall purpose of this study was to better understand the relationship between SES, course delivery method, and student success in different STEM course types (natural science, technology/engineering, mathematics) at a state college. The study was designed to address the research questions on enrollment and student success in a deliberate manner. This first statistical analysis in this study was conducted to determine if students of low and not low SES levels enrolled disproportionately in different STEM courses types by course delivery methods. The other three statistical analyses were conducted to examine student success in terms of final course grades, course completion status, and course passing status for STEM course types delivered in different course delivery methods and how they relate to the SES of the students enrolled in those course types. The current study used enrollment and final course grade data for 20,456 students enrolled in STEM course types delivered in traditional, online, blended, and web enhanced course delivery formats at Miami Dade College from August 2011 – July 2012.

Overview of the Problem

Community colleges are offering courses delivered in a variety of course delivery formats in an effort to improve instruction and better accommodate the needs of students. A number of these course delivery formats require students to have some level of technology fluency to be successful in the course. The literature in the areas of student

success in college and the digital divide indicates that SES impacts both the acquisition of necessary technology skills and student success. The current study was conducted to better analyze the impact of SES on student success in courses delivered using technology that requires students to have some level of technology fluency to successfully participate.

This study examined the following null hypotheses:

Research Question 1 - Enrollment

H_o: Student enrollment is evenly distributed by student SES across all course types and course delivery methods

Research Question 2 – Final Course Grades

$H_{o(1)}$: There is no difference in final course grades for students enrolled in different course types; $H_{o(1)}$: $\mu_{1.} = \mu_{2.}$

$H_{o(2)}$: There no difference in final course grades for students enrolled in different course delivery methods; $H_{o(2)}$: $\mu_{.1} = \mu_{.2}$

$H_{o(3)}$: There no difference in final course grades for students of different SES levels; $H_{o(3)}$: $\mu_{.1} = \mu_{.2}$

$H_{o(4)}$: There is no interaction between course types, course delivery methods, and SES; all $(\mu_{jk} - \mu_{j.} - \mu_{.k} + \mu) = 0$

Research Question 3 – Course Completion Status

H_o: There is no difference in course completion status for students of low and not SES enrolled in different course types delivered using course delivery methods

Research Question 4 – Course Passing Status

H_o: There is no difference in passing status for students of low and not low SES enrolled in different course types delivered using course delivery methods

Results

I conducted this study to investigate the impact of SES and course delivery method on enrollment, student final course grade, course completion status, and course passing status for students enrolled in STEM course types. In the study, I used descriptive statistics and goodness-of-fit chi-square tests to test the null hypotheses related to research questions 1, 3, and 4. To test the null hypotheses in research question 2, I used descriptive statistics and a factorial ANOVA. Using the aforementioned data analysis techniques, I generated the following results.

Research Question 1. The result of the chi-square analysis examining enrollment indicated that there were significant differences in enrollment by SES and course delivery methods for the engineering/technology (p=.000), math (p=.000), and overall (p=.003) course types, but not for the natural science (p=.084) course type. A Cramer's V analysis was conducted to analyze the strength of the association between variables because there were significant differences in enrollment overall and the engineering/technology and math course types. I found that the effect of SES and course delivery method on enrollment in STEM course types was weak in strength with only 8.8% of the enrollment variance in engineering/tech, 5.4% of the enrollment variance in math, and 2.6% of the enrollment variance in overall course types being accounted for by SES and course delivery method. Subsequently, the null hypothesis was rejected. This result showed

evidence that there is a difference in student enrollment in STEM course types by students' SES and the course delivery method of the course.

This study will add to the literature because no other study has analyzed the enrollment of students in STEM course types delivered in various course delivery methods related to their SES. Additionally, the results of the current study support findings in other studies that have found significant differences in college enrollment based on the SES of students (Fitzgerald, 2004; Lee, 2004; Perna, 2005; St. John, 2003; St. John, 2006).

Research Question 2. The factorial ANOVA analysis of student final course grades indicated that there were significant differences in final course grade for the course type (p=.000) and course delivery method (p=.000) variables and the interactions of course type * course delivery method (p=.000) and the course delivery method * SES (p=.038) variables. The partial eta squared indicated that the amount of variance (less than 1%) attributed to each variable and their interactions was so low that the conclusion was that there is no significant difference in final course grades for course types, course delivery methods, SES, and their interactions. Subsequently, the null hypothesis was not rejected. This result showed no evidence that there is significant difference in final course grades for course types, course delivery methods, SES, and their interactions.

The results of the current study concur with the findings in other studies that have found no significant difference in final course grades for college students in different course delivery methods (Bearden, Robinson, & Deis,2002; Daymont & Blau, 2008; Friday, Friday-Stroud, Green, & Hill, 2006; Hills, Brallier, Palm, and Graham, 2009;

Leasure, Davis, & Thievon, 2000; Pribesh, Dickinson, & Bucher, 2006; Reuter, 2009; Rivera & Rice, 2002; Thirunarayanan & Perez-Prado, 2001). Additionally, the findings of the current study do not concur with studies that have found significant differences in academic achievement for students of different SES levels (Ming-Hsueh & Fu-Yu, 2013).

Research Question 3. The chi-square analysis used to examine course completion status by SES, course type, and course delivery method indicated that are no significant differences in course completion status by SES and course type and/or SES and course delivery method. Subsequently, the null hypothesis was not rejected. This result showed no evidence that there is a difference in student course completion status in STEM course types by students' SES and the course delivery method of the course.

This study will add to the literature because no other study has analyzed the completion status of students in STEM course types delivered in various course delivery methods based on their SES. The completion status results of the current study do not concur with studies that have found differences in course completion status related to the SES of students (ASHE, 2007; Shouping & St. John, 2001).

Research Question 4. The chi-square analysis used to examine course passing status by SES, course type, and course delivery method yielded mixed findings and indicated that that there were no significant differences in course passing status by SES and the engineering/tech, natural science, and overall course types but that there was a weak relationship for the math course type based on the SES of the student. Additionally, the chi-square analysis indicated that there are no significant differences in course passing status by SES and course delivery method for blended, web enhanced, and overall course

delivery methods. However, there was a significant difference in course passing status by SES and course delivery method for the traditional and online course delivery methods, but the relationships were weak for those course delivery methods and the SES of the student. A Cramer's V analysis was conducted to analyze the strength of the association between variables. I found that the effect of SES and course delivery method on course passing status in STEM course types was weak with only 2.4% of the passing status variance in the traditional course delivery method being accounted for by SES. The relationship between course passing status, the online course delivery method, and SES was also weak in strength with 8.7% of the passing variance in the online course delivery method being accounted for by SES. Subsequently, the null hypothesis was not rejected. This result showed no evidence that there is a significant difference in course passing status in STEM course types by students' SES and the course delivery method of the course.

This study will add to the literature because no other study has analyzed the course passing status of students based on their SES and their enrollment in STEM course types delivered in various course delivery methods. The passing status results of the current study concur with studies that have not found a significant difference in passing status for students enrolled in different course delivery methods (Bearden, Robinson, & Deis,2002; Daymont & Blau, 2008; Friday, Friday-Stroud, Green, & Hill, 2006; Hills, Brallier, Palm, and Graham, 2009; Leasure, Davis, & Thievon, 2000; Pribesh, Dickinson, & Bucher, 2006; Reuter, 2009; Rivera & Rice, 2002; Thirunarayanan & Perez-Prado, 2001). The course passing status results of the current study do not concur with studies

that have found a difference in course achievement, passing, and completion related to the SES of students (ASHE, 2007; Ming-Hsueh & Fu-Yu, 2013; Shouping & St. John, 2001).

Implications

Community colleges are often referred to as democracy's colleges because of the opportunities they provide to students from diverse backgrounds to succeed at completing degree programs, finding gainful employment, and being valuable contributors to society. Student success is vital for the fulfillment of the community college mission. The community college mission is to provide comprehensive education through open access admission policies into courses and programs that meet the needs of the community and contribute to employment, economic development, teaching, and promote lifelong learning. Community colleges attempt to serve their communities through fair and equal treatments of all populations especially those from underrepresented groups based on age, gender, race, ethnicity, and SES.

Implications for Practice

The current study yielded mixed findings in terms of how students from different socioeconomic groups enroll and perform in STEM course types delivered using various course delivery methods. Overall, SES does not appear to deter students from enrolling in courses regardless of course type or course delivery method. While the findings for enrollment by SES for course type and course delivery method were statistically significant, the relationship is so weak (2.6%) that for practical, Real-world purposes a larger investment in course delivery models targeting students by SES such as designing

courses with only free online course materials may not be needed for Miami Dade College. MDC still serves the mission of the community college while being a state college, but not all community colleges invest in enrollment strategies targeting underrepresented groups at the same level as Miami Dade College. It is important for higher education institutions serving populations with similar demographics to MDC to analyze their investment in course delivery models, course offerings, and technology access and training if they want to provide truly open access to all populations they serve.

The findings of the study are clear in that no evidence was found that final course grades are impacted by course types, course delivery methods, student SES, and their interactions. Additionally, no evidence was found that course completion status is related to course types, course delivery methods, and student SES. The findings were not so clear when looking at course passing status and how it may be related to course type, course delivery method, and student SES. Overall, students regardless of SES demonstrated no evidence of having their passing status being related to course type or course delivery method overall.

However, when taking a closer look at the findings I found that student passing status had statistically significant differences by SES and course delivery method for the traditional and online course delivery methods. Even though the relationships between the passing status of students, SES, and course delivery methods were weak for all traditional (2.4%) and online (8.7%) course types, it is important to realize that passing a course even by the slimmest of margins has a large impact in moving a student toward

meeting their educational goal, retaining a student in college, and/or helping a student find employment.

The largest numbers of students in this study enrolled in courses delivered in traditional and online course delivery formats. Concluding that there are no significant differences in passing status based on SES, course type, and course delivery method and moving on would be disingenuous when the data indicates it is not so simple to disregard. More research is needed to effectively make decisions on the investment of further resources to improve course passing status for students at MDC regardless of course type and course delivery methods. Again, it is important to note that not all community colleges invest in effective success strategies targeting underrepresented groups across course delivery methods at the same level as Miami Dade College. It is important for higher education institutions serving populations with similar demographics to that of MDC to analyze their investment in course delivery strategies, course offerings, and technology access and training if they want to provide opportunities for success to all populations they serve.

Implications for Policy

The major implication of this study is that to accommodate the continual growth of student learning at community colleges, improvements in access and technology are needed (Watson, 2004). Community colleges need to build a technology infrastructure that provides access to students and faculty and information technology plans that: (a) includes goals that are descriptive, detailed, and institution specific and address issues of organizational change, technology upgrades, cost, as well as incorporating the

involvement of constituents, experts, and necessary human resources, (b) provide technological resources and support to students, faculty, and staff, and (c) provide college administrators access to information from all institutional systems to assist in reporting and decision making. The findings of this study seem to indicate that MDC is successfully using their technology planning model to invest in course delivery strategies, technology access, and technology skills training for students. Additionally, MDC's enrollment management strategies are successfully recruiting students from low and not low SES who are being successful across different STEM course types delivered using various course delivery methods. The results of the study indicate that MDC's technology planning and course delivery models are good examples for institutions of higher education serving populations with similar low SES demographic characteristics to follow.

MDC is a state college with a community college mission that historically has provided access and opportunity to underserved populations from low socioeconomic backgrounds. MDC's recruitment strategies in targeting low SES student populations in its service area has demonstrated great success in terms of getting low SES students into college. Equally impressive is MDC's academic support infrastructure. The findings of the current study seem to indicate that low SES students at MDC are able to perform as well in terms of final course grades, course completion status, and course passing status as their not low SES counterparts. Whether the acquisition of the necessary cultural capital for student success occurred at MDC or whether it occurred in the process of becoming a college student, the results of the study indicated that there were no

differences in academic achievement between the low SES and not low SES groups once they were enrolled and taking courses at MDC. The results of the study indicate that MDC's recruitment and academic support policies and practices are doing a good job of providing access and opportunity for success to all socioeconomic levels of students. MDC is a model for institutions of higher education serving populations with similar low SES demographic characteristics to follow when it comes to supporting underserved and underrepresented student populations.

Recommendations for Future Research

This study investigated enrollment and student success based on student SES and the course types and course delivery methods of the courses in which students enrolled at a state college. Based on the findings of my study, I have five recommendations for future research. The first recommendation is that this study be replicated using a true experimental model with a random sample of the student population enrolling in STEM course types self-selecting the course delivery methods for the course types they choose to register for. A random sample of current students would enable such a study to use additional quantitative and qualitative instruments to probe for information on student technology skill level, experience in taking courses in different course delivery methods, reason for taking certain course types, and rationale for selecting a particular course delivery method. All this additional information can help faculty and administrators make decisions on course offerings, course delivery methods, course schedules, and assist in the development of policies and best practices in the design of curriculum and programs.

Second, I think the study should be replicated examining a more diverse SES population. The majority of the population at MDC is of low SES with very little variation in SES levels. In any future study using a more diverse SES population, I recommend establishing more SES levels using a range of median family incomes in lieu of using Pell grant eligibility. In conjunction with the more detailed family income levels, I would recommend broadening the scope of the study to include another independent variable often tied to SES such as first generation in college or native English speaker. Additionally, opening up the population of the study to include multiple colleges with more diverse SES groups would allow a more in-depth investigation of the relationship between SES and student success in different course types using various course delivery methods.

Third, I think it is important that this study be replicated to look at non-STEM course types. It is certainly possible that some non-STEM disciplines are delivered more effectively in terms of student success through different course delivery methods. Likewise it is possible that students with different SES levels perform differently in terms of student success measures in non-STEM course types. This is not to say that non-STEM course types are easier, but it speaks more to the notion that there may be academic software and instructional content for non-STEM disciplines that lends itself better for instructional use in different course delivery methods. This information would be valuable to faculty and administrators in terms of making decisions on course offerings, course delivery methods, course schedules, and the development of policies and best practices in the design of curriculum and programs.

Fourth, I would recommend replicating this study but including an investigation of the characteristics of the faculty teaching in the different course types. Faculty technology skill level and experience teaching using the different course delivery methods are variables that could have impacts on student success. Similar to how a student's technology skill level and familiarity with a course delivery method can affect student success, faculty technology skill level and familiarity with a course delivery method can impact the success of all students in the course. Examining the skills and experience of both faculty and student would address the issue of making sure that all participants in the teaching and learning process have the necessary technology skills and experience to provide the best opportunity for a successful learning outcome. The additional research on faculty technology level and experience would be valuable to faculty and administrators in terms of determining the level of skills and the amount of experience needed to teach using different course delivery methods. This would assist in the quality assurance aspect of course delivery because it would enable an institution to verify that the faculty teaching the courses are sufficiently trained and experienced to provide a high quality learning environment for students regardless of course delivery method.

The final recommendation is for a study to investigate how non-cognitive factors like motivation, time management, and self-regulation impact student success in courses delivered using different course delivery methods for students with different SES levels. Different course delivery methods may require varying levels of non-cognitive skills for students to be successful. Similarly students from different SES groups may

have varying levels of non-cognitive factors which may impact their success in courses offered in a variety of different delivery methods. This research would assist colleges in devising strategies to provide students with the necessary support and training to develop and/or improve skills to mitigate non-cognitive factors.

Summary

Chapter 5 detailed the findings of the study, the implications for practice and policy, and recommendations for future research. The findings indicated there were no significant differences in final course grades by course types, course delivery methods, SES, or their interactions. Additionally, the findings of the chi-square tests indicated that: (a) there were significant differences in enrollment by SES and course delivery methods for the Engineering/Technology, Math, and overall course types but not for the Natural Science course type, (b) there were no significant differences in course completion status, and (c) there were no significant differences in course passing status by SES and course types overall and SES and course delivery methods overall. However, there were significant differences in course passing status by SES and the math course type as well as SES and course delivery methods for the traditional and online course delivery methods but the relationships between SES, course type, and course delivery method were weak.

The implications for policy and practice were that institutions with similar low SES populations can use MDC as a model for the purposes of providing necessary technology support to students enrolled in various course delivery methods and course types as well as designing course delivery models that are equally effective for the

delivery of instructional content. Based on the findings and implications of this study, I recommended that future studies examine different aspects of the variables in the study such as looking at non-STEM course types, refining the breakdown of SES to create more groups based on median family income instead of Pell eligibility, expanding the study population to include multiple colleges with more diverse SES groups. I also made recommendations for future research outside of the scope of the current study to examine the technology fluency level of the faculty delivering the courses in the different course delivery methods and student non-cognitive characteristics.

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