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The Effect of Modality on Student Achievement and Course Completion in a Developmental Mathematics Course

Robert Allan Greene
University of North Florida

The Effect of Modality on Student Achievement and Course Completion in a Developmental Mathematics Course

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Robert A. Greene

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CERTIFICATE OF APPROVAL PAGE

The thesis of Robert Allan Greene is approved:

______________________________ __________________
Dr. Daniel Dinsmore- Chair

______________________________ __________________
Dr. David Hoppey

______________________________ __________________
Dr. Kosze Lee

______________________________ __________________
Dr. Deb Miller

Accepted for the Department

______________________________ __________________
Dr. David Hoppey
Chair

Accepted for the College of Education and Human Resources:

______________________________ __________________
Dr. Diane Yendol-Hoppey
Dean

Accepted for the University:

______________________________ __________________
Dr. John Kantner
Dean of the Graduate School

DEDICATION

To my amazing wife, Yadira, and my children who have always supported me. To my parents who gave me the inspiration and opportunity to pursue my dreams.

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ABSTRACT

Students taking courses in developmental mathematics do so in one of three modalities - some take the classes face-to-face in a classroom with a professor who is physically present, others take the classes in what is known as a blended or hybrid mode in which the professor uses a combination of classroom and online time to teach the course, and another group takes the classes completely online. Increasingly, a growing number of students are taking these courses in a hybrid mode or completely online, and this phenomenon is causing educators to redesign their programs, offering more courses in these two modalities. However, some program leaders do so without any data about the achievement and course completion rates of students in the different modalities. This research 1) investigated the achievement rates of students taking an eight week developmental mathematics course, taught in three different modalities and 2) investigated the course completion rates of students taking an eight week developmental mathematics course, taught in three different modalities. Specifically, the purpose of this study was to examine the achievement and course completion rates of students enrolled in an eight week developmental mathematics course, Elementary Algebra, based on the delivery modality. The study was conducted at a large multi-campus institution located in the southeast United States as the research site. The theories used to frame the research were the Information Processing Theory and Cognitive Load Theory.

CHAPTER I

Introduction

The objective of this research is twofold: Firstly, I investigated the achievement rates of students taking an eight week developmental mathematics course, taught in three different modalities and secondly, I investigated the course completion rates of students taking an eight week developmental mathematics course, taught in three different modalities. I wanted to investigate whether students taking a basic developmental mathematics course in an eight week term were more successful in one of the three delivery models: 1. face-to-face (completely in class), 2. Hybrid (usually split equally between in-class time and online instruction), and 3. Online (courses where the instructor never meets physically with students). I also investigated whether there was a significant difference in course completion rates of the students taking the three different delivery modalities. I believe that evaluating the achievement and course completion rates of students in developmental mathematics courses taught in different modalities is a logical place to start the conversation of practices that are conducive to the effective teaching of mathematics.

Educators see community colleges as the gateways of the American higher education system (Dowd, 2007), for community colleges enroll approximately eight million students and about forty percent of all undergraduates (Horn & Nevill, 2006). The primary reason for this is that community colleges are open-door or open access institutions. This “open access” enables a person with a high school diploma or a general equivalency diploma (GED) to apply to a community college. The college then typically requires that the student take a placement test that measures the student’s proficiency for college level work. Because of this open access policy, many community colleges routinely see an influx of students who are not adequately prepared for college (Jaggars & Stacey, 2014). For these individuals who ordinarily would not be accepted at a university, the community college presents a unique opportunity to get an education; however, at the same time, the open access practice presents each community college with a unique number of challenges, most of which are related to the characteristics of these students.

The typical community college student can be very different from the typical university student. Community college students are more likely to have lower academic skills than their counterparts, are more likely to be employed while in school, and are more likely to come from lower income families (Gooden & Matus-Grossman, 2002; Horn & Nevill, 2006). Many do not come into college with behaviors that are conducive to success; for instance, some do not know how to study, how to manage their time, or how to prioritize (Chen & Simone, 2016). For such students, achieving success in developmental courses, especially in developmental mathematics courses, can be particularly challenging.

Undergraduate enrollment at post-secondary institutions increased from 12 million in 1990 to 17.5 million in the fall of 2013, an increase of 46%, and is projected to reach 19.6 million between 2013 and 2024 (U.S. Department of Education, National Center for Educational Statistics, 2014). In 2002, the Community College Research Center found that out of a sample of 46,000 students, seventy percent were in need of developmental education in math compared to thirty four percent who required developmental education in English (Biswas, R., 2007). Approximately half of those referred for developmental math courses were required to take courses three levels below college-level math (Biswas, R., 2007). Of those taking the remedial courses, less than 18% percent attempted to take a college algebra course, and of those that took college algebra, only 14% completed the course. Those who tested into the lowest level of developmental math had a completion rate of only 16% whereas students who tested into a higher level of developmental math had a completion rate of 31%, both of which are significantly lower than the achievement rates in college credit level courses. Improving the student achievement rate in developmental math courses has become a major priority at many higher-level education institutions, particularly at community colleges.

Although each institution has its own organizational structure for students who test into developmental math, the pathway generally consists of a series of sequential courses beginning with basic math, followed by elementary algebra, and ending with intermediate algebra. All of these courses must be passed prior to a student being given clearance to take a college credit course in math. This additional coursework, though necessary, provides a burden to many community college students and contributes to the attrition rates in developmental math classes. According to Stigler et al. (2010), "A student placed in basic arithmetic may face two full years of mathematics classes before he or she can take a college-level course" (p. 4). Bailey (2009) states that "students either get discouraged or drop out altogether, or they get weeded out at each articulation point, failing to pass from one course to the next" (p. 12). Because of this attrition trend, developmental math poses a very serious threat to many students' college achievement as they probably would not complete a program of study needed for their future career, and it could affect their ability to find a good-paying job.

In addition to being a burden to the students, such courses are also a financial burden to the community and the educational system. In the years between 2004 to 2011, the cost of remedial education in Florida increased from $118 million to $168 million while state funding for the Florida College System (FCS) declined by twenty five percent during the same time period (Florida College System, 2011). This results in community colleges having to allocate resources to developmental education that may have been able to help in other parts of the institution. The annual cost of remediation at community colleges was estimated at $1.9 to $2.3 billion dollars and another $500 million at four-year institutions (Strong American Schools, 2008).

In the past few years, many national initiatives have focused on the role of developmental math and the achievement of community college students. These studies included the *Achieving the Dream* project by the Lumina Foundation for Education, the Ford Foundation's *Bridges to Opportunity*, and the Carnegie Foundation's *Strengthening Pre-Collegiate Education in Community Colleges* project. As a result of such initiatives, several states, including Florida, have explored a variety of new innovations and strategies to help developmental students succeed.

In Florida, members of the legislature determined that academic institutions in the state were not doing enough to address the concerns associated with developmental education programs in the state. Citing poor completion rates, high attrition rates, and the high cost of remediation as primary reasons, lawmakers passed a law, known as Senate Bill 1720, which provided a framework for how developmental programs would be taught in Florida.

The Florida Legislature passed Senate Bill 1720 into law in July of 2013. Senate Bill 1720 limited college placement testing and made placement testing voluntary for many students within the state. In addition, the bill also required institutions to accelerate the movement from developmental courses into college level courses. To meet this requirement, institutions offered compressed or accelerated developmental courses; therefore, traditional developmental courses, which were once offered in 16-week sessions, were offered in 8-week sessions. The purpose of the bill was to help students become college ready in a faster way thus reflecting a cost savings to both the students and the institutions that would not have to offer as many developmental courses.

Advocates of the bill believed that reframing the way developmental courses were taught would help more students attain a degree. Opponents of the bill believed that developmental students would suffer because they would be placed into courses that they were not academically prepared to handle. In the meantime, the challenge of dealing with and meeting the needs of underprepared students taking courses in developmental mathematics persisted.

One of the greatest challenges that postsecondary educational institutions face is that of understanding and increasing the achievement and course completion rates of student taking courses in mathematics. Many students, specifically those taking entry-level credit courses in mathematics, are not adequately prepared for the level of rigor found in the courses (U.S. Department of Education, National Center for Educational Statistics, 2015). To help such students succeed, colleges and universities have traditionally offered courses that students are required to take prior to taking college level courses. Such courses are referred to as "developmental courses," and the students who take these courses are referred to as "developmental students." Developmental students are traditionally characterized as students who are underprepared for college level courses as established by each individual educational institution (The National Center for Education Statistics, 1991). However, many of the students who take these developmental courses leave the institutions before finishing the course or sequence of courses required by institutions. This phenomenon has, in turn, led many institutions to implement programs and initiatives to improve the achievement and course completion rates of these students.

To meet the needs of both the students and the institutions, many colleges offer a variety of course delivery modalities. In addition to offering courses in a "traditional" face-to-face mode, many institutions also offer courses in a hybrid or "blended" format as well as courses that are completely online. Recent studies have found that, in some instances, students in an online or hybrid environment were just as successful or more successful than their counterparts in a traditional face-to-face course. Ashby (2011), for instance, found that students in the online environment had the greatest achievement when compared to their peers in a face-to-face class or a hybrid class. Another researcher, speaking specifically about mathematics, noted, "the quality of education gained from online basic skills mathematics courses is relatively equivalent to face to face courses" (Rey, 2010).

Statement of Problem

Many students who take developmental math classes were not completing the courses and were not returning to take the following courses in the sequence. Because of this phenomenon, educators have attempted to redesign the way they taught developmental mathematics courses. At the institution where the research was completed, developmental classes were taught in three different modalities: face-to-face in a classroom setting, partially face-to-face and partially online in a blended or hybrid setting, and completely online. At the same time, in Florida, the legislature passed a law, Senate Bill 1720, which mandated that all institutions in Florida follow specific guidelines in developmental programs. As a result of this law, The Division of Florida Colleges (DFC) provided a template to the Florida College System (FCS) institutions to assist and guide educators with their redesign efforts (Appendix A). For instance, FCS institutions were directed to offer courses in an accelerated or compressed format. Traditionally, developmental courses had been offered in a 16-week format in all modalities to allow the students maximum time for achievement in the course. Because of the new guidelines, the instructional time of developmental courses was decreased by half of the traditional time, but the materials that the students were required to master stayed the same. I looked at the student achievement rates and the course completion rates in the three different modalities.

At the state college where the study was conducted, the developmental mathematics course that many students were required to take was Elementary Algebra. The course was the second of two developmental courses that many students were required to take prior to taking college level mathematics courses. Major topics in the developmental course include linear equations and linear inequalities, exponents and polynomials, real numbers and their properties, and introduction to applications, factoring, radicals, and graphing with two variables. In order to pass the course, a student had to earn a grade of “C” or better in the class. The prerequisite to this course was Basic Mathematics. The Basic Mathematics course was not used in the research since it was only offered in a face-to-face and hybrid modality and not delivered in the online modality.

Prior to Senate Bill 1720’s passage, all students at the institution were placed into either college level mathematics or developmental mathematics based on SAT/ACT scores or their scores on a standardized placement exam, which was used to determine the students “college readiness.” Dependent on their level of readiness, students were placed into either of the two developmental classes, placed into college level mathematics, or referred to basic adult education courses. The two developmental courses were considered gateway courses to taking college level mathematics courses but did not count as credits toward the associate’s degree.

Purpose of Study

Senate Bill 1720 became effective in July of 2013, and all Florida colleges were required to implement changes to their developmental education by fall of 2014. As a result of this law, educational institutions in the Florida College System (FCS) adopted some form of the accelerated developmental model. The majority of accelerated math courses utilized a Computer Aided Instruction (CAI) tool, and these courses were taught face-to-face, in a hybrid mode, or completely online. This study will look at the achievement and course completion rate of these students taking developmental mathematical courses in all three modalities.

Significance of the Study

Traditionally in Florida, developmental education had been conducted in full-term classes that usually lasted 16 weeks at most institutions. These classes were taught in three different modalities: face-to-face, in a hybrid format, or completely online. Students in Florida were required to take a placement exam, and depending on their scores, they could be required to take developmental courses. Senate Bill 1720 greatly decreased the length of the developmental courses.

This study is significant because describing the achievement and course completion rates of students taking developmental mathematics courses in different modalities will be beneficial to many educational institutions and state legislatures as they make decisions about developmental education programs. The result of this study can be useful to institutions that offer developmental mathematics courses in different modalities as well as those that offer them in accelerated models.

Data on the impact of modality on student achievement and course completion will be beneficial to both students taking developmental courses in mathematics and the institutions which offer such developmental courses. Institutions will benefit from the resources saved by offering the courses in a format that would be most efficient and cost effective, and students will benefit by being able to take the courses in the modalities which would allow them to get to college level courses faster and with more success.

Research Questions

The study will address the following research questions:

1. Does modality (i.e., online, hybrid, or face-to-face instruction) influence student achievement in a developmental mathematics course?
2. Does modality (i.e., online, hybrid, or face-to-face instruction) influence student course completion in a developmental mathematics course?

Methods and Procedures

This study is a quantitative study utilizing data from a large multi-campus institution located in southeast United States. I examined archival data regarding a developmental mathematics course, Elementary Algebra, from the Fall 2015 and the Spring 2016 terms and used that data to determine the achievement and course completion rate of students taking the course in any of the three modalities. I reviewed the data from the two terms, Fall 2015 and Spring 2016, taking into account the requirements of compression on the developmental course. The data was compiled by delivery modality to avoid identifying any particular instructor in the research findings. Descriptive statistics was generated for each modality after the implementation of Senate Bill 1720. Using statistical software, the data was analyzed to determine significance and effect size through an analysis of variance (ANOVA).

The purpose of this study is to generate quantitative or numerical data about student achievement and course completion in a developmental mathematics course delivered in three different modalities post passage of Senate Bill 1720 that can later be statistically analyzed (Fowler, 2002).

Limitations

One limitation of the study is that many full-time faculty members as well as adjunct professors teach the courses. Because of this, there are many unaccountable variables, such as the difference in time spent with students, differences in teaching styles, and differences in attitudes of the professors that this study does not seek to clarify. An additional limitation is the challenge of not knowing the digital preparedness of the students taking this course in either a hybrid or online format or of the instructors who may be delivering the courses in these different formats. The college does not require an assessment or preparedness orientation prior to a student registering for a hybrid or online course, so this is a variable not accounted for within the study when looking at the achievement and course completion of the students in hybrid or online sections. An additional limitation of the study is not taking into account how students with disabilities or non-native English speaking students were supported in the classes taught in any of the three modalities.

Definitions

Face-to-Face. Courses that physically meet in a classroom with an instructor on a regularly scheduled basis. Face-to-face courses may include computer-assisted instruction or other supplementary materials. Testing usually takes place in the classroom with the instructor present.

Hybrid or blended courses. Courses that integrate face-to-face class delivery with online class delivery. Hybrid courses taught at the research site typically have at least half of the instruction delivered in the online modality including course discussions and course content.

Testing in these courses may be in a classroom with the instructor or may be online in a proctored manner.

Online courses. Courses that have 100% of instruction delivered online with the instructor supporting students virtually with no physical meeting patterns. Testing is usually proctored either online or at a physical proctoring site.

Developmental or remedial. Refers to either courses that help to prepare students for college level courses or students who require assistance in their educational preparedness to become college ready. The terms are used interchangeable in the study.

Course completion. The student continues participation in a learning event to completion. The learning event may be a course, program, institution, or system (Berge & Huang, 2004).

Student Achievement. For purposes of this study, success is considered earning a grade of “C” or higher in the course.

CHAPTER 2 - REVIEW OF THE RELATED LITERATURE

Introduction

There is evidence which indicates that developmental education courses have been an impediment for community college students moving toward college level courses and earning college credit. According to Bailey, Jeong, and Cho (2008) only 31% of students who were required to take developmental mathematics courses completed the required sequence of courses within three years, and only 16% of students who were referred to the lowest level of developmental mathematics completed remediation. Thomas Bailey (2009) of the Community College Research Center reported that completion rates of developmental mathematics students dropped with each additional developmental course they were required to complete. At the same time, researchers have suggested that over half of all community college students are not prepared for college level coursework and should be required to enroll in developmental courses (Bailey, Jeong, and Cho, 2010). The research further shows that very few of these students who are required to complete developmental courses actually complete the courses (Jenkins, Jaggars, & Roksa, 2009; Bailey, Jeong, & Cho, 2010). Despite this, students continue to enroll in these classes, taking classes face-to-face, in a hybrid format, or completely online.

Especially noteworthy is that there has been continuous growth in enrollment in online as well as in hybrid courses during the last thirteen years (Babson Research Survey Group, 2015). As a result, community colleges have increased their online and hybrid offerings to meet the needs of students who look for these courses because of convenience and flexibility. However, because community colleges are open access institutions, many of the students who apply may not be well prepared for college level courses that are taught using these modalities (Boylan, 2005), and administrators are challenged to make informed decisions when offering classes because of the lack of information about the performance of students who take classes taught in different modalities.

The purpose of this review is to provide a brief overview of developmental education, specifically of developmental mathematics education, to explain some of the issues related to this discipline. The review will focus on several factors, including the phenomenon that many students are not adequately prepared to take college level courses, the organizational change that is required to implement changes, and the use of technology to assist educators in meeting the learning needs of students when offering classes in these different course modalities. The review will also include a discussion of Information Processing Learning theory, which will provide a theoretical framework for the study, for I believe that Information Processing Theory can assist in providing an understanding of the learning process of the developmental mathematic students and guide educators as they reimagine their developmental mathematics programs.

Definition of Developmental Education

The term *developmental education* is often used interchangeably with the term *remedial education* by many higher education institutions. Developmental education generally refers to programs and services designed to meet the educational needs of underprepared college students (Payne & Lyman, 2001). Although these two terms are widely used in education today, there are those who prefer to accentuate the difference of the two terms. Cross (1976) and Maxwell (1979) called attention to distinctions between remedial and developmental education. Cross (1976) believed that developmental education also included the goal of talent development for all students at an institution. Maxwell (1979) believed that the usage of the term developmental education became popular to avoid the stigma associated with remedial education. Maxwell

(1979) pointed out that many states did not fund programs termed remedial, but funded programs that were identified as developmental education programs.

According to Boylan (1990), the distinction between remedial and developmental education became blurred in the 1960s and 1970s when an increasing number of underprepared students entered higher education institutions. As a result of this influx of underprepared students, the terms have become almost synonymous. The National Association for Developmental Education (NADE) has defined developmental education on their 2011 fact-sheet as “a comprehensive process that focuses on the intellectual, social, and emotional growth and development of all students. Developmental education includes, but is not limited to, tutoring, personal/career counseling, academic advisement, and coursework,” (NADE Fact Sheet, 2012, p. 1). The current definition of developmental education has shifted to focus on the areas that are underdeveloped and to acknowledge that there are areas of strengths, thereby developing a more positive approach in the education process.

Developmental Mathematics Education

In most instances, when students apply to a community college, they are required to take a placement test, and based upon their performance on the placement test, they may be placed into a developmental or remedial class. In 2001, nearly one-third of first-year college students were required to take a remedial course in reading, writing, or mathematics (National Center for Education Statistics (NCES, 2003). The majority of students who take placement tests at community colleges are ultimately placed into a developmental mathematics course (Bailey et al., 2005) and may be required to follow and complete a specific sequence of courses before they can take college-level courses.

The sequence of required developmental courses that a student may be required to take varies across institutions. For instance, at the research site, the general sequence would start with basic mathematics, followed by elementary algebra, and finally intermediate algebra. All of these courses must be passed successfully, with at least a “C” in the course, before a student may enroll in a college level mathematics course.

Many students have long viewed mathematics as a stumbling block to a higher education. Since mathematics has usually been taught in a sequential manner, a student who has tested into the lowest level of mathematics may have to take developmental mathematics courses for at least a year, and sometimes two, before he or she has the chance to take a college level course. However, data shows that many of these students get discouraged and drop out or fail before they get to the next required mathematics course (Bailey, 2009). Because of this, developmental mathematics can be seen as a barrier to the successful completion of a degree for many students who may leave the institution because they are unable to complete the required developmental mathematics courses.

Because developmental mathematics is viewed as a difficult course, which keeps many students from achieving their dreams of a postsecondary education, there have been attempts to reform developmental mathematics education in the United States. However, many of these reforms are focused on student success courses which help students learn study and time management skills as well as other skills needed to be successful in college and life (Zachary, 2008). For example, the research site offers a student success course called SLS, Student Life Skills, which all developmental students are required to complete as part of their first semester in college. In recent years, developmental mathematics has come under much scrutiny because of several national initiatives (*Achieving the Dream, 2004*; *Shifting Gears, 2007; Bridges to*

Opportunity,2003) to assess the role of these courses in the course completion of community college students. These initiatives yielded several new strategies and innovative ideas to help developmental mathematics students succeed. One of the innovations which was prominent was the use of technology in the remedial courses. In 2006, the American Mathematical Association of Two-Year Colleges (AMATYC) made several recommendations concerning the use of technology in the instruction of mathematics and expressed its support in the following statement, "Technology provides opportunities for educators to develop and nurture learning communities, embrace of collaboration, provide community-based learning, and address diverse learning styles of students and teaching styles of teachers," (Blair, 2006, p. 55). Because the cost of digital devices has decreased dramatically, computers have become more powerful, and improved software has made it easier to adapt assessments for individual learners, technology has progressed to the point where it is now seen as a feasible and viable resource that can help developmental students succeed in mathematics courses (U.S Department of Education, 2017).

Technology in Developmental Mathematics Education

The use of technology, especially computer-aided instruction, to help promote learning is not a new concept and has been around for some time. Technology has been used since 1965 to promote learning in mathematics (Saunders & Bell, 1980), and Kober (1992) pointed out that computers are more widely used in mathematics than in any other subject. However, the results of previous studies on the use of technology in mathematics courses have been mixed. Some studies have found no effect. For example, Ganguli (1990) and Tilidetzke (1992) reported that using computers in college algebra courses had no significant effect on student achievement or attitudes when compared to teaching the course in a traditional face-to-face method without the use of technology. Lazari and Simons (2001), in a study done at Valdosta University, compared traditional college algebra courses to the same courses delivered in a completely online format using mathematical software, *Interactive Mathematics* developed by Academic Systems Corporation. The course completion rates in the completely face-to-face classes were significantly higher in two of the six semesters when compared to those courses that were taught completely online.

However, some studies have found improvements in student performance when technology was used as a supplement in the course. For example, Palmiter (1991) and Judson (1990) found that there were significant gains in certain areas when using technological resources in the classroom, such as increased knowledge and greater student involvement and motivation. The research also indicated that computer-aided instruction used as a supplement with traditional face-to-face teaching methods was more effective than if the traditional in-class method was used by itself (Bialo & Sivin-Kachala, 1996; Butzin, 2000; McSweeney, 2003; Nguyen, 2002; Olusi, 2008; Dalal & Rinku, 2013)

With technological advances in both software and hardware, it has become more realistic to have an online educational experience that would be similar to an in-class experience. With the help of audio and video capability as well as improved networks to support that capability, students do not have to feel as though they are having to learn on their own. A meta-analysis done for the U.S. Department of Education showed that students in online classes performed just as well or slightly better than their peers who received face-to-face instruction (Means, Toyama, Murphy, Bakia, & Jones, 2010).

Because the cost of developmental education continues to grow, and the student population continues to change, educators are challenged with finding new ways to promote success in developmental classes, including developmental mathematic courses.

This generation of students that typifies the current remedial student is often referred to as the Millennial generation (Howe & Strauss, 2000). Currently, Millennials make up 36% of the total population in the United States, and 31% are minorities (Rainie, 2006). These millennial students are characterized as being the most technological generation, for they have grown up with interactive videogames and the Internet. They are used to the concept of self-service and their own expectation for control (Taylor, 2005). Because of these factors, they are the students who should benefit the most from the infusion of technology in the curriculum.

Technology has been described as the tool that can help most remedial students (McGrath & Spear, 1992). However, although there is quite a bit of research on the effects of using technology in classroom instruction at the K-12 level, there have not been many comprehensive studies in the area of developmental education that focus on the use of technology and remedial students (Trenholm, 2006). According to Barrett and Goebel (1990), computers have not had a major impact on the teaching and learning of mathematics as had been predicted because not all classrooms have computers, and educators are often uncertain of the roles that the computer should play in the classroom. Mahmood (2006) conducted a study at a historically black community college in Texas using both Fundamental Mathematics Classes and Analytical Mathematics classes. Using a quasi-experimental design which utilized a pre- and post-test, and measuring success as the gain in scores (an analysis of variance was conducted on the gain scores) from the pre-test to the post-test, he found that the students who received supplemental computer aided instruction did significantly better than those who did not receive the supplemental computer-aided instruction.

One of the problems often faced by teachers when teaching developmental mathematics is that some students have negative dispositions toward mathematics and soon begin to lose all interest in the subject (personal communication; Bell, 2009). One way this problem might be solved is through the more interactive approach of using technology in the classroom. Through the use of technology, students would take ownership of the work, and many of the classes offered today are designed to allow the students to work at their own pace. With the use of computer aided instruction (CAI), students are given the opportunity for more highly individualized instruction, and it allowed students to work at their own pace (Heath and Ravits, 2001). In a CAI classroom or lab, the instructor would divide his or her time between group instruction and individualized instruction. The students would be able to work at their own pace on the computerized program after listening to the instructor explain the concept in a lecture or demonstration on the computer. At the same time, with the help of the computer the instructor would be able to help the students individually if a problem was too complicated for the student to understand.

The technology that is being used in today's classroom is much more sophisticated than the technology that has been used in the past. Powerful computer programs are now able to help students needing remediation and make them feel empowered (Kutzler, 2003). Programs such as ALEKS, MyMathLab, MyMathLabPlus, and MathXL are able to place students into the appropriate level of developmental coursework, help them to review the material, and provide checkpoints for them to see if they are attaining their goals. Many of these programs have so-called smart features that indicate whether or not a student has successfully mastered a particular unit or topic. If students are not able to pass a checkpoint, the program places them back into a remedial mode where they have the opportunity to repeat the portion in which they are unsuccessful. For example, in MyMathLab, students are not allowed to move to another unit in the lesson until they have successfully passed a prerequisite to a test or a quiz. Once they have successfully passed the test or quiz, with a passing score set by the instructor, they may move ahead to the next unit or lesson. If the students are not successful, they can automatically receive additional practice in the areas where help is needed. The instructor's role in this process is to facilitate the learning process of the students. This is particularly the case when dealing with developmental students. Through the use of CAI, instructors are better able to monitor the progress of their students and get immediate feedback on the progress of that particular student or on the class as a whole, which can be used to determine if the majority of the students did not learn a particular skill or unit.

The adoption of technology to enhance instruction is a major undertaking and requires a great time and monetary commitment from the institution wishing to adopt it. If technology is adopted and used improperly the potential benefits may not be realized, and the expenditures and time may be seen as being wasted. However, if executed properly, there is the potential for great gains in student achievement and course completion. One of the areas where educators can use technology to enhance learning is in online and hybrid courses.

Online education has continued to grow consistently and rapidly for the last thirteen years in a row, with 28% of students taking at least one distance education course (Allen & Seaman, 2015). As a result of this increased demand, some educators recommend that community college leaders focus on improving and increasing online and hybrid learning course offerings to meet the continued growing demand by these non-traditional students (Hachey, Conway et al., 2013). According to a report published by the Sloan Consortium and the Babson Survey Research Group, online learning had increased by 16.1% in the period from 2002-2012 while overall enrollment had only increased by 2.5% (Allen & Seaman, 2013). In a survey done by *The Chronicle of Higher Education* in 2015, 63.3% of academic leaders believed that online learning is critical to their long-term strategy (Allen & Seaman, 2015). However, only 29.1% of the academic leaders surveyed reported that their faculty accepts the “value and legitimacy of online education,” (Allen & Seaman, 2015, p. 6).

Course Completion and Student Achievement

Community colleges are open access institutions that continue to evolve by increasing accessibility and affordability to non-traditional students who would like to obtain a college education because a college education is so vital in today’s economy. However, many of these non-traditional students are working full time jobs, come from low socioeconomic backgrounds, and have children (Dahlstrom, 2015). The purpose of open access is to encourage many of these potential students, who are not academically ready to attend college, to pursue a college education (Oliver, 1995). According to the American Association of Community Colleges (AACC), 46% of undergraduate students in the United States attend community colleges and more than half are single parents (AACC, 2015). Because of the needs of this population, there has been an increased demand for online and hybrid courses due to the flexibility and convenience that these types of courses offer (Jaggars, 2014).

Achievement and course completion in online and hybrid

As online and blended college courses continue to grow, programs have come under scrutiny from administrators, educators, and other agencies. Concerns about the achievement and course completion of students taking these courses compared to the students who take traditional face-to-face classes have been voiced. According to the Babson Report (2015), though 50% of academic leaders stated that online learning and face-to-face learning outcomes where the same, 28.6% considered online learning outcomes inferior when compared to face-to-face learning. The same report states that 35.6% of academic leaders found hybrid courses to be superior or somewhat superior to completely face-to-face classes while 13.9% believed that hybrid courses were inferior or somewhat inferior when compared to face-to-face classes. With some faculty and administrators accepting the legitimacy of online education and the disparity of beliefs about which modality is better for students, it is important that additional research in this area is conducted to add to the body of literature so that college leaders can have a better understanding of the reality of academic achievement in the different modalities.

The literature on student success is mixed with some research indicating that there is not a significant difference between online and face-to-face courses (Allen, Bourhis, Burrell, & Mabry, 2002; Cavanaugh, 2001; Long, 2013; Machtmes & Asher, 2000; Shachar & Neumann, 2003; Ungerleider & Burns, 2003). In 2010, the U.S. Department of Education published a meta-analysis and review of online learning studies and found that online learners performed slightly better than students learning the same material in a traditional face-to-face format. Another study found that online Algebra I students performed better than the students who took the course in a traditional face-to-face format on the end of the year assessment (USDOE, 2011). However, some educators (Xu, D. & Jaggars, S, 2013) have reported that students taking traditional on-site courses earned better course grades than students taking the course completely online. In that study, all online students suffered in their performance, but the males, younger students, black students, and those with the lowest grade point averages suffered the most in their performance.

In a comparison of online to hybrid courses, a meta-analysis of the literature indicates that there was no statistical difference between student's performances in the online versus the hybrid sections (U.S. Department of Education, 2010). However, the studies were mixed in the definition of what elements of the course were considered hybrid. Campbell et al. (2008)

compared an online course with a hybrid course, in which the discussions were face to face but all other instruction was online, and found that the online students performed significantly better on the discussions than the hybrid students. Caldwell (2006) found no significant differences on the performance of a multiple-choice test taken by undergraduate science students in an online course versus students taking a hybrid course. It is important to note that these differences in outcome can be attributed to the differences in quality of instruction as well as the differences in terms of the content being taught.

Much of the literature reviewed indicates that traditional face-to-face classes have the highest rate of student course completion while online courses tend to have the lowest course completion rate. For example, Xu & Jaggars (2011) found that students were more likely to fail or withdraw from online courses than from face-to-face courses; however, they found that the course completion rates for the hybrid and the face-to-face were equivalent. In another study done by Xu and Jaggars (2013), the same results were replicated between the online students and the students taking the traditional face-to-face class. Similar findings were found in a study from Texas that looked at archival data over a four-year period and found significant differences in the completion rates of online and traditional students (Atchley, Wingenbach, & Akers, 2013). However, a study at Lane Community College (2010) found no significant differences in completion rates among face-to-face, hybrid, and online courses. A more recent study involving 105 community college students found that the students in the instructor’s online sections were more likely to withdraw from the class than the students taking the instructor’s face-to-face course (Wolff, Wood-Kustanowitz, & Ashkenazi, 2014).

In order for the effective use of hybrid courses, utilizing technology, and online courses to be to be fully implemented in an organization to effectively impact student achievement and course completion, there has to be organizational support from faculty, staff, and administrators. If the culture of the institution is not changed to reflect the use of online and hybrid learning, the implementation of such delivery modalities will not be successful.

Organizational Change

Given the changes in technology and course delivery, it is important to also consider how organizations might adopt these changes. Higher education institutions are very complex organizations with a tradition and resistance to change (Johnson, Hanna, & Olcott, 2003). However, Bowman (1999) has identified three forces that are driving institutions to change: demographics, technology, and knowledge. Demographic changes in the twenty-first century will include changes in the minority population, the aging American population, and the redefining of the American family. Technological changes include technological literacy necessary for students to be able to be competitive in the global economy. Changes in knowledge include the so-called Knowledge Age that, according to Trilling and Hood (as cited in Craig, 2004), began in 1991 when “spending for Industrial Age capital items was exceeded by spending on information technology (p. 81)”.

Many organizations are facing challenges in preparing for these future changes. Guskin & Marcy (2003) argue that these issues driving the change are not cyclical or short term and will require transformation of the institutions. According to Geoff Scott (2003), increased competition, decreased government funding, greater government scrutiny, consumer rights’ movement, and the rapid spread of communication and information technology are driving the change in higher education. Scott’s research at the University of Technology, Sydney (2003) produced 90,000 responses each year from graduates of Australia’s 38 universities. The study’s findings highlighted several key characteristics that make learning programs responsive to students: a) the programs have to be relevant, b) they have to provide opportunities for active learning, c) they have to link theory with practice, d) they have to manage students' expectations, e) they should have flexible learning pathways, f) they should have feedback that is timely and focused, g) they should provide opportunities for self-managed learning and coach students how to use it, h) they should provide administrative services and support that are responsive to the needs of the students, and i) they should acknowledge prior learning and make provision for both program delivery and assessment.

Systems theory has dominated the conversation of organizational change since the mid-1960s and shows that organizations respond slowly or not at all to changing external conditions or that organizations change just to claim that change has occurred without any strategic planning to support the change (Gayle et al., 2003). Higher education institutions have a culture that resists changes and are comfortable with the status quo according to Freed, Klugman & Fife (1997). Gumport and Snydman (as cited in Craig, 2004) use the competing organizational theories of inertia and adaptation when looking at higher education institutions. Inertia is the failure of the organization to respond to changes in demographics, markets, and technology. Adaptive institutions, however, have the flexibility to respond to changes in a measured and analytical way. If an organization is to have meaningful change occur in the organization, it is imperative that the change be done in a calculated methodical way that will help to sustain the change.

In order for an institution to successfully embed e-learning, Rossiter (2007) states that the e-learning innovations have to deliver more than just technological changes. In order for the technological innovation to work, it will have to use, "multiple constituent facts: pedagogy, theory, technology, assessment, administration, commerce, legislation, creativity and research, and at all levels of organisational granularity" (Rossiter, 2007, p. 99). In a study of the introduction of e-learning at four Australian universities, Rossiter identified three different domains that institutions evolve through to accomplish change with e-learning: product centric domain, business domain, and the complex domain. The product-centric domain is very small and usually includes very little institutional investment. In this domain, the innovation has to have a champion who is able to get resources, or the innovation will die. An example of this innovation would be redesigning a course for online of hybrid delivery. When the innovation moves from the individual who championed it to the institution, the institution then enters into the business domain. In the business domain, the institution increases its investment in the innovation and adopts policies and procedures to aid in the success of the innovation at the institution. The complex domain is entered as the institution searches for additional ideas and innovation to make the original innovation more valuable.

New organizational policies were required as a result of Senate Bill 1720. Students had to be informed of the new law and about their exemptions. Student advising had to be re-trained in the advising of new students who were now exempt. Courses and curriculum had to be redesigned or modified to meet the new requirements of the law.

Adaptation

Adaptive schools have to be both efficient and innovative and have to take advantage of various forms of social capital (Hung et. al., 2008). The social capital allows the institution to create a learning community where both the individuals in the community and the community as a whole are learning from each other and create a "culture of learning such that everyone is involved in a collective effort of understanding" (Bielaczyc and Collins, 1999, p. 2). Bielaczyc and Collins (1999), identified learning communities as having four characteristics: a) diversity of expertise among members; b) shared objective of advancing collective knowledge; c) emphasis on learning how to learn; and d) a way to share what was learned. In addition, the community should be structured so that members are dependent on each other in some way.

Kezar (2001) points out that "change occurs because leaders, change agents, and others see the necessity of change," (pp. 5). The organization must find a way to adapt to the change and its unique characteristics that include all of its relationships and its culture (Kezar, 2001).

Theoretical Framework

In order to understand the factors that will affect the students taking compressed developmental mathematics courses, Information Processing Theory and Cognitive Load Theory can be used to illustrate some important issues. In an *Inside Higher Ed* article, Vincent Tinto (2010) stated that," We must stop tinkering at the margins of institutional life, stop our tendency to take an 'add-on' approach to institutional innovation, … stop marginalizing our efforts and in turn our academically under-prepared students, and take seriously the task of restructuring what we do" (p.52). The accelerated developmental mathematics courses involved in the study have been instructionally designed and guided by the Information Processing Theory as well as the Cognitive Load Theory.

Information Processing Theory

Information Processing Theory states that individuals can change information, think about it, and process it while at the same time building a capacity to hold and process the information (Kuhn, 2009). Information Processing involves several processes, which the learner goes through every time new information is encountered. Information Processing focuses more on how a problem is solved rather than was the problem solved correctly. According to Gagne (1998), there are several "Events of Instruction" that make up instructional events. Traditional face-to-face and hybrid instructors have an advantage when teaching over online instructors when gaining the attention of students and providing feedback in the physical classroom setting

Information Processing Theory is often compared to the workings of a computer system in how it tries to explain the individual mental processes that take place in the perception, storage, and retrieval of information (Mayer, 1996). Information is input through the sensory system, and it is then placed into the working memory. In the working memory, information is either processed or is lost. If the information is properly encoded, it will be placed into the long-term memory.

The three different delivery modalities are impacted in the different stimuli that may be delivered to the learner by the instructor. In a traditional classroom as well as the hybrid classroom, the learner has the benefit of focusing on lectures of the instructor as well as immediate access to assistance from the instructor to help them with their information gathering skills as needed. This immediate response and assistance in the gathering of information may not be as readily available to students who are taking an online course, and who may be communicating asynchronously with their instructor. The additional difficulty of communicating and ability to render assistance may lead to an increase in cognitive overload.

The transformation of the information from the stimuli into the metacognition area is one that can be influenced by the environment and by modeling. The speed with which the individual processes the material may depend on different factors such as age (Strayer et al., 1987), immersion of the material (Olmos et al., 2000), and the workload involved (Wickens & Hollands, 2000). The environment and the instructor can have a major role in the influence of what will be retained and how the processing takes place. In the classroom and hybrid courses, the practice with the computer aided instruction gives the student immediate feedback and allows them to process what they did wrong and then try to do similar problems over and over until they are able to internalize the information. This immediate feedback to the learners from the instructors is not available to most of the online learners. In the physical classroom, the instructors can help the students with their focusing skills and information gathering skills. This may serve as an advantage to the students who take a traditional face-to-face class or a hybrid class. Although the online courses also utilized computer aided instruction to assist in the learning process of the students the assistance with focusing skills and information gathering skills were not supplemented by a physical instructor.

Cognitive Load Theory

The Cognitive Load Theory explains how working memory is affected by the amount of mental effort which is used to complete a task. Cognitive Load Theory was developed by Sweller in 1988 (Cognitive Science) and builds upon Information Processing Theory. CLT focuses on the Working Memory, which holds approximately seven items at one time, also referred to as cognitive load, and the building of schemas. Sweller's perspective was that the emphasis on problem-solving skills was actually interfering with learning (p. 257) and that educators should avoid overloading the working memory, for doing so was not conducive to optimum learning. He pointed out that experts possessed cognitive structures or schemas which enabled them to recognize problems and problem states from previous experiences and categorize them accordingly; novices did not possess the same schemas. This phenomenon led him to suggest "that schema acquisition constitutes a primary factor determining problem solving skill" (p. 260). As a result, he focused his research on how best to acquire the skill of problem-solving (p. 260).

The three different delivery modalities may have different impacts on the cognitive loads of students. The most challenging modality may be the completely online courses as that may be the modality which puts the greatest stress on a student's cognitive load. Learners can only absorb and learn a certain amount of material before their cognitive capacity are overloaded. Courses should be instructionally designed to reduce cognitive loads of students who are learning at a distance in order to avoid overloading. By carefully laying out how a course is designed, the instructional designer can focus on "chunking" the content in an order that will allow the students to build their "schemas". In the online environment, part of this overload may be caused by two different activities overlapping (learning math as well as learning to use the technology involved in the course) which would result in a limited cognitive processing ability to accomplish either.

Chapter Summary

Developmental education has been debated in both educational institutions and state legislatures. The State of Florida has passed Senate Bill 1720 which changed the face of developmental education in Florida. Most of the students in Florida are exempt from having to take a developmental courses upon entering college because of the Senate Bill. The literature review suggests that developmental students need more guidance and "hands-on" assistance to be successful. Computer aided instruction and more personalized time with instructors or tutors are also recommended.

Conclusion

In Chapter 2, I have provided an overview of developmental education in mathematics, technology in developmental education and the impact on course completion and achievement, as well as an overview of the organizational change needed to be successful for organizational change to occur. I have discussed research that showed how technology could impact course completion and achievement of students taking developmental mathematics courses.

Chapter 3 contains a description of the methodology I used to conduct the study. I will discuss the purpose of the study, the research questions, and the study site. I will explain the sampling method that was used in the study and the measurements. Finally, I discussed my data collection procedure as well as my plan of analyses.

CHAPTER 3 - METHODOLOGY

In this study, I investigated student achievement, as measured by grade earned in the course(A,B,C,D,or F/FN), and course completion, as measured by the number of students who completed the course and received a grade, in a developmental mathematics class, which was taught in an eight week session in three different delivery modalities - completely face-to-face, hybrid, and completely online. To examine the differences, I conducted a quantitative study using archival data. The purpose of this study was to determine if there was a significant difference in student achievement rates and the course completion rates of students enrolled in an eight week developmental mathematics course, Elementary Algebra, based upon the delivery modality. In this chapter, I also provided a rationale for the choice of research method and then discuss the site of the study. Data collection and ethical considerations for the study will be described in this chapter as well.

Purpose of the Study

The purpose of this study is twofold. The first purpose was to determine whether students taking a developmental mathematics course, Elementary Algebra, in a compressed eight-week format were more successful in a fully face-to-face format of delivery, a hybrid form of delivery, or a fully online form of delivery. The second purpose of the study was to investigate if there was a significant difference in the course completion of students taking the same course in any of the three different delivery modalities. It is important to understand both which format of delivery is most instrumental to students' academic achievement as well as to understand if delivery modality has an effect on student course completion. Institutions, as well as policymakers, can use the data on student academic achievement and course completion to make informed decisions.

Research Questions

The following research questions will guide the study:

1. Does modality (i.e., online, hybrid, or face-to-face instruction) influence student achievement in a developmental mathematics course?

    Prediction: There is a statistical difference in student achievement based on instructional modality. (Allen, Bourhis, Burrell, & Mabry, 2002; Cavanaugh, 2001; Long, 2013; Machtmes & Asher, 2000; Shachar & Neumann, 2003; Ungerleider & Burns,2003)

2. Does modality (i.e., online, hybrid, or face-to-face instruction) influence student course completion in a developmental mathematics course?

    Prediction: There is no statistical difference in student course completion based on instructional modality. (Xu & Jaggers, 2013)

Research Site and Research Population

The research site chosen for the study was a large multi-campus institution located in the United States. The institution is an open-access institution located in the southeast United States and has approximately 60,000 students annually. The college currently offers more than 150 degrees and certificate programs as well as a limited number of bachelor's degrees. As an open-access institution, the college accepts all students who apply, regardless of their educational experience. Prior to the passage of Florida Senate Bill 1720 in 2013, approximately 70% of the students at the research site were required to take developmental courses, the majority of them in mathematics. The college at which the research was conducted generally offers approximately fifty sections of the developmental mathematics course being investigated each semester in all three delivery formats. Once Florida Senate Bill 1720 was passed, the college implemented the compression of developmental courses in all three modalities. As a result of the passage of Senate Bill 1720, the percentage of students taking developmental courses dropped to approximately 40%. The institution at which the research was conducted is considered an educational innovator and is currently partnered with Achieving the Dream to increase student success. Achieving the Dream is a nonprofit organization, created by the Lumina foundation in 2004, that works with institutions to improve student success through the use of institutional initiatives and interventions and working with educational partners and investors.

The population researched in this study were all students who were registered in the elementary algebra developmental mathematics course in the Fall 2015 and Spring 2016 terms. During these two terms, 205 sections of the developmental mathematics course were offered in the three different delivery modalities, and a total of 1758 students were enrolled. The majority of the students at the institution where the research was completed are part-time students with approximately 1/3 registered as full-time students. Approximately 60% of the students at the college are female with students in the age range of 15 to 77, and the average age of students being 27. The student body population is comprised of approximately 48% white, 26% black, 6% Hispanic, and 20% other.

The data from this study should generalize to other comparable community or state colleges in Florida that offer accelerated developmental courses, including developmental mathematics courses, in any of the three different delivery modalities.

Online Learning Environment

One of the challenges in teaching a course online is meeting the needs of the students and facilitating the information that has to be learned to them in a fashion that will allow them to comprehend the materials. This is where the instructional design model plays an important part in helping to meet the needs of the students. Using Information Processing Theory as well as Cognitive Load Theory, the courses are designed with the way students learn in mind. Graphs are labeled within the graphs to help ease cognitive load. The materials are structured in such a way as to allow the students to develop schemas which would help them to learn new materials.

As the courses are developed, the instructional designers focus on the learning process and reducing the material that is being presented at one time to the learner as well as integrating information so that the learners working memory is not overloaded. One example of helping to reduce cognitive load is by differentiating instructional techniques. By presenting materials in different ways, the learner will be able to absorb materials with different processing methods which will help to reduce their cognitive loads.

Another instructional design method of reducing cognitive load and helping working memory is to “chunk” information. As information is chunked, learners do not overload their working memory and should be retain the smaller chunks of information in their long term memory. An instructionally designed course uses the principles of both the Information Processing Theory as well as the Cognitive Load Theory to guide the development of the course. However, once the course is developed, the actual delivery of the course may vary by instructor based on the teaching style of the instructor as well as the status of the faculty member as either a full time faculty or an adjunct faculty.

Typical Instruction in Context

At the institution where the research was conducted, the Elementary Algebra course is currently offered in three different delivery modalities. Traditionally, the course was offered in a 16 week semester and the majority of the course offerings were in the face to face modality. However, in the past few years, there has been a growth in the hybrid and online offerings. With the passage of Senate Bill 1720, the course has changed from being offered in a 16 week semester to being offered in an 8 week semester. The face to face courses have traditionally been taught with lecture components and with practice (or rehearsal) in the course. An average meeting pattern for a face to face class would be meeting physically with an instructor twice a week for an extended time or meeting four days a week for a shorter period. The hybrid courses have both a face to face lecture component and then utilizes computer software for additional practice. An average meeting pattern for a hybrid course would be meeting physically with the instructor once a week and then performing additional work online for the other part of the course. Most hybrid courses are a 50/50 split between face to face meeting and online work. In an online course, the instruction is delivered completely online with no physical meeting between the instructors and the students. The online course along with the online portion of the hybrid courses are generally taught in an asynchronous manner, however, online instructors are required to hold weekly virtual office hours.

All three different delivery modalities may be taught by both full time and adjunct faculty members. At the institution where the research was conducted, there currently is a required training in order to teach in both the online and in the hybrid modality.

Sample and Sampling Method

This study utilized archival data that was limited to students who were enrolled in an eight week developmental mathematics course, Elementary Algebra, taught at the research site during the Fall 2015 and Spring 2016 terms. This course was chosen because it has been taught in all three delivery modalities in the last three years and is considered a developmental gateway course for many students entering the institution. The developmental mathematics course has been instructionally designed by the college and will therefore be very similar across all three different delivery modalities. This sample was chosen because these two terms were the first two terms in which all of the developmental courses were offered in the eight-week compressed model regardless of delivery modality.

All students enrolled in the eight week developmental mathematics course during the Fall 2015 and the Spring 2016 terms were used as part of the sample group. The sample population was organized into three different groups: those who took the course in a face-to-face setting, those who took it in a hybrid setting, and those who took the course in a completely online setting.

Measures and Measurements

Modality

The Babson Survey Research Group conducts annual surveys and research reports which are widely recognized and used as an authoritative source for information about trends in online education. The group has conducted a distance learning survey since 2003 and has maintained the same definition of course modalities throughout the years. The Babson Survey Group defines face-to-face learning as a course in which zero to twenty-nine percent of the content may be delivered online, hybrid learning is defined as courses in which thirty to eighty percent of the course may be online, and online learning is defined as a course in which more than eighty percent of the course may be presented online (Allen & Seaman, 2017). For the purpose of this study, the definitions set forth by the Babson Group were used so that there would be consistency with the courses used in the study. The Babson definition is also recognized and used by the institution where the study was completed. Only courses using the standardized development model and meeting the definition of the Babson Group were selected for the study, any courses not meeting the definition or not utilizing the designed courses were exempted from the study.

Course completion

In higher education, the words student persistence and student course completion are often used interchangeably. However, according to Hagedorn (2005), the National Center for Education Statistics defines “course completion as an institutional measure and persistence as a student measure” (p. 6). Although there has been much public discussion about course completion rates, it is very difficult to compare from institution to institution since there is no universally accepted definition or measurement of the term (Van Stolk, et al. 2007).

At many institutions, course completion can be looked at programmatically or can be measured by students who enroll from term to term. For the purpose of this study, the students enrolled in the developmental mathematics course were treated as a cohort, and course completion was defined as those who enrolled in the course and completed the course with a final grade in the course. Once the student has earned a final grade, he or she will be viewed as having completed the course regardless of the modality in which the course was delivered.

Academic Achievement

Since the passage of No Child Left Behind Act of 2001, academic achievement has become an important measurement of many educators to help define how programs and institutions impact students' academic school success. However, the definition of academic achievement may vary widely between educational stakeholders and other in the community. Academic achievement can be seen as a representation of academic ability and a gauge of academic performance. It can be assumed that a grade measures the extent to which a student has mastered the learning objectives of the coursework. Choi (2005) uses the term *academic achievement* to describe student GPA and as a measure of academic success. Parker, Summerfeldt, Hogan & Majeski (2004) use the terms *academic achievement* and *academic success* interchangeably, and most of the literature uses the terms academic success and academic achievement interchangeably (Choi, 2005; DeFreitas, 2012; Dennis et al., 2005; Gore, 2006; Tracey, Allen &Robbins, 2012; Zajacova et al., 2005).

For the purpose of this study, academic achievement was measured by the course grade of A, B, C, D, or F. Students who earned a grade of a C or above were coded as having passed the class and earning college credit for the course.

Procedures

Data Collection

Data used to conduct this study was gathered from the institution's information system. Permission to study the data was obtained from the institution's Institutional Review Board, and the study plan that was submitted to the IRB was accepted as an exempt study. All of the data in this study originated from the research site's information management system which is maintained by the college's Institutional Analytics and Research Department. The data ~~was~~ were gathered from the Grade Analytics Dashboard which contains approximately one million student course grades spread across sixteen consecutive academic terms and which is also maintained by the Institutional Analytics and Research Department.

Prior to granting access to the data, the Institutional Analytics and Research Department removed all personal identifiable information from the data at my request. The data were filtered by final student grade received in the course and the course completion rate of those completing the course.

The data gathered did not have any identifiable personal student information, and there was no interaction or intervention with the students included in the study sample and no direct participation of human subjects.

Plan of Analyses

Data testing of all the predictions was conducted using analytical software. To examine the research questions an analysis of variance (i.e., one-way ANOVA) test was run to determine if there was a significant difference between the dependent and independent variables. The first test was to investigate whether student achievement (i.e., the dependent variable) was affected by the modality in which the course was offered (i.e., the independent variable). The second test was to research to what extent student course completion (i.e., the dependent variable) was affected by the modality in which the course was delivered (i.e., the independent variable). The ANOVA test was used and its assumptions were assessed. One of the assumptions of the ANOVA was that the dependent variable would be normally distributed for each category of the independent variable. Another assumption was that there would be homogeneity of variances. The t-test was designed to be two tailed with the probability of rejecting the null hypothesis when it was set at $p<0.05$. This was to ensure that there would be a 95% possibility that the differences did not occur by chance.

Summary

I described in this chapter the research design, population and sample, hypotheses, data collection, and analysis used in this quantitative research study. I explained that I used statistical analysis using one-way analysis of variance and t-test to determine if there were any significant statistical differences in the academic achievement and course completion of students enrolled in any of the three different delivery modalities used to teach the compressed courses. The results of this study will be presented in Chapter Four.

CHAPTER FOUR

Results

The purpose of this study was twofold. The first purpose was to determine if there was a significant difference in academic success among students taking a developmental mathematics class in three different delivery modalities; face-to-face, hybrid, and completely online. The second purpose of the study was to compare the course completion rates of students in the face-to-face classes as compared to the completion rates in hybrid classes, as well as in the completely online classes. The researcher used final course grades as the determinant of academic success in the courses. In addition, the researcher examined demographic relationships of gender, race, and age in relation to student academic performance in the three different delivery modalities.

This chapter begins with a demographic overview of the institution as well as of the population included in the study.

Institutional Demographics

The institution where the research was conducted is a large multicampus state college located in the southeastern United States. The institution typically has an annual enrollment of approximately 50,000-60,000 students. The majority of the students at the institution are part time students. Demographic data for the sample semesters of Fall 2015 and Spring 2016 terms were provided by school's institutional research department. The demographic profile of the institution is similar to the demographic profile of the study group. Tables 1, 2, and 3 include the demographic profile for the institution.

Table 1

Institutional Student Gender Profile

Gender	Fall 2015	Spring 2016	Avg.
Female	57%	57.4%	57.2%
Male	43%	42.6%	42.8%

Table 2

Institutional Student Race Profile

Race	Fall 2015	Spring 2016
Black	26.6%	26%
White	46.3%	45.7%
Hispanic	7.7%	9%
Other races	19.4%	19.3%

Table 3

Institutional Student Age Profile

Student Age	Fall 2015	Spring 2016
Under 18	6.9%	8.1%
18-21	32.9%	27.8%
22-24	15%	14.4%
25-29	16.1%	16.1%
30-34	10%	10.6%
35-39	6.3%	6.9%
40-49	8.6%	10%

50 and over	4.2%	6.1%

Sample Demographics

The institutional research team provided data from the school's data system for the Fall 2015 and the Spring 2016 terms. The data included all developmental mathematics class, Elementary Algebra, taught in an eight-week session. The sample included courses taught in the face-to-face, hybrid, and in the online modality by both full-time and adjunct faculty members. The overall sample size of the study population was 1751 (n=1751) The average age of the students involved in the sample was 27 years old, which was very similar to the average age of the students at the research site which was 27.5 years old.

The Effects of Delivery Modality on Academic Success

A one-way between-subjects ANOVA was conducted to compare the effect of course delivery modality on student achievement in face-to-face, hybrid, and online learning environments. The results of the one-way ANOVA, presented in Table 4, indicated that there was a significant difference among the three different delivery modalities. There was a significant difference on student success among the different delivery modalities at the $p < .05$ level for the three conditions ($F(2,1755) = 22.49$ $p < .001$; $ή^2 = .025$)]

Table 4

One Way Analysis of Variance (ANOVA) of Success by Delivery

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.18	2	5.09	22.49	.000
Within Groups	397.36	1755	.27		
Total	407.54	1757			

In Table 5, a post hoc comparison using the Tukey HSD test indicated that the mean score for the completely online modality (M = .503, SD = .500) was significantly different than the face-to-face modality (M = .672, SD = .469) and the hybrid modality (M = .688, SD = .463). However, there was no significant difference between the face-to-face modality and the hybrid modality.

Table 5

Post Hoc Test for Student Success and Delivery Modality

			Subset for alpha = 0.05	
	Delivery Method	N	1	2
Tukey HSD[a,b]	Distance	439	.50	
	Classroom	774		.67
	Hybrid	545		.69
	Sig.		1.00	.84
Duncan[a,b]	Distance	439	.50	
	Classroom	774		.67
	Hybrid	545		.69
	Sig.		1.00	.57

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 555.067.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

This evidence can be interpreted to mean that there is a difference between the success rates of students taking the eight week developmental mathematics course in a completely online delivery modality. The students taking the eight week online developmental class were not as successful as the students taking either the completely face-to-face class or the hybrid version of the class.

The Effects of Delivery Modality on Course Completion

A one-way between-subjects ANOVA was conducted to compare the effect of course delivery modality on course completion in face-to-face, hybrid, and online learning environments. There was not a significant difference on course completion among the different delivery modalities at the p<.05 level for the three conditions ($F(2,1755) = 1.15$; $p = .318$; $\acute{\eta}^2 = .025$).

Table 6

One Way Analysis of Variance (ANOVA) of Course Completion by Delivery

		Sum of Squares	df	Mean Square	F	Sig.
Retention	Between Groups	.114	2	.057	1.147	.318
	Within Groups	87.072	1755	.050		
	Total	87.185	1757			

Table 7

Post Hoc Test for Course Completion and Delivery Modality

	Delivery Method	N	Subset for alpha = 0.05 1
Tukey HSD[a,b]	Distance	439	.93622
	Classroom	774	.94703
	Hybrid	545	.95780
	Sig.		.240
Duncan[a,b]	Distance	439	.93622
	Classroom	774	.94703
	Hybrid	545	.95780

Sig.	.128

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 555.067.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

The research questions that guided this study were the following:

1. Are there differences in achievement rates in an eight week developmental mathematics course, Elementary Algebra, by modality (online vs. face-to-face vs. hybrid)?
2. Are there differences in course completion rates in an eight week developmental mathematics course, Elementary Algebra, by modality (online vs. face-to-face vs. hybrid)?

The results indicate that there is a difference in the success rates of students taking the eight week developmental mathematics course in a completely online delivery modality when compared to the face-to-face and hybrid delivery modes. The students taking the eight week online developmental class were not as successful as the students taking either the completely face-to-face class or the hybrid version of the class (Figure 2).

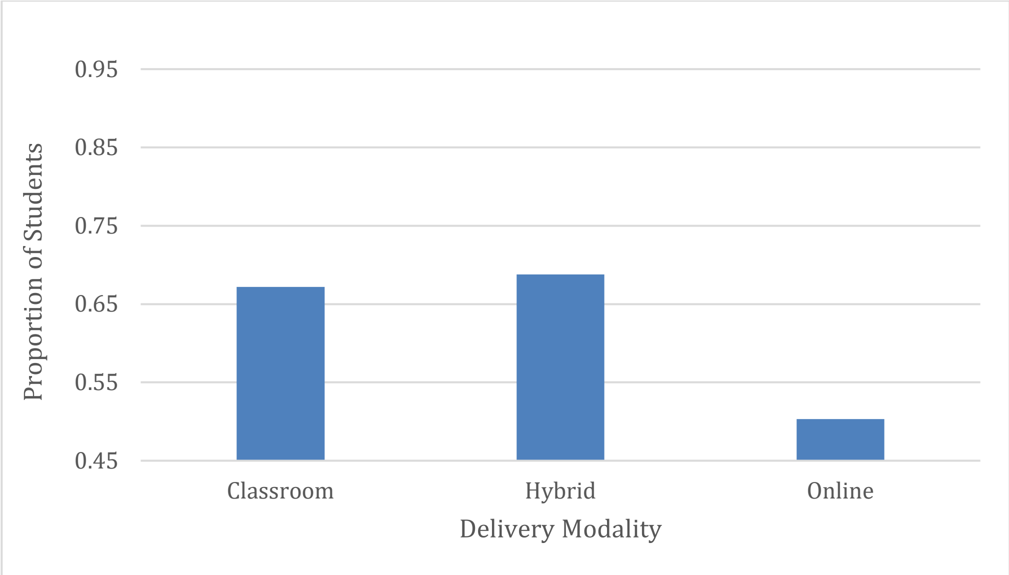

Figure 2. Student Achievement by Delivery Modality

At the same time, as predicted, there was no difference in course completion rates among the face-to-face, hybrid, and online modes of delivery (see Figure 3).

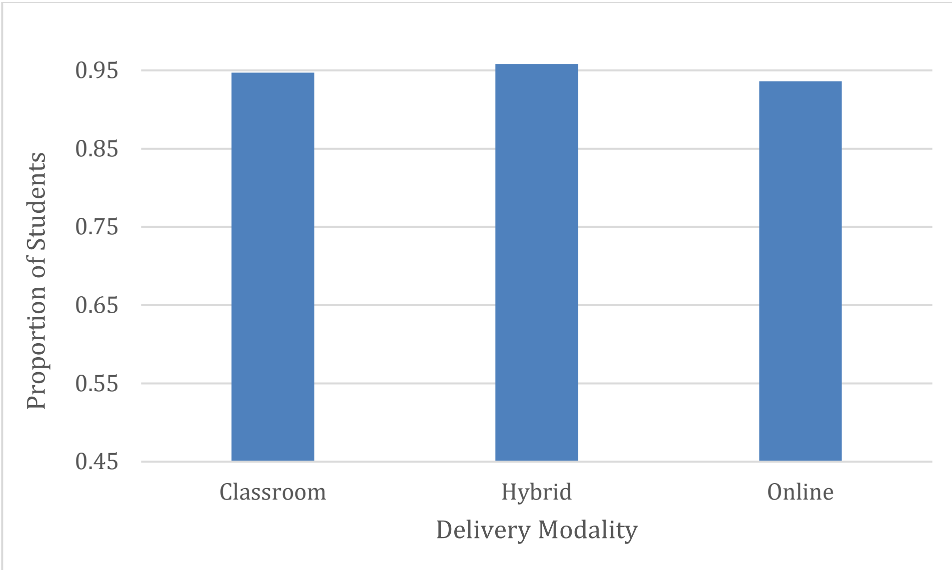

Figure 3. Course Completion by Delivery Modality

Summary

In this chapter, the purpose of the study as well as the analysis was presented. The institutional demographics were discussed as well as the demographics of the research population. The statistics and results of the one way ANOVA were interpreted for both student success and course completion.

Results of the test revealed that there was a significant difference among the success of students taught online compared to those taught in the face-to-face or hybrid modality. However, the analysis revealed that there was no significant difference in course completion among either of the three different modalities.

Chapter Five will provide a summary of the study and discussions for future research as well as a conclusion to the study.

CHAPTER 5 – DISCUSSION AND RECOMMENDATION

Discussion

The significance of this study is that the information presented might convince educational leaders and other policy makers of the need to revisit the way developmental courses such as Elementary Algebra are designed and taught. The data indicated that students taking Elementary Algebra were more successful when taking classes face-to-face or in a blended mode. The results showed that there was a significant difference when looking at student achievement between the online modality compared to the face- to-face and the hybrid modality. In addition, the results showed that there was not a statistically significant difference in course completion rates among the three different delivery modalities: face-to-face, hybrid, and totally online.

Online learning has greatly increased its presence as a delivery mode at many higher education institutions in the United States. Since 2012, the number of students taking at least one online course has increased by 11% (Allen & Seaman, 2017), and online education has become an important part of growth for the institution where the study was conducted. The purpose of the study was to increase the literature about online education in an effort to explore what modality was best for achievement and course completion in Elementary Algebra. To accomplish this objective, there were two questions that guided the research study. The first question was whether there was a significant difference in achievement rates in a developmental mathematics course, Elementary Algebra, by modality (online vs. face-to-face vs. hybrid)? The second question was whether there were differences in course completion rates in a developmental mathematics course, Elementary Algebra, by modality (online vs. face-to-face vs.

hybrid)? A review of the rest of the descriptive data (see Appendix) indicated that delivery modality alone was not enough to explain the low achievement rates. I will now discuss some other factors that might have caused this occurrence.

Generally, students taking Elementary Algebra face numerous challenges that contribute to their lack of achievement. First, though educators see Elementary Algebra as an entry level course, many students are not adequately prepared to take even this course. To compound the problem, many take the class just to satisfy requirements imposed by the programs they wish to pursue or to meet the requirements of higher education institutions; few take the class to understand or “to master” the concepts taught in the course or the establish a solid foundation for further study. Because of this, the focus is not so much on understanding materials or mastery of content; instead, many students approach the course as a necessary obstacle that needs to be overcome or bypassed. When taking classes face-to face, or in a hybrid mode, such students interact with professors who are passionate about their discipline, and such professors can at times succeed in motivating students to revisit their reasons for taking the class and become a bit more committed to understanding course concepts. In addition, the face to face modality and the hybrid modality offer immediate feedback from the instructor during practical exercises in class while the instructor is physically present. This is generally not an option afforded to most online students who normally connect asynchronously with their instructors. If they have questions about their practical exercises, they generally would have a somewhat extended wait period until their instructor responds to their question. Though instructors teaching online may find it difficult to make this connection with students, data indicate that there are no significant differences in the course completion of students regardless of delivery modality. This would indicate that the challenges that lead to a lack of achievement are present in all delivery modalities and leads me to think that the basis of the problem lies in how we approach the teaching of concepts in these types of courses.

Findings Related to Literature

Information Processing Theory, one of the frameworks through which I am interpreting the data, states that individuals can change information, think about it, and process it while at the same time building a capacity to hold and process the information (Kuhn, 2009). Information Processing involves several processes, which the learner goes through every time new information is encountered. Online students may not have all of the immediate benefit of the stimuli which goes into the sensory memory.

Information Processing focuses more on how a problem is solved rather than whether the problem was solved correctly. When one reflects on the philosophy behind the teaching of mathematics, one quickly sees that colleges which are teaching developmental classes using an accelerated model essentially are focusing more on problem solving, i.e., instructing in ways designed to get students to arrive at correct solutions, instead of developing thinking related to how problem solving should be approached. This occurs because educators using such models believe that the courses are more a review of materials previously learned by the student that an attempt to teach students the concepts and skills covered in the courses. The data that have emerged indicate that students need a first-rate attempt instead of a review, for though many pick up a cursory understanding of the material, most do not understand the material long term - i.e., many can pick up enough to solve a problem correctly at the skills level, but quickly forget the material covered and are not convinced that they can really “do” math.

Sweller (1988), in researching how novices and experts approached problem-solving in areas such as mathematics and science, observed that teaching mathematics primarily by assigning students to solve problems was actually interfering with learning (275). Building upon ideas expressed in Information Learning Theory, he developed what is known as Cognitive Load Theory (CLT), which focused on how best to acquire the skill of problem-solving (260). His caution was that educators should avoid overloading the working memory when teaching. As I investigated the success and completion rates of students taking classes in Elementary Algebra, I found that Sweller's Cognitive Load Theory presented concepts through which we could address the challenges that we faced when teaching Elementary Algebra. Classes instructionally developed using the Information Processing Theory as well as the Cognitive Load Theory are meant to facilitate the intake of materials, reduce cognitive load, and help the student to retain information in their long term memory.

Online education has not only allowed colleges and universities the ability to expand their service areas and increase enrollment, it has also created new opportunities for students who were unable to attend traditional campus-based courses. With this increase of students taking online course, one of the primary purposes of this study was to determine if a significant difference existed between student success, as measured by passing grade of "C" or higher, and the modality in which the course was delivered. Several studies found no significant differences in the achievement rates between students taking online and traditional face-to-face courses Allen, Bourhis, Burrell, & Mabry(2002), Cavanaugh (2001), Long (2013), Machtmes and Asher (2000), Shachar and Neumann (2003), and Ungerleider and Burns (2003). These studies compared grades of students taking face-to-face courses versus the grades of students taking the same courses online and found no difference in achievement between the two different delivery modalities. A meta-analysis conducted by the USDOE (2011) concluded that students taking online courses tended to perform better than their face-to-face counterparts. The results of the previous studies were not supported by this study. Rather, this study supported the findings of a study conducted by Xu, D. and Jaggars, S. (2013) which found that students taking courses in a traditional face-to-face modality were more successful than their peers taking the same course in an online modality.

The second purpose of this study was to determine if a significant difference existed between course completion in an eight-week developmental mathematics class and the delivery method of the course. Xu and Jaggars (2011 and 2013) found that students were more likely to withdraw or not complete an online class as compared to a face-to-face class. This study did not support that previous research. There was no significant relationship between course completion and the modality in which the course was delivered.

Limitations of the Study

One limitation of this study was that classes in each modality were taught by both full-time and adjunct faculty. Though professors in each group are considered experts in the field because of the credentials they possess and had access to professional development, students have noted that there are differences in the level of ability to teach because of the knowledge or lack of knowledge that professors possess about items such as available resources - I could not track the level of expertise of the individual instructor. Instructors teaching online may have different teaching styles as well as different knowledge of the learning platform used to deliver the online course as well as different levels of technical expertise.

An additional limitation was that though classes taught in different modalities were considered the same, there were differences inherent in the challenges associated with using specific modalities that could not be accounted for; an example of this is the different levels of access to the Internet and computers that individual students taking the classes in the hybrid or online modality might have had. The institution recommends the use of specific operating systems as well as specific hardware requirements for taking an online or hybrid course, but there is no guarantee that the students are meeting the requirements recommended by the college.

One more limitation was the level of expertise each student, possessed in both preparation to take a course in math and in knowledge of the use of technology. Because community and state colleges are open access institutions, students who enroll in classes possess varying levels of knowledge and academic behaviors. The dispersion of technology is also not equitable distributed among our different students. Many of the students may not be using technology that has been recommended by the college, and a growing number of students are using phones as their primary means to access online course materials. I could not account for any of these differences during the study.

Future Directions for Research

The recommendations in this section are focused on three audiences: students, instructors and administrators.

Students

One recommendation is to provide each student enrolling into mathematics courses with opportunities for diagnostic testing. Such tests should not be designed to prevent students from enrolling into courses; instead, the idea should be for students who would have enrolled to be provided a mechanism to address areas of weakness. Next, instructional packets that cover specific topics should be designed and offered in modules and made available to students free of charge.

Another recommendation would be to require an orientation to online for all learners taking courses online. Currently, at the institution where the research was done, there are no requirements for students to be oriented to online learning. Many students do not understand the nuances that are required to be successful in an online class. For many of these developmental students who are required to take remedial math, the online delivery modality poses an additional challenge. Students are not only required to learn the content for the course, but they are also being required to learn the intricacies of the delivery modality as well as any third-party software that will be utilized during the course. This tends to provide an additional stressor to the students cognitive load, and this could be a reason for the discrepancies in the success of the online delivery modality. An online orientation would allow a student the opportunity to decide if he or she was truly prepared to take an entirely online course.

Instructors

One important recommendation to make for instructors would be that all instructors be properly trained in how to deliver an interactive, effective online course. Many instructors like the idea of teaching online because it is seen as an area of enrollment growth for institutions (Allen & Seaman, 2015). Although their willingness to serve the students are well intentioned, some may not have the proper training for interaction with students online, giving appropriate feedback online, or even in how to prepare their classes for an online delivery modality. The instructors should not only have a working knowledge of effective teaching online, but in the case of teaching remedial students, they should also have the preparedness of understanding the special considerations of the developmental student population.

Training for teaching in a hybrid or completely online modality should be a mandatory requirement prior to teaching a hybrid or fully online course. Best practices for distance learning students should include communication practices, grading practices, and overall presence in the virtual classroom. There should also be an understanding of ADA requirements and copyright compliance training. There should be an effective demonstration of the ability to use the college’s learning management system as well as how to provide assistance to students who may either not understand the content or how to use the delivery platform of the course.

Administrators

In reviewing the data, I found that there was a significant difference between the success rates of students taking classes face-to-face and in a hybrid format, and those taking classes online. Students who withdrew from the class cited personal reasons as the primary reason for withdrawing. Others commented on the length of the course, and some noted that they were not familiar enough with the technology used in the course to complete the class successfully. Providing students with more information prior to beginning the class may address these concerns. Though instructors may be providing such information to students, a more directed and purposeful approach may be needed. Many educational institutions are in the process of changing the way they have traditionally served developmental students. In order for such a change to be effective and accepted, the institution must have a strong visionary leader who is not afraid to make unpopular decisions or afraid to take risk and must be able to manage the change. The task of changing some delivery methods of the developmental course requires strong commitment from the leader. Attitudes and mindsets must be changed and the success of the students must still be the primary focus. The implementation of such a task could be a daunting challenge that could fail. At the institution where the research was conducted, the institution focused on doing the majority of its mathematics courses in a compressed eight-week format. The support of the leader was essential in making this initiative successful at the research site. This change has to be implemented top down from the leadership to the faculty and ultimately to the students who may be concerned about taking an accelerated mathematics course.

Additional initiatives that may be implemented with the support of leadership would be a mandatory orientation to online learning for students. Such an orientation should contain information about college resources in dealing with life-related issues and information about using technology. In addition, administrators should encourage faculty to create and administer a pre-test that inform students of the knowledge they are expected to possess before enrolling in Elementary Algebra and of the areas where they need additional practice before taking Elementary Algebra.

Some students and faculty state that the accelerated format of instruction is not conducive to the success of students taking Elementary Algebra, especially students who enter higher education via the open access model. This is a claim that should be investigated in a careful and deliberate manner. Additionally, though it is assumed that students have already been exposed to the skills and concepts found in Elementary Algebra and need a course just to refresh skills forgotten, this view is not held by students and faculty. Many students who encountered problems in Elementary Algebra do not recall having covered the materials discussed; hence their concern about attempting to complete the entire course in eight weeks. Because these comments were made by both students and faculty, I suggests that this is an area where additional, more purposeful research is needed. Assuming that students have previously been exposed to the concepts and skills covered in the course, research should be conducted to see whether Cognitive Learning Theory does provide a framework that can ensure success in Elementary Algebra and similar entry level courses.

Additional research should be conducted to see if the same outcomes are achieved when looking at different semester lengths. This study utilized the accelerated eight week course, but it may be beneficial to look at this course taught in a 12 week and 16 week terms. In conjunction to the course length, it would be beneficial to understand if there is a statistically significant difference in both student achievement and course completion between adjunct faculty and full time faculty teaching the course.

Another area of interest would be to measure the student achievement and course completion of students who are required to take an orientation to online learning to see if there is a statistically significant difference between student taking an orientation to online learning versus students who do not take an orientation to online learning. Finally, it would be important to understand if student demographics has a statistically significant impact on student achievement or course completion based on the different delivery modalities.

Conclusion

After reviewing data on student course completion and achievement rates, I have concluded that students achieve at a higher rate when they take the Elementary Algebra course in either a face-to-face or hybrid format when compared to the Online format. The primary explanation for this phenomenon is that students in such classes get information in a face-to-face format, even if 50% of the time, as is the norm in a hybrid; this delivery approach ensures that students get knowledge of course materials and concepts in a manner that they understand – the access to an instructor minimizes the risk of information not being communicated effectively, and misunderstandings can readily be “cleared up.” On the other hand, though one might think that the face-to-face modality has the potential to be the most effective, success and completion rates are affected by students’ abilities to attend classes consistently because of family and work demands; therefore, the hybrid model has the potential to be the most effective. Meanwhile, completion and student achievement rates in courses delivered completely via an online modality are impacted by students' level of preparedness and students' access to technology.

APPENDIX A

Florida College System Developmental Education Implementation Plan Template Section (s.) 1008.30, Florida Statutes (F.S.), excerpt:

(6)(a) Each Florida College System institution board of trustees shall develop a plan to implement the developmental education strategies defined in s. 1008.02 and rules established by the State Board of Education. The plan must be submitted to the Chancellor of the Florida College System for approval no later than March 1, 2014, for implementation no later than the fall semester 2014. Each plan must include, at a minimum, local policies that outline:

1. Documented student achievements such as grade point averages, work history, military experience, participation in juried competitions, career interests, degree major declaration, or any combination of such achievements that the institution may consider, in addition to common placement test scores, for advising students regarding enrollment options.
2. Developmental education strategies available to students.
3. A description of student costs and financial aid opportunities associated with each option.
4. Provisions for the collection of student success data.
5. A comprehensive plan for advising students into appropriate developmental education strategies based on student success data.

Please enter the following information and submit to the Division of Florida Colleges no later than March 1, 2014. Florida College System institutions are recommended to submit plans by

January 15, 2014, to Ms. Julie Alexander at julie.alexander@fldoe.org for approval by the chancellor no later than March 1, 2014.

COLLEGE:

SUBMITTED BY:

TITLE:

BOARD OF TRUSTEES APPROVAL DATE*:

* The board of trustees may appoint the president as designee.

I. Comprehensive Advising Plan Enter a description of your comprehensive plan for advising students into appropriate developmental education strategies based on student success data. Also, include a description of policies that notify students about developmental education options and include details about the availability of opportunities for tutoring, extended time in gateway courses, free online DEV ED PLAN 2 courses, adult basic education, adult secondary education or private provider instruction (s. 1007.263, F.S.). Students who are not college ready based on common placement test scores must be informed of all the developmental education options and shall be allowed to choose a developmental education option (s. 1008.30(4)(b), F.S.).

II. Documented Student Achievements Enter local policies that utilize documented student achievements in addition to common placement test scores (i.e., PERT, SAT, ACT, ACCUPLACER, FCAT 2.0 Reading) for advising students regarding enrollment options. Please check the boxes for student achievements that apply and add additional achievements in the space provided. High School Grade Point Average, Cumulative High School Grade Point Average, Subject Area Work History Military Experience Participation in Juried Competitions

Career Interests Degree Major Declaration Meta-Major/Program of Study Declaration Achievement on an assessment other than a common placement test Other Student Achievements:

III. Developmental Education Strategies Enter local policies specifying developmental education strategies to be implemented. s. 1008.02, F.S., defines developmental education strategies in terms of modularized instruction, compressed course structures, contextualized developmental instruction and co-requisite developmental instruction. Please check the boxes for developmental education strategies that apply and add information in the space provided. Modularized instruction Compressed course structures Contextualized developmental instruction Co-requisite developmental instruction Please provide specific details about the use of each strategy identified above. For example, if you selected modular instruction, please enter details about the modularization implementation, including specifics regarding course placement advising and registration, course numbers, targeting DEV ED PLAN 3 specific skill gaps, opportunities to quickly transition to gateway courses, etc.

IV. Description of Student Costs and Financial Aid Opportunities Enter local policies related to student costs associated with enrollment options. Also include financial aid opportunities that may be available for each enrollment option. Examples of student costs are: tuition and fees disaggregated by developmental education strategy; laboratory fees; costs associated with online options and/or tutoring; textbook costs; local scholarships/grants for students who demonstrate a financial need; and emergency, time-limited financial assistance.

V. Student Success Data Collection Enter details about your plan for collecting data related to student success based on your plan. s. 1008.30(6)(b), F.S., requires Florida College System institutions to submit an annual accountability report beginning October 31, 2015, that will include student success data associated with each developmental education strategy implemented by the institution. The Division of Florida Colleges will work with Florida College System institutions to determine an appropriate format that will facilitate analysis and identification of successful strategies.

Examples of student success data are: course enrollment disaggregated by exempt or non-exempt status; course enrollment disaggregated by developmental education strategy or option; percentage of successful course completions (grade of C or better) disaggregated by developmental education strategy and gateway course; average time to successful completion of developmental education disaggregated by strategy or option; for those who successfully complete developmental education, average time to completion of gateway course; and average time to degree completion disaggregated by exempt and non-exempt status.

VI. Additional Components Please enter any additional related policies or procedures.

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VITA

Robert Greene

Education

Doctoral Degree - Educational Leadership - University of North Florida. Jacksonville, Florida. August/2018

Master of Arts in Teaching with Educational Technology - Jacksonville University. Jacksonville, Florida. May/2003.

Bachelor of Arts - Regents College. Albany, New York. July/1995

Associate in Art - Florida Community College at Jacksonville. Jacksonville, Florida. December/1992

Work History

Florida State College at Jacksonville **2012- Present**

Academic Dean Deerwood/FSCJ Online

Reporting to the Campus president, led Florida State College Open Campus and Deerwood Center with over 15,000 students per term and in excess of 300 faculty members teaching across all academic disciplines. Through participatory leadership, I was able to integrate faculty from across other campuses to work with Open Campus in the development of a collaborative method for course delivery and development.

Accomplishments:

- Expanded Center for eLearning department for instructional design and faculty support
- Implemented virtual tutoring and made it available for online students
- Established and implemented a new collaborative system to develop and deliver online courses

- Initiated online instructor training and professional development for all online faculty
- Fostered workforce partnerships focused on industry-customized training
- Secured a multi-million state contract to develop online training for the Florida Department of Agriculture for over 45,000 participants state-wide
- Secured a workforce grant for the development of online programs focused on workforce readiness in IT
- Assisted in the development and implementation of the new assessment process at Florida State College
- Supervise 300+ full time and adjunct faculty, managers, and staff
- Manage approximately 1,000 distance learning courses each semester with approximately 25,000/30,000 enrolled students each semester
- Responsible for all online course development for the institution (over 400 master courses developed)
- Responsible for all contractual development of online training for institutional partners (over 200 lessons created)
- Ensure ADA, 504, and copyright compliance of courses developed for online delivery for the institution.
- Supervised contractual training for the Florida Department of Agriculture for four years and ongoing support.
- Design, implement, maintain, and coordinate online and campus based courses and programs
- Collaborate with college wide leaders to develop distance learning programs
- Design, implement, maintain and coordinate accelerated degree programs
- Member of the college wide institutional effectiveness team in preparation for accreditation (SACS) visit.
- Created syllabus templates for online and hybrid course to be used by the institution
- Responsible for all student appeals and faculty issues.
- Led fully online development of several accelerated Bachelor's Degree programs –Early Childhood Education, Business Administration, Financial Services, Human Services, Nursing BSN, Supervision and Management, Logistics, and Biomedical Sciences.

Florida State College at Jacksonville **2008-2010**

Director, Center for Teaching and Learning

Accomplishments:

- Created the Center for Teaching and Learning academic newsletter
- Developed the faculty assessment model for the college-wide assessment process
- Initiated a faculty training program for the assessment management system
- Assisted in the development and implementation of the new administrator training program
- Co-chaired the International Conference for Teaching and Learning

- Contributed in the development and maintenance of the Center for Teaching and Learning speaker series
- Developed and implemented college-wide best faculty practices conversation programming

Florida State College at Jacksonville **2007 - 2008**

Instructional Officer-MCCS

- Coordinated, scheduled, and facilitated SLS training college wide
- Chair of the SLS college wide Committee
- Served on Gen Ed. College committee as co-chair
- Worked with Project Renaissance coordinator to gather data concerning the success of developmental students
- Coordinated Faculty Mentoring Program for new faculty members

Florida State College at Jacksonville **2006-2007**

Head of Quality Assurance/ Instructional Designer-MCCS

- Was responsible for the Quality Assurance Department
- Scheduled and supervised Quality Assurance employees
- Supervised the quality of college owned courses, including Sirius courses created during this time
- Created flow process to facilitate and expedite job request processed through the office
- Served as Instructional Designer for several college developed courses

Florida State College at Jacksonville **2004 - 2012**

Professor of Education- Kent Campus

- Teach core education courses (EDF 1005, EDG 2701, and EME 2040)
- Teach courses in Developmental English (ENC0001 and ENC0021)
- Developed several college owned courses, including two for the Bachelors in Elementary Education program. (EME 2040, EDG 2701, EDF 1005, EEC 4404, and EEX 4231)
- Member of the Kent Campus and college wide General Education Review committee
- Member of the SACs readiness committee, Audit Team #2
- Sponsor of the Future Educators Club of America
- Learning Outcome Enhancement Plan trainer/coordinator for the college
- Member of NADE, TYCA, FEA

Florida State College at Jacksonville **2000-2004**

Adjunct Instructor-Developmental English

- Taught English 0001 and English 0021
- Developed Fully Online Courses for Developmental English
- Achieved a success rate of over 90% in both courses

Duval County Public Schools **1996-2004**

Instructor-A.P. U.S History, Economics, and Government.

- Taught A.P. U.S History, Economics, and Government
- Taught Gifted and ESOL students
- Sponsored Diversity Club
- Coached Cross Country and Soccer Teams

Visiting Professor and e-Learning Consultant 2013-current

Jazan University, Kingdom of Saudi Arabia