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Students' Decision-making After Florida Senate Bill 1720: Guiding Students through Math Placement

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MA, University of Central Florida, 2008

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Dissertation Submitted in Partial Fulfillment

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After Senate Bill (SB) 1720, exempt students enrolling in colleges in Florida no longer have to take a college placement test or enroll in developmental education courses before enrolling in college-level classes. SB1720 caused Florida colleges to find new methods of placement for incoming students, a concern because incorrect placement can have detrimental effects for the student and institution. Bounded rationality theory and Bahr's interpretation of student typology informed this study. The purpose of this survey study was to compare the exempt students who enrolled in remedial math to those who enrolled in college-level math. Research questions asked what differences existed between the 2 groups of students comparing high school grade point average (GPA), student typology, prior knowledge of enrollment decisions, confidence in enrollment decision, satisfaction with the course, and expected course grade. A survey was distributed to all students at a Florida college affected by SB1720, and 84 responses were received from 15 developmental students, 51 gateway students, and 18 college-level students. Analysis of variance test results only showed a significant difference, $F(1, 82) = .54$, $p = .040$, between exempt students enrolled in developmental math and students enrolled in gateway or college-level math comparing high school GPA. Based on the study results, college administrators should use high school GPA as an alternative method for better placement of students in their first college-level math course. Enrolling students in the correct courses from the start could eliminate the costs of time, money, and credit hours, resulting in more students completing college on time.

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Dedication

This study is dedicated to all students affected by SB1720.

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Chapter 1: Introduction to the Study

Introduction

U.S. President Barack Obama's focus on access to higher education as a stimulant for the economy brought attention to the national need for developmental education programs in higher education institutions (Wilson, 2012). Open-access institutions, such as Lake State College (pseudonym), help to create the access to college President Obama called for by requiring only a high school diploma or equivalent for students to enroll. However, many of the students enrolling in college enter their courses of study without proficiency in the skills required to complete college-level work in math, reading, and writing courses (Bailey, Smith, Jaggars, & Scott-Clayton, 2013; Edgecombe, 2011). Some researchers estimated that as many as 60% of students enrolling in colleges needed to take at least one developmental education course to be ready for college-level work (Melguizo, Kosiewicz, Prather, & Bos, 2011). However, with a national price tag of 7 billion dollars (Scott-Clayton, 2012b) and less than half of all students enrolling in college achieving a credential (Tinto, 2012), the cost of developmental education programs, not only for students, but institutions and state budgets, may not be fiscally responsible.

States have taken different approaches to the challenge of developmental education. California invested in research and experimental interventions to support students through the remediation process and empower educators to develop best practices. Florida, however, took a dramatically different approach. With the support of

the legislature, Senate Bill 1720 (SB1720) was passed in 2013 and implemented in 2014. This bill changed the organizational and pedagogical structure of developmental education programs in Florida. SB1720 created a new classification of students: the exemption group. The exempt student is any student who graduated since 2007 with a regular, Florida diploma. This group of students is no longer required to take the traditional college placement test (PERT) or to enroll in developmental education courses to gain proficiency in basic skills. Students are able to self-place in gateway, upper-level, or remedial courses, possibly bypassing developmental education all together. This change required Florida State Colleges to redesign enrollment, advising, and support services to meet the needs of students who elect not to take remedial classes.

Important in SB1720 are the restrictions on the types of courses that colleges in Florida could offer students. Instead of offering developmental education courses in the traditional, full-semester format, developmental courses had to be redesigned as modularized, compressed, accelerated, or contextualized courses. Under the definitions provided by SB1720, a modularized course is one that separates skills taught in a 3-credit developmental education course into smaller components, allowing students to enroll in and complete only the modules they need. Compressed courses combine skills of reading and writing into one course. Accelerated courses move students through developmental education courses in 12 or 8 weeks, instead of the traditional, 16-week course. Contextualized courses embed the skills covered in developmental education courses into a college-level course, sometimes requiring an extra lab component. The purpose of

redesigning developmental education courses into one of these models is to increase student retention and decrease the time it takes a student to enter college-level classes.

In a 6-month period, colleges such as Lake State College were forced to create completely new assessment, enrollment, and remediation programs in a short period. After several years of operating under SB1720, California also created a pay-for-performance model that ranks colleges according to several indicators, including time to completion, credit hours and cost to completion, and retention. According to the colleges' ranks, the state legislature awards monies or deducts monies from schools' operating budgets. The combination of these two legislative actions resulted in students placing into inappropriate levels of math and English, slowing their time to completion (Scott-Clayton, 2013) and resulted in the loss of funds for Lake Sate College.

Through this study, I hoped to understand the important differences between students who enrolled in developmental math and college-level math courses during their first semester at Lake State College. Through the understanding of how these student groups were different, Lake State College and the other colleges may be able to assess incoming students more effectively and guide them through the decision-making process when choosing a math course. The findings may promote positive social change on several levels. For the incoming students, enrollment decisions would be made efficiently and confidently, avoiding the possible negative outcomes of erroneous placement (Scott-Clayton, 2012b). Lake State College would have a supportive data to guide students into the correct level of math, resulting in an increase of retention rates, decrease of time and

cost to completion, and lower student failure. These outcomes were all metrics of the new performance based funding model in Florida; therefore, I also hoped this study would increase Lake State College's funding from the State of Florida by decreasing student placement error. On a broader scale, the results of this study could be expanded for more efficient placement of students at other schools in Florida, allowing institutions to create more accessible pathways for all students, helping to eliminate possible inequities resulting from SB1720.

This chapter has several sections. In the background section, I summarize important themes in the literature regarding developmental education, college placement, and student retention. In the background section, I also establish the gap in the literature that this study seeks to fill and explain why this study is needed. In the problem statement, I indicate the problem I addressed, and I prove the study's relevance and situate the current study in the context of studies in the last 5 years of research. In the next section, the purpose of the study, I explain the quantitative nature of the study, the intent of the study, and the variables that I measured. I then establish the research questions and hypothesis. I also briefly discuss the framework of the study, including theoretical and conceptual frameworks. In addressing the nature of the study, I provide the rationale for the design of the study, the key variables, and methodology. I then provide key definitions for the variables and specific assumptions I made. I also examine any limitations, delimitations, or concerns regarding the scope of the study. Finally, I establish the significance of this study.

Background

Helping students who want to attend college but are not academically prepared is an ongoing issue. Developmental education can be traced to a newly established Harvard University offering Latin remedial courses for incoming students. Since then, remedial courses have been offered at institutions nationwide to help students achieve competency in their basic skills. The need for remediation at the college-level has only grown. The number of students needing at least one remedial course at the national level was 72% (Bonham & Boylan, 2011) and in Florida 78% ("Why Is Florida Ending Remedial Education for College students?," 2014). Despite the long standing tradition of developmental education programs, present in 80% of all 4-year schools and virtually all 2-year and open-access colleges (Wilson, 2012), the research examining the effect of developmental education on long-term persistence and college success demonstrated that, overall, developmental education had little significance in student outcomes (Bailey et al., 2013; Bettinger, Long, Oreopoulos, & Sanbonmatsu, 2009; Hu, Katherine, & Kuh, 2011; Quint, Jaggars, Byndloss, & Magazinnik, 2013; Scott-Clayton & Rodriguez, 2012). On the other hand, some researchers found the positive effect of developmental math courses in aiding students to reach college-level competency and further persistence in math (Bonham & Boylan, 2011; Davidson & Petrosko, 2015; Mesa, 2012; Ngo, Kwon, Melguizo, Prather, & Bos, 2013).

Even though the problem of developmental education and remediation in higher education institutions is well established, the political climate in which Florida colleges

found themselves operating in at the time of this study was new. In 2013, a new bill was implemented that changed the entire developmental education infrastructure in Florida. Policy makers had justified the new bill by stating that students who did not have the skills to be enrolled in college-level courses would not succeed, further demonstrating that no reason existed to pay for remediation in skills that students should have already mastered in high school (Levine-Brown, 2013; Stockfish, 2013). Added federal funding to increase retention and achievement at the college-level was been met with a skeptical state government that no longer wanted to pay for courses that students should have had in high school, forcing institutions and educators in Florida to rethink their approach.

Although Florida was forced to redesign its placement and developmental education programs, national changes for developmental education were already underway. New redesign efforts started in 20 states (Wilson, 2012), and researchers found promising trends in accelerated, modularized, compressed, and contextualized modes of delivery. Accelerating students through their developmental education sequences or moving students from remedial to college-level courses has had a positive effect on student retention and persistence (Edgecombe, 2011; Jaggars, Hodara, Cho, & Xu, 2015; Jenkins & Rodriguez, 2013; Venezia & Hughes, 2013). This effort to accelerate students through developmental education sequences and into their program of study demonstrated a significant correlation to student retention (Karp, 2013; Scott-Clayton, 2011).

Despite the research encouraging institutions to place students in the highest level of math, questioning the effect of developmental education on student outcomes, and research that has demonstrated the positive effect of entering a program of study, the fundamental question of determining which level of course is appropriate remained for Lake State College and other Florida State Colleges. Though SB1720 no longer requires exempt students to take the college placement tests, the option is still available. Research, however, does not support placement tests as effective predictors of student ability or persistence (Burdman, 2012; Melguizo et al., 2014; Scott-Clayton, 2012a). Researchers found that high school grade point average (GPA) is a better predictor of positive student outcomes than a placement test (Bailey et al., 2013; Belfield & Crosta, 2012; Burdman, 2012; Edgecombe, 2011; Fletcher, 2014).

Another indication for the need of this study is the concept of college readiness. Because each state holds the ability to determine the characteristics that constitute college readiness, and because each institution applies college readiness differently, commonalities in college readiness policies are difficult to identify (Blume & Zumeta, 2013; Camara, 2013; Tierney & Sablan, 2014; Wyatt, Wiley, Proestler, & Camara, 2012). Under SB1720, college readiness is simplified for exempt students: Any student with a high school diploma from a regular Florida high school is automatically considered college ready. SB1720 allows for more student choice in enrollment and allowed students to enroll in college credit courses more quickly, but no structures are in place to aid students in determining their levels of college readiness. Students are responsible to

independently decide if they are ready to take college-level courses and be successful in those courses.

Florida's approach to college readiness relies on the individual student's ability to determine his or her readiness for college level work. The elimination of a required placement test and mandated remediation, created a need for Lake State College to examine its enrolling students for patterns of enrollment, success, and satisfaction. In existing literature, no studies have been published that examine the effect of student typology, decision making factors, and high school GPA in a self-placement system. Researchers have not examined the relationship between the decision to place into college-level or remedial coursework and later satisfaction with the course chosen, expected course grade, confidence in enrollment choices. In these ways, this study addressed gaps in the current literature.

I conducted this study at Lake State College to examine several characteristics of incoming students. It determined to what extent student typology, or the student's future goals, affected which level of math is taken. I looked for correlations between courses chosen and confidence in the decision, satisfaction with the course, and expected course grade. Based on this information, Lake State College advisors, who must work with a large number of students in a short time, may be able to help students confidently enroll in the correct courses.

Problem Statement

In this study, I addressed the new problem that institutions in Florida faced under SB1720: Schools need to help students determine the most appropriate level of math course without using placement tests. Under SB1720 students, are no longer required to take placement tests or remedial courses. The removal of this requirement for exempt students opens access to college-level courses and program of study entry. However, even though this legislative bill identifies students as college ready, this classification does not mean that students are automatically graduating from high school with better skills (Clark & See, 2011). The same skill deficiencies that students entered college with before SB1720 are still present in exempt students after the enactment of SB1720; nothing new has been done to increase those students' skill levels upon entering college.

The conditions surrounding enrollment are difficult for students, as even the researchers have not agreed on the effect of developmental education courses, college readiness definitions, or the validity of placement scores. With so many unknown factors, first-time-in-college-student could have an exceptionally difficult time making good enrollment decisions. Students generally struggle when making decisions regarding college courses, and these difficulties are evident particularly among students who are new to college (Diamond, Vorley, Roberts, & Jones, 2012). Extra support for those students is needed at Lake State College after SB1720 changed the developmental education policies.

Research has shown that placing students in incorrect courses is detrimental to their success and persistence in college. Incorrect placement could negatively affect student success and persistence. Kazis and Couturier (2013) found that almost 50% of students in Massachusetts community colleges are placed incorrectly, resulting in increased cost, time to completion, and probability of student attrition. This placement error could be demotivating to the student and cause students who are unsure of their purpose in college to lose hope of credentialing (Jaggars et al., 2015). It is vital that schools in Florida make every effort to help students avoid poor enrollment choices.

Not only is incorrect placement a deterrent to credentialing, but students who are required to complete developmental education sequences are less likely to graduate. Developmental education programs have a negative correlation with student success and persistence. Students are enrolled in developmental education courses when they could successfully complete their college gateway courses has a negative correlation with student success (Scott-Clayton & Rodriguez, 2011). Scott-Clayton (2012a) found that students who enrolled in college courses after being referred to developmental education courses based on placement exams had only a slightly lower success rate than those students who placed in college-level courses, and a much higher success rate than those who enrolled in and completed their remediation sequences. Taylor (2012) showed that students who score close to college-level on placement tests and are consequently boosted into college-level courses instead of remediation have more academic success than students who enroll in remedial courses.

With the new complications that SB1720 brought to the enrollment process, requiring students to determine their own skill level with no alternative placement systems in place at Lake State College, the advising and student services staff have to guide students into gateway and upper-level math courses or developmental math courses without the help of a placement score. Despite the need for extra advising to help place students into the correct courses, community college advising remained underfunded. Bettinger et al. (2013) found that more than 55% of community colleges operated with a ratio of 1 advisor to every 1,500 students with little hope of additional funding to support hiring more advisers or expanding advising departments. If a student decides to visit an advisor to help with registration for classes, that student typically faces long lines and has only a short amount of time with the advisor to discuss any concerns. During peak registration times, advisors are limited in their ability to spend time with students to walk them through this important decision of placement level. Therefore, the current study holds significance for the Lake State College students and advisors. With the results of this study, Lake State College could potentially provide an alternative placement method to be followed at other Florida institutions to aid with the correct enrollment in math courses. This model would increase student confidence at the time of enrollment and move students through the decision-making process more efficiently and support already overwhelmed advisers.

Two theories of bounded rationality theory and student typology provided the theoretical framework for the study. In Simon's (1972) bounded rationality theory, the

author argued that there are specific conditions under which a rational decision can be made. For example, clear understanding of options, an appropriate number of options, and a common recommendation based on previous customer's experiences would all help a consumer make a confident decision that he was satisfied with afterward. However, some elements could restrict, or bind, the ability of the consumer to make a rational decision. Some of those elements were incomplete information, a lack of experience with the subject of the decision, and information overload.

I used Bahr's (2011) examination of student typology, or the type of student enrolling in college, as the foundation of student type as a variable in the study. Bahr's (2011) specific inquiry into of the type of student and enrollment patterns for developmental and college-level math classes, Bahr's Behavioral Scheme, created the variable of student goals as a variable for the current study. According to Bahr's (2011) theory, the type of student (transfer, vocational, noncredit, experimental) directly affects the ability of the student to be successful in developmental or college-level math courses. I used the variable of student typology in this study to determine what, if any, significant differences exist between students who enrolled in upper-level and gateway math courses or developmental education courses.

Scott-Clayton's (2011) study of the conditions students experienced at the time of enrollment at the typical community college demonstrated how incorrect enrollment options affects students. Using Scott-Clayton's application of bounded rationality (Simon, 1972) to higher education allowed me to examine the decision-making process

for students at Lake State College under SB1720. Scott-Clayton found that students who enrolled in incorrect courses experienced dissatisfaction, delay in enrollment or completion, and lower chances of success. Scott-Clayton also asserted that students enrolling at a community college need structure in the presentation of their course options, extra guidance as many community college students are first generation, and clear pathways to avoid course placement error and overload. Lake State College, though it has several bachelor's programs, has traditionally been a community college; the change to "state" in the title occurred in 2012. As only 12% of students were enrolled in bachelor's programs, the majority of the population served is still, demographically and institutionally, the traditional definition of a *community college student* (Office of Institutional Research, 2015).

Based on a review of the literature, a gap exists with regard to understanding how students make enrollment decisions under SB1720. Although the majority of institutions in the United States have some metrics in place to help students find the right course, including placement scores, the unique situation of exempt college students in Florida, including Lake State College, warrants investigation. Enrolling students are not required to take the placement test and have no requirements when selecting the correct level of mathematics. Institutions in Florida understand how many students are choosing to take developmental or college-level math courses, but understanding is limited regarding how those two groups of students differ. This is the gap I sought to fill with this study.

Purpose of the Study

This was quantitative, survey study that explored how factors differ between students who enroll in developmental math and students who enroll in gateway or upper-level math under the exemption clause of SB1720. In this study, the course chosen was the independent variable, and the dependent variables were high school GPA, student typology, prior knowledge of enrollment decisions, confidence in enrollment decisions, satisfaction with course, and expected course grade.

Research Questions

The primary research question (RQ) in this study was: How do students who enroll in developmental math courses differ from students who enroll in college-level math courses? The primary null hypothesis (H_0) for this study was: There is no significant difference between students who enroll in developmental education and college credit math courses. The primary alternative hypothesis (H_a) for this study was: There is a significant difference between students who enroll in developmental and college credit math courses.

The secondary research questions and hypotheses were:

- RQ2: How do students who enroll in developmental math and students who enroll in college-level math differ with regard to student typology?
- $H_0$2: There is no significant difference between students who enroll in developmental math and students who enroll in college-level math with regard to student typology.

- H_a2: There is a significant difference between students who enroll in developmental math and students who enroll in college-level math with regard to student typology.
- RQ3: How do students who enroll in developmental math and students who enroll in college-level math differ with regard to high school GPA?
- $H_0 3$: There is no significant difference between students who enroll in developmental math and students who enroll in college-level math with regard to high school GPA.
- $H_a 3$: There is a significant difference between students who enroll in developmental math and students who enroll in college-level math with regard to high school GPA.
- RQ4: How do students who enroll in developmental math and students who enroll in college-level math differ with regard to prior knowledge of enrollment decisions?
- $H_0 4$: There is no significant difference between students who enroll in developmental math and students who enroll in college-level math with regard to prior knowledge of enrollment options.
- $H_a 4$: There is a significant difference between students who enroll in developmental math and students who enroll in college-level math with regard to prior knowledge of enrollment options.

- RQ5: How do students who enroll in developmental math and students who enroll in college-level math differ with regard to confidence in enrollment decision?
- $H_0$5: There is no significant difference between students who enroll in developmental math and students who enroll in college-level math with regard to confidence in enrollment decisions.
- H_a5: There is a significant difference between students who enroll in developmental math and students who enroll in college-level math with regard to confidence in enrollment decisions.
- RQ6: How do students who enroll in developmental math and students who enroll in college-level math differ with regard to course satisfaction?
- $H_0$6: There is no significant difference between students who enroll in developmental math and students who enroll in college-level math with regard to course satisfaction.
- H_a6: There is a significant difference between students who enroll in developmental math and students who enroll in college-level math with regard to course satisfaction.
- RQ7: How do students who enroll in developmental math and students who enroll in college-level math differ with regard to expected course grade?

- $H_0$7: There is no significant difference between students who enroll in developmental math and students who enroll in college-level math with regard to expected course grade.
- H_a7: There is no significant difference between students who enroll in developmental math and students who enroll in college-level math with regard to expected course grade.

Theoretical and Conceptual Framework

I used two theoretical frameworks for this study. Bounded rationality (Simon, 1972) offered an inquiry into the specific factors surrounding decision-making. Simon (1972) argued when consumers had too many choices, a decision was too risky, or the consumer did not truly understand the effect of the decision, irrational decisions can be made. The variables tested in this study of confidence, satisfaction, and prior knowledge of enrollment options. I will discuss bounded rationality and its application to higher education in more detail in Chapter 2.

The secondary theory I used in this study is the theory of student typology. Though there are many variations of student typology, I used Bahr's (2011) behavioral scheme in which the specific relationship between student typology and developmental or college-level math performance was examined; this theory utilized the classification of community college student based on typology (vocational, drop-in, transfer, experimental, exploratory, and non-credit). Bahr's (2011) assertion that students who are transfer or vocational students with a clear focus will have more success in college, if

supported by this study, would allow advisors to quickly determine the typological group a student belonged in and which level of math course the student would find most beneficial.

The intersection of these two theories is a unique contribution to the literature and knowledge. Because both of these theories address the issue of decision-making, and the lack of strong decision-making skills in incoming students was evident in Diamond et al.'s (2012) study, the conceptual framework this study used was the decision-making process each student must complete to select the best math course. Issues of college readiness, developmental education or college credit courses, and which type of remedial course, if any, the student chooses were variables derived from the decision-making framework. The elements of decision-making that students enrolling at Lake State College encountered were included on the survey.

Nature of the Study

In this study, I surveyed students who were first-time-in-college and enrolled in either college-level (gateway or upper level math courses) or developmental education math (MAT0018, MAT0028, MAT0057, and MAT0057L) courses. Because of the inclusion of affective variables, including confidence, satisfaction, and prior knowledge of enrollment options, I created a Likert 5-point scale. Other dependent variables, including expected course grade, student typology, and high school GPA are included in a separate section of the survey. The Office of Institutional Research distributed the surveys through Lake State College's email system to students who fit the parameters of

the population. The population for this study, students who were enrolled in their first math courses at Lake State College and considered exempt under SB1720, were identified through Lake State College's Office of Institutional Research.

The independent variable for this study was the level of math class the student chose. The students in developmental math (MAT0018, MAT0028, and MAT0057) and the students in college-level math (including gateway and upper level math courses) were separated based on this independent variable. The dependent variables that were examined for both groups were high school GPA, student typology, prior knowledge of options before enrollment, confidence in enrollment choice, satisfaction with enrollment choice, and expected course grade. The two groups were then compared to see what variables, if any, had a statistically significant difference.

Data were compiled through Lake State College's survey tool, Qualtrics. The Office of Institutional Research de-identified and data sent the data files to me electronically. I conducted a one-way between subjects analysis of variance (ANOVA) to determine the differences between the two groups of students' responses for the dependent variables examined in the study. An ANOVA allowed for an understanding of differences between the two populations with regard to the dependent variables.

Definitions

College-level courses: These courses bear credit and the curriculum is a continuation of those skills required to graduate high school. In this study, the gateway

college-level math courses examined were MAT1033 and MAT1101, along with several other upper level mathematics courses including Statistics and Topics in Math.

D*evelopmental math course*: Courses that did not bear college credit and remediate skills students need to perform at college-level. These courses are offered in math, reading, and writing with the goal of helping underprepared students prepare for college credit courses.

Exempted student: Under SB1720 exempted students are students who have graduated with a regular, Florida high school diploma since 2007 ("SB 1720," n.d.).

Satisfaction: The likelihood that the student would make the same decision after being in the class for an extended time. Satisfaction for this study was defined by bounded rationality (Simon, 1972).

Student typology: Classification of students based on intentions when enrolling in college: planning to transfer, entering a vocational field, experimenting with college, and seeking a non-degree. Bahr (2011) classified students into student typology groups.

Student confidence: The student's belief that he or she made the most rational choice based on factors of risk, uncertainty, and complete information (Simon, 1972).

Assumptions

There were several assumptions in the design of this study. The first assumption was that students who took the survey were able to predict their grades in the courses accurately. I assumed that the students have kept track of their scores on tests, the professors had graded tests, and that student performance would maintain a predictable

trajectory from the time of the survey to the end of the semester. These assumptions must be made because of the timing limitations on the study.

A second assumption of this study was the assumption that all students will receive the same quality of math instruction from their professors. Because this survey was distributed to all students who fit the population of the study, there could have been some variance in the answers according to how the students perceived the professor. In order to adjust for this, I specifically worded the survey questions to reflect the institution, not the professor. Questions regarding satisfaction with the course focused on the level of work in the curriculum, not on professor likeability.

Scope and Delimitations

The strict restrictions of SB1720 narrowed the scope of the study considerably. Because students do not have to take developmental education courses and they do not have to take placement tests, these factors do not aid in the placement of exempt students. Though the research in these areas added to the context of the current study and were included in the literature review. This study could potentially be generalizable to all colleges operating in the Florida State College system and who are under SB1720.

Limitations

Because the survey was distributed 6 weeks into the semester, there were some limitations in the students who were surveyed. Students who enrolled and then withdrew before the survey was distributed were not part of this study. Also, not accounted for in this study were students who did not enroll in a math course in their first semester at Lake

State College. The small number of developmental education students in the sample required the removal demographic identifiers. For example, there were only 12 students enrolled in the lowest level of developmental math courses. The inclusion of demographic characteristics of age, gender, or ethnicity was not appropriate for this study as a student's identity could, potentially, be deduced from this information.

Another limitation for this study was the use of an electronic survey. The respondents in this study were most likely active in reading institutional email and choose to respond. Though a paper-pencil delivery of the survey to all students in math courses may have provided more results, protecting the anonymity of students did not allow for this method of distribution. This limitation could hinder the generalizability of the study as there was a less institutionally engaged group of students who would not participate.

Significance

By including aspects of decision-making, bounded rationality, and student typology, advisors and students can easily decide on the course that is best suited for the student based on his or her intended use of the college. Advisors could also provide a research-based recommendation for students to simplify what could be a complicated and costly decision-making process. I specifically sought to identify a placement method for students and advisors to utilize in order to place students in the correct math course under SB1720.

Using the results of this study, advisors would be able to understand how the variables of high school GPA, knowledge of enrollment options, student typology, and

confidence in decision differ with these two groups of students (developmental and college-level). Without subjecting the student to a 3 hour long standardized assessment, advisors and students can use the results of this study to determine the best level of math for a student based on those variables found to have statistical significance. This will save the students time and lower the risk of enrolling in the wrong course, but it will also allow Lake State College to efficiently place students without the cost of placement tests.

The results of study can result in a positive social change as they could help students enroll in math courses more confidently with the aid of an advisor. The study could reduce the time to degree and the attrition for students enrolling at Lake State College, allowing students to avoid the costly consequences of incorrect course choice under self-informed placement. As Lake State College and other colleges in Florida struggle to help students who are exempt from remedial courses find their appropriate math course. Understanding the differences between students who enroll in developmental education and students who enroll in college-level classes, can be used to recommend a placement method for exempt students enrolling math courses at Lake State College, ultimately making college more accessible, less expensive, and less time consuming for students.

Summary

In this chapter, I summarized the topic of the study and important research trends affecting the study. I established the problem of the study, the need for the study, and the purpose of the study. I discussed the research questions, hypotheses, and study design. I

defined important terms, specifically those that have a connection to SB1720. I established assumptions of the study, the scope and delimitations of the study, limitations of the study, and the potential for significance. Before further discussion of the design and outcomes of the study, an in-depth look at the literature relevant to the study is needed.

Chapter 2: Literature Review

Introduction

The problem that I addressed in this study was the complicated decision-making process that first-time in college students at Lake State College must navigate to choose the correct level of math coursework. Because the structure of developmental mathematics and placement testing was drastically altered under SB1720, the institution needed a placement method for incoming, exempt students.

Not understanding how students make decisions and, as a result, not having a process in place to guide students into the correct courses, are important issues for institutions to resolve. At the micro-level for the student, selecting an incorrect level of math is detrimental for a student's progress. Making the wrong enrollment decision is costly for the student in terms of money, time, and motivation (Scott-Clayton, 2011). At the macro-level, institutions such as Lake State have added pressure from performance funding and can lose significant amounts of money if students do not persist towards their degrees or waste credits by taking the wrong courses (Jenkins & Rodriguez, 2013). The purpose of this study was to better understand the factors that affect students enrolling in developmental or college credit courses including their prior knowledge of enrollment options, their confidence and satisfaction with those decisions, expected course grade, high school GPA, and student typology.

The literature review demonstrated important themes relevant to the current study. Bounded rationality theory (Simon, 1972) was applicable to the community college

setting as many aspects of the enrollment process affect students' ability to make rational decisions (Capogna, 2011; Diamond et al., 2012; Picciano, 2012; Scott-Clayton, 2012b; Scott-Clayton, 2011; Simon, 1972). Student typology, as the secondary theory for the current study, provided a more robust understanding of the type of students enrolling at Lake State College and the needs of those students (Bahr, 2011; Bahr, 2013b; Clark, 1965; Hu et al., 2011; Trow & Clark, 1960).

The current study focused on students enrolling at Lake State College and the decisions that they must make to enroll in the correct math course, the conceptual framework that I used consisted of the steps in the decision-making process. The research reviewed demonstrated the need for additional support when students are making decisions (Behrens & Nauta, 2014; Bettinger et al., 2009; Bullock-Yowell, McConnell, & Schedin, 2014; Fish & Kowalik, 2009; Johnson, Schamuhn, Nelson, & Buboltz, 2014; Karp, 2013; Somers, Woodhouse, & Cofer, 2004; Walsh & Kurpius, 2015).

The variables I examined in the literature were college-readiness, how students were traditionally placed in developmental or college-level courses, the effectiveness of developmental education, developmental mathematics, alternative methods of remediation, and the importance of program entry. The emerging trends from the reviewed literature demonstrated that there is not a consensus of how college readiness is defined (Blume & Zumeta, 2013; Camara, 2013; Hodara, Jaggars, & Karp, 2012; Lott, 2012; Maruyama, 2012; Ngo et al., 2013; Scott-Clayton & Rodriguez, 2012; Tierney & Sablan, 2014; Wyatt et al., 2012). The lack of a sound definition of college readiness

created a situation in which each institution and each student is responsible for determining college readiness. Tool traditionally used for measurement and placement, the standardized placement assessments, left much to be desired with regard to accuracy and the ability to predict college success (Bailey et al., 2013, 2013; Belfield & Crosta, 2012; Burdman, 2012; Calcagno, Bailey, Jenkins, Kienzl, & Leinbach, 2008; Fay, Bickerstaff, & Hodara, 2013; Hodara et al., 2012; Kazis & Couturier, 2013; Ngo et al., 2013; Scott-Clayton, 2012a). Therefore, I reviewed research in alternative placement methods. These studies demonstrated that high school GPA and past course work were stronger predictors of college readiness and long term success than college placement exams (Bailey, Jeong, & Cho, 2010; Belfield & Crosta, 2012; Burdman, 2012; Edgecombe, 2011; Fletcher, 2014; Hodara et al., 2012; Howell, Kurlaender, & Grodsky, 2010; Kazis & Couturier, 2013; Ngo et al., 2013; Scott-Clayton, 2012b).

After the student determined his or her college readiness without the help of a college placement exam, the next step is to determine whether or not to enroll in developmental courses. The overwhelming trend in the research shows that developmental education does not help students persist, and students should be enrolled in the highest level of course work possible to increase chances of credentialing (Bailey et al., 2010; Bettinger et al., 2009; Hu et al., 2015; Jenkins & Cho, 2012; Martorell & McFarlin Jr., 2011; Tatiana Melguizo, Bos, & Prather, 2011; Melguizo et al., 2011; Moss & Yeaton, 2013; Skidmore et al., 2014; Wilson, 2012; Zachry Rutschow & Schneider, 2012). However, there are also several studies that outline the importance of remedial

math for student persistence (Bahr, 2013a; Davidson & Petrosko, 2015; Fong, Melguizo, Prather, & Bos, 2013; Mesa, 2012; Ngo et al., 2013; Sommo et al., 2014).

I also reviewed research that demonstrated the importance of accelerating students through the developmental education sequences (Baldwin et al., 2012; Edgecombe, 2011; Quint et al., 2013; Scrivener, Weiss, Sommo, & Fresques, 2012; Venezia & Hughes, 2013; Zachry Rutschow & Schneider, 2012). The ultimate goal of this acceleration is to provide students earlier access to their program of study, identified as a significant factor in student persistence and success (Jenkins & Cho, 2012; Karp, 2013; Moore & Shulock, 2011; Scott-Clayton, 2011).

This literature review has several major sections, all with the purpose of establishing the need for this study and its validity in the context of recent research. The first section of the literature review outlines the research strategies I used to find the most useful, current, and valid studies available. I will discuss the two theories being used: Simon's (1972) bounded rationality and student typologies, specifically Bahr's (2011) behavioral scheme. This section will also establish the applicability of these two theories to this study. In the third section of this literature review, I discuss the conceptual framework of decision-making as it applied to student enrollment.

In the fourth section of the literature review, I demonstrate current patterns in research for several important variables and concepts related to this study. An initial discussion of the inconsistencies and resulting complications with the concept of "college readiness" is conducted. Following this is a section regarding college placement

practices. Next, I inquire into the effectiveness of developmental education courses with regard to college success is discussed. Within this section, I establish the specific importance of developmental mathematics in student success. Issues of current developmental education redesign and accelerated paths to college credit courses are examined. Research demonstrated the need for clear pathways for students to be successful in college are explored, including aspects of current legislation and its effect on pathways to college.

Literature Search Strategy

When conducting this literature review, I accessed several databases and search engines in order to examine relevant studies from the last five years of research, searching for articles from 2011-2016; these databases and search engines included meta-searches through Walden University's Library, Lake State College's database system, and Google Scholar. I also used the Lake State College's interlibrary loan system to access several seminal and important resources in print format.

The search terms used were *developmental education*, *developmental education effectiveness*, *developmental education redesign, student enrollment*, *Bounded Rationality*, *placement testing*, *student retention*, *advising developmental education students*, *educational pathways*, *college student program entry*, *developmental mathematics*, *decision-making*, *developmental education acceleration*, *college student typologies, Florida developmental education*, and *college readiness*. I also searched for sources used in Scott-Clayton's (2011) study and Bahr's (2011) theory.

I limited the search to articles published since 2011. The majority of the studies examined were published between 2011 and 2016 to ensure the most recent studies were used. The notable exceptions to this scope of the literature were several seminal pieces including Tinto's volumes on retention and Simon's theory of bounded rationality and some news items regarding the implementation of SB1720.

Theoretical Foundations

Bounded rationality theory (Simon, 1972), though historically used in economic and political markets, was one of the theories that I used to guide this study. Bounded rationality theory asserted that the method a consumer uses to make a logical decision can be affected negatively, resulting in bounded rationality: the best decision a consumer could make at the time under those circumstances (Simon, 1972). To achieve the consumer's goal, whether it is the purchase of a good product, voting for the best candidate, or enrolling in a course, a rational decision is needed. Simon (1972) argued that the rationality of a decision was be affected by several factors: risk, uncertainty, incomplete information, and how complex a choice is.

The complexity of a choice increased when there are layers of decisions to be made. For example: when purchasing a car, the consumer would have many layers of decisions to make in order to choose an appropriate vehicle. The consumer would have to answer many questions in order to find a good car for his needs: What body style would be best? How much can the consumer afford to pay? What kind of warranty was needed? Will the consumer finance? What are the options available that the consumer would want

to purchase? Would the consumer go to a dealer or a private seller? How new should the car be? With these and many more questions, a consumer could quickly become overwhelmed and the ability of the consumer to make a rational decision can be restricted (Simon, 1972).

If there are too many options for a consumer to choose from, the decision can also become rationally bounded (Simon, 1972). Businesses may pride themselves in their ability to offer many different options to consumers, but this theorist argued that more choices were not helpful to the decision-making process of a consumer (Simon, 1972). To continue with the example of purchasing a car, if the consumer went to a dealer that had hundreds of options to choose from, the consumer would quickly become overwhelmed with the decision, resulting in an irrational choice in vehicle. If, on the other hand, the consumer visited a smaller dealership with only ten or fifteen options to choose from, the likelihood of a rational decision being made was much higher.

Simon (1972) argued that the amount of prior knowledge a consumer has before entering a decision-making situation, or the lack of complete information, correlated with the rationality of the decision. The car buyer who attempted to purchase a vehicle with little prior knowledge regarding the type of vehicle needed as well as the process of purchasing a car struggled in making a rational decision. However, the consumer who previously completed research regarding the type and price of the desired vehicle would be able to make a more logical and rational decision.

The risk and uncertainty of a decision also correlated with the ability of the consumer to make the best choice (Simon, 1972). The amount of risk involved in a purchase, both financial and otherwise, increased the consumer uncertainty as he made a decision. Buying a car is a risky decision: the financial risk is high as a car is an expensive investment, but also taken into consideration is the risk of an unsafe vehicle, a vehicle that could malfunctions, or a vehicle that would not perform the way the consumer needed it to. These risks could cause a consumer to make in irrational decision. For example, compare purchasing a meal at a new restaurant with the purchase of a new vehicle. The meal at the restaurant would be a more rational decision as the outcomes of that situation are not as risky as the purchase of a car.

Simon's (1972) theory offered several steps to create an environment for sound decision-making. First, Simon (1972) argued that to unbind rationality when consumers are making decisions satisficing is a necessary element to guide consumers through the decision-making process. In other words, consumers should be given a rule of thumb. For the car buyer, if the customer drove many miles every day, a rule of thumb would be to get a vehicle with lower gas mileage. If the vehicle is for a large family, a rule of thumb would be to look for a van or vehicle with enough seats to accommodate the family. The other tool that can be used to help unbind rationality for the decision maker was the concept of optimizing the decision (Simon, 1972). Optimizing the decision means offering simple, applicable situations to help guide the choices. Car salesmen who offer experiential stories regarding the implications, both good and bad, of a specific car

purchase helped guide the consumer towards a rational decision. Finally, Simon's (1972) theory advocated for the empowerment of the consumer through optimal decision-making environments. To help consumers make a rational choice, that was not bounded by uncertainty, complexity, risk, the lack of prior knowledge, or incomplete information, consumers should first choose a decision-making strategy, not just a course of action (Simon, 1972).

Simon's (1972) theory was extended into higher education and the decision-making patterns of enrolling students. Because the structure of community colleges lacked clear pathways for incoming students, Scott-Clayton (2011) argued that the intertwining of bounded rationality and the enrollment process at community colleges was key to helping students. When students, specifically first generation and under-represented students (a large population in open-access institutions such as Lake State College), attempted to enroll with little prior knowledge regarding course options, more options were not better; instead students became overwhelmed and experienced overload (Scott-Clayton, 2011). Scott-Clayton (2011) argued that students who made the wrong decision when enrolling in courses experienced significant setbacks including delay to degree completion, paying for the wrong course, and general dissatisfaction with the option chosen. By translating bounded rationality to enrollment in higher education, Scott-Clayton (2011) concluded that students need more structure and guidance to make decisions, less complex decisions, and more support through the enrollment options. The

inability of an institution to offer structure placement methods had a direct effect of student retention, success, and satisfaction (Scott-Clayton, 2011).

Scott-Clayton (2012b) continued to apply Simon's theory to students enrolling in higher education institutions by specifically pointing out the market failures of institutions when conveying information to students. Scott-Clayton argued that students lack basic information regarding the cost benefits of college, and because the cost of college and the benefit of a college degree was not clearly communicated to students, they do not take academic preparation for college seriously. Referring back to Simon's (1972) discussion of factors that bind rationality in decision-making, Scott-Clayton argued that young people do not have the complete information needed when enrolling in courses at college. This lack of information was even more evident in first generation students and resulted in poor enrollment decisions. Institutions that offer too many choices to a first generation student during enrollment could detrimentally effect the student's ability to make rational decisions, ultimately leading to mistakes, procrastination, and regret that will affect college success (Scott-Clayton, 2011).

Other studies have used Simon's theory to create recommendations to institutions for aiding students through the enrollment process. Diamond et al. (2012) applied the basic concepts of bounded rationality in their study and recommended that for the most effective method of informing students regarding their enrollment decisions, an institution should be framing options clearly and simply. In this qualitative study, Diamond et al. interviewed important stakeholders in the higher education institutions of

the United Kingdom and found that students did not always make rational choices; students who became overwhelmed made particularly poor decisions.

To help increase student retention and success, Diamond et al. (2012) recommended organizational restructuring similar to Scott-Clayton's (2011) recommendations. Scott-Clayton concluded that in order to encourage the success of students, institutions must clearly convey to students course options, including the predictable outcomes of different decisions. Diamond et al. (2012) recommended parental involvement in student enrollment decisions, multiple information sources to increase prior knowledge, effective guidance, and a simple decision-making process. Picciano (2012) argued that a more analytical system should be used to help students make rational decisions. Through the implementation of a technology system to examine factors in a student's life, both academic and nonacademic, students would be guided to the best enrollment decision (Picciano, 2012).

Furthermore, educational organizations affected successful placement through the correct framing of options upon enrollment, and those options must be framed in a variety of ways, as groups of students made decisions differently (Diamond et al., 2012). A student intending to transfer, for example, needs to take courses that the transfer institution would accept as transfer credits. Students who were unclear of their purpose in college, on the other hand, should be directed towards classes that would introduce them to the college culture and help guide their career and major decisions. The concept of

presenting enrollment decisions differently to specific groups of students led to the secondary theory used in this study: student typologies.

Student typologies has its origins in the 1960's and has continued to be relevant for educational organizations. After the launching of Sputnik, the identification of students who were talented in the Science, Technology, Engineering, and Math (STEM) areas and pressure for there to be accessible college pathways for students who showed scientific promise resulted in the study of student typologies. Clark (1965) argued that the increased value of education resulting from the political, economic, and social climate of the nation brought with it a need to understand who was enrolling in college and how college would contribute to the individual's career path. On a broader scale, Clark (1965) determined that the correct placement of a student in a college pathway based on the student typology would ultimately contribute to a stronger labor force, scientific development, and political health of the United States.

The basic assertion of student typology was that analytical methods (interviews, questionnaires, surveys) should be used to determine the type of student enrolling in an institution and, based on that information, the student should be guided towards the appropriate pathway (Clark, 1965). Students act in predictable patterns, including their enrollment and performance patterns, and those patterns could be used by institutions such as Lake State College to programs, placement methods, and supportive measures as needed (Clark, 1965). Clark and Trow's (1966) initial study set the foundation for student typology to develop as a larger theory. Students at the University of California, Berkley

were surveyed involvement with ideas and involvement with college community; the data yielded four typologies: academic, collegiate, vocational, and nonconformist. Based on the gathered data, predictable behavioral patterns and trends were identified and could be used to help support students through their college experience (Trow & Clark, 1960).

Student typology, though not in the same form it was in the 1960's, has continued to contribute to the functioning of educational institutions. As the demographics of college students shift, so, too, did the needs of the student. As a result of increasing access to college, more students than ever were enrolling in higher education institutions. Institutions were not ready to accommodate the influx of nontraditional students. Student typology was used to help institutions adjust to the new demographic of student. Considering the national concern surrounding retention rates, student typology could be implemented to increase the chances of students enrollment in appropriate courses and, ultimately, successful completion of a degree (Hu et al., 2011). Hu et al. (2011) used the typological approach to identify types of students enrolling in community college, and used the similarities in groups to develop an advising program in order to help students be successful.

Bahr (2011) forwarded the concept of student typology into the developmental education field with the assertion that community colleges, specifically open access institutions such as Lake State College, provide a significant service by allowing the non-traditional students to pursue a degree; however, the enrollment of these non-traditional groups create complicated and non-linear progressions through course work (Bahr,

2013b). Bahr (2013b) argued that with the national focus on college enrollment and degree attainment, insufficient research has been completed to demonstrate the unique intersection of these to concepts. In order to move students from enrollment to degree attainment, there must be an understanding of the needs of unique student groups and the obstacles they face throughout their college career. Based on those patterns, institutions could create supportive advising and interventions for specific student groups (Bahr, 2013b).

I used the framework of Bahr's (2011) behavioral classification scheme for the current study. Based on the patterns of enrollment, student goals, and the length of time a student remains enrolled in courses, Bahr (2011) identified six classifications: drop-in, experimental, vocational, transfer, exploratory, and non-credit (Bahr, 2011). Enrollment patterns, success, and duration of stay at community colleges were outlined below:

- Drop-in students: These students enrolled for a short time, two semesters, took approximately two courses per semester, and had a success rate of about 95%.
- Experimental students: These students, on average, stay enrolled the same number of semesters as drop-in students, took a few more credit hours than the drop-in students (a little more than half full time), and had a success rate of 23%.
- Non-credit students: Non-credit students enrolled for up to seven semesters and took almost all non-credit courses.

- Transfer students: These students were enrolled in full time credit hours, stayed at the community college for, on average, seven semesters, and had a 77% success rate.
- Vocational students: Vocational students enrolled in a full time load, stayed enrolled for seven semesters, and had a 79% success rate. (Bahr, 2011)

Based on these classifications of students, Bahr continued his application of his student typology classification to explore the enrollment behaviors of these groups of students when choosing developmental or college-level math courses; Bahr (2011) specifically examined math because this is the course with the highest need, and math is also the course most likely to cause students to stop their education (Bahr, 2011). A quantitative study of 105 colleges in California yielded several important patterns of student enrollment and success in developmental or college-level math courses. Most notably, Bahr (2011) found that the students most likely to enroll in remedial math were experimental (24%), exploratory (38%), and transfer (28%); the highest rates of passing college math were seen in transfer students (57%) with the lowest pass rate in the experimental group (<1%).

With of the application to developmental math and community colleges, student typology, specifically Bahr's Behavioral Scheme, was appropriate for use in this study. Bahr's (2011) method of classification could be helpful for Lake State College when attempting to understand the enrollment patterns of students exempt under SB1729. By inquiring into the student's typology at the time of enrollment, advisors would be able to

understand which course would be appropriate for a student. For example, a student who is identified as a transfer student would most likely be successful in a college-level math course without the need of remediation, where as an experimental student would not want to take college-level math without remediation. These patterns can help advisors identify and direct students through this decision.

Simon's (1972) bounded rationality was used for this study as I explored the factors Simon recognized as binding to rational decision-making (prior knowledge, confidence, and satisfaction) for students enrolling in math courses. Based on this line of inquiry, data were gathered to help the institution reduce the complexity of choices, the overload students may experience, and allow students to have a better understanding of the effect their enrollment decision will make on their college pathways.

The intersection of the two theories, bounded rationality (Simon, 1972) and Bahr's behavioral scheme (2011) was demonstrated in several ways: first, in understanding the type of student enrolling in math based on student typology, and further in understanding the differences between the type of students of students enrolling in developmental education or college-level math courses, student's prior knowledge of enrollment options, confidence in decision, and satisfaction with decision as addressed in the research questions. Ultimately, these two theories could provide a two-step process for advisors and instructors to (a) understand what type of student is enrolling in the math courses and (b) know how to guide students to the most appropriate level of math based on student typology.

Conceptual Framework

The goal of the current study was to understand the differences (if any) between students who enrolled in developmental or college credit math courses in a new system without pre-assessment or required remediation in order to inform a new method of placement for exempt students at Lake State College. The conceptual framework for this study was decision-making and the steps to the decisions students make to find the best math option. Previously, there were placement tests and institutional requirements of remediation at Lake State College. At the time of this study, however, students are able to make their own determinations regarding how ready for college they are, whether or not to take placement assessments, if they should take developmental education courses or math courses, and ultimately, if they made the correct choice. There are multiple layers to the enrollment decisions that a student, who may be first generation with limited knowledge of college life and institutional culture, has to make. This section of the literature review examines decision-making as it relates to student enrollment and placement.

Referring back to Bahr's (2011) typology of students, different groups have different needs regarding their future goals and focus. Students who are in the vocational or transfer category would, presumably, already have a career path and should be advised regarding placement according to those goals. However, other groups like the drop-in and experimental groups, are be more likely to enroll in courses that are not needed and lack motivation when it comes to completing a degrees or courses of study. These groups need

to be treated differently when they are making decisions regarding their courses of study and whether or not to enroll in developmental math courses.

During the process of enrollment at Lake State, students self-report their intended major within a range of several meta-majors. However, these general categories and curricula does not focus students on their career and vocational goals, possibly causing an inability to make a strong decision. Also, students enrolling who are undecided in their career goals, such as Bahr's (2011) experimental student type, need to have some direction when choosing a career or pathway early in their college coursework in order help the student's goal to become clear. Therefore, students in the typology categories without a strong career identity (experimental and non-credit) should be given supportive measures, such as information regarding Lake State College's career center or enrollment into a college and career course in the student's first semester.

With this in mind, the importance of career goal clarity is established when considering a student's initial enrollment. One study determined that the ability to make a strong decision regarding career and vocational options comes from the balance between healthy attachment with parents and the student's own, individual career identity (Johnson et al., 2014). This particular study discussed major choices, the findings that career choice importance had the strongest correlation to helping students make decisions and is a study that holds some implications for Lake State College. Many of the students enrolling in college nationwide, 31%, are first generation students and struggle with their ability to make a career related decision without parental influence (Somers et al., 2004).

However, the number of students at Lake State College who was first generation at the time of the study was 61%, meaning that the number of students who would home-based support.

Using data from the National Postsecondary Student Aid Survey, over 24,000 students were surveyed and over 20 variables were found affecting the first-generation students with regard to persistence, cost of college, and college experiences (Somers, Woodhouse, & Cofer, 2004). In an attempt to understand the effect of parental influence, high school GPA, residential status, and personal beliefs regarding decisions, Walsh and Robinson Kurpius (2015) surveyed 433 students. The trends this study demonstrated that parental education and high school GPA do not correlate with student persistence; residential status has a small correlation, but personal beliefs holds significant effect on student persistence (Walsh & Kurpius, 2015). The results of this study indicated that it is a student's own beliefs about college that will affect his persistence. When helping students through the new, complicated decision-making process during a student's initial enrollment, it is important for advisors to be sure that the student is confident in the decision he made.

The constraints of advisor time and the number of students in need of placement guidance caused many schools, including Lake State College, to consider using standalone interventions such as automates questionnaires that recommend courses based on students' answers. However, a pre and post intervention survey of 131 students in a Midwestern studied students who attempted to get help in their career decision from a

self-directed career search (Behrens & Nauta, 2014) showed that the stand alone intervention is not as effective as time with a counselor. A student who is able to meet with an advisor when attempting to make career decisions had more positive outcomes than when using technology systems to maneuver this decision on his or her own. At Lake State College, where there are approximately 5 advisors to 6,000 students, the need for efficient guidance is evident. From the results of this study, advisors could easily place students in the correct math classes, reducing the time and stress that can be experienced during peak registration times.

Another significant relationship between student decidedness and negative thinking is seen in the Bullock-Yowell et al. (2014) examination of 223 decided and 83 undecided college students. Using an ANOVA procedure, this study demonstrated that the lack of a declared major causes students to have lower self-efficacy, more decision-making difficulties, and more negative thoughts regarding careers (Bullock-Yowell et al., 2014). With this negative effect, a student risks not completing his or her degree without supportive interventions.

College students struggle making rational decisions (Bettinger et al., 2009; Fish & Kowalik, 2009; Karp, 2013). The above studies demonstrated the importance of strong decision-making skills with regard to the overall ability of a student to succeed in college. The added complexity of decision-making for students entering college in Florida after the enactment of SB1720 is daunting. In previous studies research is based on career and decision majors, the new requirements under SB1720 creates further demands on students

enrolling, requiring them to make more immediate and high-stake decisions. Students are required to decide if they are college ready, if they should take a placement test, if they should enroll in developmental education courses, and which level of developmental education they should enroll in. All of these decisions are made before a student can even take a career and college class.

Key Variables

Working within the conceptual framework of how college students make decisions and applying the concept to the complicated decisions students enrolling at Lake State College have to maneuver, the concepts discussed in this section reflect the decisions students must make. First, studies that seek to define college readiness will be examined as students in Florida must decide individually if they are college ready. Next, students must decide whether or not to take a placement test; therefore, the effectiveness of placement tests and the alternatives to placement testing as demonstrated in research will be discussed. The next decision, regarding whether or not to enroll in developmental education and the type of developmental education offering to enroll in (specifically developmental math), resulted in an inquiry into the effectiveness of developmental education and which mode of remediation are proving to be the most beneficial to students. A look at the importance of program entry is needed as students must choose their courses for the entire semester, not just developmental math.

College Readiness

One of the fundamental issues surrounding proper placement into the appropriate level of college classes is the issue of college readiness. Because each state has a constitutional control over its educational system, each state is also required to develop its own standards of college readiness (Hodara et al., 2012; Ngo et al., 2013; Scott-Clayton & Rodriguez, 2012). Despite the recent movement to develop national standards for all K-12 students, with hopes of increasing college and career readiness, Common Core Standards did little to create a standard for all states regarding the college readiness of graduating high school students (Tierney & Sablan, 2014). A 2012 national report regarding college readiness defined college readiness as competency in four areas: content knowledge, cognitive strategies, learning skills, and transitional skills (Burdman, 2012). Blume and Zumeta (2014) studied patterns of college readiness standards across the states and conducted a cluster analysis in order to answer two questions: (a) How were states grouped together on their commonalities in college readiness policies and (b) What were the emerging themes across the states regarding college readiness? Specifically addressing the gap in the literature regarding a common understanding of state-level college readiness policies, the variables examined included a P-20 council, accountability data, dual enrollment, advanced course offerings, and state-wide assessment (Blume & Zumeta, 2013). This study placed Florida in Cluster 1 with similar states; this cluster was ranking high in the two most important variables: a P-20 council and accountability data (Blume & Zumeta, 2013). This study brought a significant

contribution to the college readiness discussion by explaining the similarities and differences in college readiness policies.

A brief examination of college readiness studies exemplified the difficulty in a workable definition for college readiness. The College Board asserted that college readiness standards that states and institutions are using widely vary. One major component, academic rigor, was common in many of the studies (Wyatt et al., 2012). Wyatt et al. (2012) addressed a research gap as there was no common measure of academic rigor. By examining variables of students taking College Board Exams, high school courses in math and English, scores on exams, and first year GPA in college, a positive correlation was seen between high school courses in math and English and first year GPA (Wyatt et al., 2012). Though this study described a scale easily used by states and institutions to determine academic rigor, the population of students studied were those who took the SAT in high school. The SAT is not a requirement for enrollment in community colleges including Lake State College. This study also did not address any of the affective measures seen in other definitions of college readiness.

Tierney and Sablan (2014) identified the following as a workable definition of the concept of college readiness: "curricular content, academic behaviors, cognitive strategies, and knowledge about the context of college itself" (p. 944). Content, academic, contextual, and awareness skills were identified as the four areas which indicate college readiness by Lott (2012). In Maruyama's (2015) meta-analysis of the literature regarding definitions of college readiness, he found that the elements

contributing to success in college differ when looking at first year persistence as opposed to long-term educational attainment. The definition of college readiness used in this study was "an accumulation of knowledge and experiences that prepare students for college…defined using measures during high school that serve as proxies for how students will perform in college courses and later careers" (Maruyama, 2012, p. 253). Using the guidelines published by that ACT testing group, Strayhorn (2014) defined college readiness as "the acquisition of the knowledge and skills a student needs to enroll and succeed in credit-bearing, first year courses at a post-secondary institutions" (p. 973).

Working within the two broad categories of cognitive and non-cognitive factors of college readiness, researchers administered a student readiness inventory to 505 high school students, and corresponding college GPAs were examined for 375 of those students (Komarraju, Ramsey, & Rinella, 2013). Komarraju et al. (2013) attempted to determine if the traditional predictors of college readiness correlate with success in the transition to college and the academic success. Despite the heavy reliance on GPA, high school curriculum, and standardized assessments in determining the readiness of an entering college student, there was no significant correlation between standardized test scores and college success; the success of students was determined by the personality trait conscientiousness (Komarraju et al., 2013).

College readiness standards vary between two and four-year colleges as well (Lee, 2012). Strayhorn's (2015) study of underrepresented populations' college readiness at four-year colleges attempted to understand factors that influence college readiness by

making use of federal longitudinal data. The standards of being college ready vary from the placement into a college-level course through standardized testing to the simple achievement of a high school diploma (Hodara et al., 2012). There is no consensus regarding readiness at the state level. Each institution is required to create its own methods of college readiness assessment and its cut off score determining students who is ready for college-level work and the students who are in need of remediation before entering college-level work (Melguizo et al., 2014).

An important theme in these studies is the methods of examining and assessing college readiness. The majority of researchers, with the exception of Camara (2013), relied on academic and content skills to define college readiness, not affective or socioeconomic characteristics of incoming students (Lott, 2012; Maruyama, 2012; Melguizo et al., 2014; Strayhorn, 2014; Wyatt et al., 2012). Camara, on the other hand, suggested implementing a College and Career Readiness assessment, as opposed to a state assessment used for college placement. Camara asserted that without a definition for college and career readiness, there can be no guarantee of correctly implemented and understood college readiness measures.

The differences between states and institutions in the measure of college readiness for incoming students resulted in each institution's college readiness and placement process being unique. This complicated relationship between possible predictors of college readiness and the multitude of different processes and standards across the United States creates inconsistency in understanding developmental education and college

retention efforts (Ngo et al., 2013; Scott-Clayton & Rodriguez, 2012). On one end of the spectrum, California passed policies stating that the use of a singular placement test to determine college readiness was not reliable and other factors must be used. On the other end of the spectrum is Florida, where students were self-placing. Methods of placement in Florida under SB1720 need to be examined as a unique setting, not one that is easily generalized into a national population.

Senate Bill 1720 defines college readiness for all 28 of the institutions in the Florida State College System. SB1720 asserted that students who have graduated from a Florida high school with a regular diploma since 2003-2004 should be automatically considered college ready ("SB 1720," n.d.), The debate of what measures should be used at a state level for college readiness is moot. This assumption that all students entering college in Florida who have met the requirement of graduating from high school are college ready does not correlate with the traditional needs of incoming students in the Florida (Baldwin et al., 2012; Jenkins & Rodriguez, 2013; Mullin, 2012). The majority of the population of incoming students required remediation before SB1720. On the national level 60% of students are labeled as in need of remediation, and only 30% of students completing their first college credit courses (Baldwin et al., 2014). The majority of students enrolling in college are not completing their degrees (Baldwin et al., 2012). Students are no more college ready after SB1720 than they were before the legislation was enacted (Clark & See, 2011). Approximately 78% of incoming students at Lake State College (Office of Institutional Research, 2014) met the exemption requirements; this

creates an complicated issue for advisors to present to incoming student determining which level of courses to enroll in.

College Placement Testing

Four-year colleges and universities have a structured and selective enrollment process, including students applying for admissions, working directly with an admissions counselor, and an extensive review of the students' academic and personal characteristics as determinants of college readiness. Burdman's (2012) report regarding the national trends in college placement testing drew a correlation between admissions practices of most universities and the use of a single measure for college placement. Though colleges and universities explore a student's standardized test scores, high school work, and other factors to make acceptance decisions, the use of a single test score for the placement of students was not a responsible practice, especially when considering the additional hurdles that underprepared students must overcome (Burdman, 2012).

In stark contrast to the enrollment and placement methods of a university, the community colleges do not filter students, but with the proof of completing high school or obtaining a GED, the student is admitted. Morest (2013) observed "the transition into community college boils down to the bare essentials with potential to be abrupt and impersonal" (p. 18). This is evidence in the processes in place before SB1720. Once the student was admitted, a mere formality, most schools employed a method of placement assessment to determine the level of course work the student should enroll (Bailey et al., 2013; Belfield & Crosta, 2012; Edgecombe, 2011; Kazis & Couturier, 2013; Ngo et al.,

2013; J. Scott-Clayton & Rodriguez, 2012). Scott-Clayton (2012a) found that 92% of two- year colleges require students to take a high-stakes placement test, and, many times based on the results alone, college readiness is determined. The majority of institutions use placement assessment products from two publishers: ACCUPLACER, created by the College Board, is seen in 62% of community colleges and COMPASS, created by ACT, is used at 46% of community colleges (Scott-Clayton, 2012a). However, the utilization of those assessments varies greatly as institutions and states can determine their own cut-off scores to determine placement. For example, the Algebra cutoff score varies from 27-40 and the reading cutoff varied from 72-81 within one state's college system (Bailey et al., 2013). Institutions are also able to use their own discretion when deciding whether or not to use other measures like GPA or high school transcript for placement.

The variances in the application of college placement tests are only one of the problematic aspects of utilizing a standardized assessment to determine college readiness. Another issue is the inaccuracy of such tests and the lack of valid data supporting these assessments as significant predictors of college success (Bailey et al., 2013; Edgecombe, 2011; Kazis & Couturier, 2013; Ngo et al., 2013; Scott-Clayton, 2012b). Using *Achieving the Dream* datasets, Bailey et al. (2008) found that, based on placement testing score, 59% of students were referred to developmental math (24% one level below college-level, 16% two levels below, and 19% three levels below), and 33% of students were referred to developmental reading (23%, 7%, and 3% respective to the levels below college-level). The study used a multivariate analysis to explore relationships between

institutional factors and student progression and found that many students do not complete their developmental sequences, the majority not completing their first courses; demonstrating a need for better placement methods and interventions for first-year students (Bailey et al. 2010). Bailey et al. (2010) argued that more students fail to complete remediation because they never enrolled in their first or second course; this failure to enroll after placement testing could be evidence of students becoming discouraged by the results of placement assessments and, as a result, choosing not to pursue higher education.

The effect of developmental education placement and placement assessments could be detrimental to the success of a student. Scott-Clayton (2012) argued that the use of placement tests is not supported by research, pointing out that the research conducted using college entrance exams is not using high-stakes placement assessments in the studies and is mostly conducted by the writers of the tests. Using three analytical measures (correlation coefficients for predictability power, placement accuracy rates, and severe error rate) Scott-Clayton (2012a) found that the accuracy of the ACCUPLACER and COMPASS assessments were not statistically valid. Even further, Scott-Clayton (2012a) argued that the test makers themselves assert the use of the assessments needs to be examined by the users for the appropriateness of the exam. This study examined four cohorts of enrolling students, approximately 70,000 students between 2004-2007, and found that the severe error rate of placement in math of 24% and 33% in English (Scott-Clayton, 2012a). The conclusion that students who placed into developmental courses

were less likely to enroll and persist (Bailey et al., 2010) along with the assertion that a significant number of students who were placed in developmental or college-level courses are not placed correctly (Scott-Clayton, 2012a) raises concern regarding the effect of placement testing on the success and retention of college students.

Hodara et al. (2012) interviewed administrators and stakeholders at higher education institutions across the country, specifically examining institutions with mixed geographies and demographics, and gathered data from those institutions to examine the effectiveness of placement assessments and placement practices. The problem identified in this study was the over-reliance on placement tests for students enrollment and the inability of placement assessments to correctly identify students in need of remediation (Hodara et al., 2012). Hodara et al. argued that the causes of this poor accuracy are students being unaware of the purpose of placement examination, the exams not being aligned with college course work, and score from one assessment does not accurately correlate with all measures of college readiness. This study supported the theme in the literature that college placement exams are not a valid placement method for students.

An expansion of Scott-Clayton's 2012a study asserted that the accuracy of these placement tests and their application to a student's enrollment had not been studied and, therefore, little was understood regarding the tests' accuracy (Belfield & Crosta, 2012). Furthermore, the use of these tests to indicate if a student is in need of remediation limited the usefulness of the assessments (Belfield & Crosta, 2012). Examining data from a statewide community college system, researchers found several themes regarding the

application and accuracy of the statewide placement tests through correlational analysis: (a) there is no correlation between college placement scores and student grades (a correlation of .17 for math and .06 for English, and (b) the difference in GPA for a student who scored in the lowest quartile for math (2.15 predicted GPA) and the highest quartile (2.34 predicted GPA) is only one fifth of a grade (Belfield & Crosta, 2012). Based on these results, Belfield and Crosta (2012) found no significant correlation between placement test scores and college GPA. Researchers concluded that the use of placement tests at institutions is not supported by research.

The use of alternative placement methods instead of a strict reliance on the traditional placement testing is supported by research. Ngo et al. (2013) addressed the issue of placement tests in a quantitative study; specifically comparing two groups of students: one that took the placement tests and placed directly into a math course and one that placed into courses based on multiple measures. The group placed using multiple measures was placed using placement scores, prior math experience, college plans, and motivation (Ngo et al., 2013). The study yielded no difference in performance in math courses for students who directly placed into college-level math and students who were boosted based on other measures. Ngo et al. concluded that placement has no significant effect on a student's success

Though the placements tests are not accurate in placing students correctly, they can be used to predict student success. A correlation study showed that the lower the student is placed the less chance the student had of completing the courses (Kazis &

Couturier, 2013). Examining the redesign efforts in Massachusetts, Kazis and Coutrier (2013) found that for every 100 students placed three or more levels below college-level in math, only 57 passed, 16 never enrolled, and 25 did not complete the first level; that same group of students two levels below college-level math, 29 passed, 12 did not complete, and 16 never enrolled in the second level; of those 29 students who passed level two, only 22 enrolled in the last developmental education math course before college-level, 7 never enrolled, and 6 did not complete. Out of 100 students referred to the lowest level of math, only 16 were successful in completing remediation. The low rates of developmental math completion drove the argument that the placement assessment is flawed; supporting Scott-Clayton's (2012a) study, Kazis and Couturier (2013) concluded that the assessments were not valid and that only 58% of students placed after assessment in Massachusetts were placed correctly. Approximately 40-50% of students who were placed in developmental math would have achieved a C or better in their gateway math course. This error in placement accuracy is detrimental to the students inaccurately placed in developmental education courses. The lack of proper placement is considered a contributing factor to developmental math students' lack of persistence and completion in the first semester of courses (Fay et al., 2013).

Finally, the student perspective of these placement assessments is not fully understood (Bailey et al., 2010). Students who test at the level of developmental math and enrolled did not demonstrate a proficient understanding of the stakes of the assessment or how to prepare for the assessment (Bailey et al., 2010). Students are not

aware of the stakes attached to the testing and typically do not receive help to prepare for the tests or even encouragement to prepare for these assessments that have such an effect on their future success as college students (Kazis & Couturier, 2013). Scott-Clayton (2012) asserted that the market for placement test preparation is non-existent, meaning that even if students understand the stakes attached to the assessments, there is no material available to them from which to study. Fay et al. (2013) asserted that students do not prepare for the placement math exams because they do not understand the stakes of the assessment; they do not know about placement materials; they misunderstand how and why to prepare; and they exhibit a lack of math confidence.

The above research clearly established that placement assessments are not a valid method of placing students into the correct level of course work. Based on this research, the new policies at Lake State College where there is no required placement exam for exempt students may not be detrimental to the students' success. However, now that the placement assessment is no longer required, the development of a method for guiding students to the correct course is vital. Considering the implications of a student's inaccurate placement on his or her success in college, there is an immediate need for Lake State College to understand how to place students accurately: a question the current study hopes to answer.

Alternative Placement Methods

Understanding the lack of a required placement test and the possibility that the student may attempt to enroll in courses without taking the placement test, other metrics

for placement are needed to support students' decision-making process. Several studies offered more reliable predictors to use as placement than standardized assessments (Bailey et al., 2010; Edgecombe, 2011; Kazis & Couturier, 2013; Ngo et al., 2013; Scott-Clayton, 2012a). These studies, after questioning the validity of placement exams, created a strong case for other indicators, most widely high school GPA and math experience, to be used in the placement of students into college-level or developmental education math courses.

Burdman (2012) found that the national trends in developmental education reform start with reduction of the importance of placement tests for student placement and enrollment. The recommendation from this national study is to reduce the emphasis on the placement testing and instead look at other measures, most specifically high school GPA, for determination of the level of math courses a student should attempt. Burdman (2012) discussed several community colleges that had attempted using informed self-placement. Despite the fact that this was the adopted policy in Florida based on SB1720, there is little research that had been conducted to measure the effectiveness of this method of placement.

Other alternatives for placement were seen in national studies. Hodara et al. (2012) examined the national efforts to improve college placement accuracy and found several strategies used nationwide based on interviews and the analysis of the data from seven different states. They found that institutions have tried to prepare students for placement tests, to adjust the placement assessments to fit college coursework, to raise

the cutoff scores, and to develop custom exams. Other schools use multiple measures like high-school GPA, non-cognitive factor assessments, and student self-placement. This is a thorough descriptive study of what was being done to improve college readiness standards, but further studies are needed to understand the implications and the effectiveness of the changes.

One study completed in California addressed the concept early testing for college readiness in high school (Howell et al., 2010). This study is of particular interest to Lake State College as Florida conducts placement testing at the high school level as well. The goal of the Early Assessment Program (EAP) is threefold: to identify students who needed remediation while still in high school, to give families information about the student's college readiness, and motivate students to remediate before exiting high school (Howell et al., 2010, p. 729). The study focuses on students enrolling in remedial math or English at one campus in the college system that identified 66% of incoming students in need of remediation in math or English. Through a logistic regression analysis, the study found that there is no significant need for English remediation for the students who were part of the EAP program; in math, however, there is a 3.4 percent decrease in the need of developmental math. Though some of the incoming students may have taken the placement tests in high school, the mere 3.4 percentage change and the viability of testing and advising all students at the high school level for college placement becomes logistically problematic for Lake State College.

Another alternative to placement testing is examination of high school transcripts for predictors of college readiness. Not only did high school transcripts demonstrate a student's GPA, but also the highest levels of math completed. Using data from students in a statewide community college system (SWCCS), Belfield and Crosta (2012) conducted a correlational study that showed there is some correlation between placement scores and college credit earned. However, a stronger correlation is seen between high school performance and college performance. High school GPA is found to correlate positively with college GPA and number of credits accumulated in the first semester of college (Belfield & Crosta, 2012). Belfield and Crosta's (2012) final assertion is that high school GPA is a better predictor of how successful a student will perform in college than all other measures used in Texas combined. With the longitudinal scope of this study and the magnitude of the datasets from the SWCCS, the generalizability of this study and its implications for the current study are evident.

Scott-Clayton (2012a) argued that when institutions use high school GPA as a placement tool, there was a reduction the severe error in placement rates in math. The study showed higher success rates for students who enrolled into college-level work, and higher overall success rates in college (Scott-Clayton, 2012a). Scott-Clayton (2012a) enhanced the assertion of this study by analyzing the results of community college success if institutions adopted a more liberal remediation placement policy, placing students into college-level at a higher rate. There are identified limitations in the study, specifically the systematic distribution of reliable high school transcripts within the state

education system. This is an area that would need to be examined at Lake State College to ensure the system to receiving and processing high school transcripts is sufficient if Lake State decided to utilize transcripts as a placement method.

Fletcher's (2014) study examined another aspect of college placement that previous studies had not: what happens when a student does not like the placement assessment results? Based on the traditional method of placement, students take an assessment and, for many, the results place the students in developmental classes. Many of these students do not complete a degree or certificate. But the unique question asked in this study was what are the other options students may look for after placement developmental education sequences (Fletcher, 2014). This case study looked at the course of action students take after placement based on assessments, and found that some students shopped for other options to maneuver around developmental requirements. This suggested that offering students more flexibility and a quicker placement based on other measures, not just placement tests, would not only benefit students but would help institutional enrollment.

Many institutions are addressing the issues of placement accuracy and experimenting with different models in efforts to improve student success. Lake State College and the other institutions in Florida were forced to reexamine placement procedures due to policy changes. According to SB1720, students are now able to make their own decisions regarding placement testing and remediation enrollment. Research suggested that this informed self-placement model should be aided by the examination of

the student's high school GPA and the level of course work completed in high school (Kazis & Couturier, 2013; Ngo et al., 2013; Scott-Clayton, 2012a).

Developmental Education Effectiveness

Despite the long tradition of colleges and universities providing developmental education, the effect of developmental education on student completion rates is a debated topic in the literature. Some studies (Bailey et al., 2010; Jenkins & Cho, 2012; Martorell & McFarlin Jr., 2011; Melguizo et al., 2014; Moss & Yeaton, 2013; Skidmore et al., 2014; Zachry Rutschow & Schneider, 2012) argued that there was no empirical evidence demonstrating the effectiveness of developmental education on retention and persistence for college students. Other proponents of developmental education (Bonham & Boylan, 2011; Boylan & Trawick, 2015; Goudas & Boylan, 2012) argue that developmental education is necessary and vital to a students' success.

Wilson (2012) reported on the national policies and trends towards developmental education and their effects on state policies. Tracing the large-scale changes to developmental education systems country wide to President Obama's goal for increased access and charge for community colleges to boost the economy, Wilson (2012) noted that this presidential challenge is problematic for many states due to decreased state budgets for developmental education. Wilson found that 35 states had developmental education policies, and many of those policies were under serious revision. The political changes have been so dramatic that in some states there are no longer developmental education courses at four-year institutions, resulting in the requirement that students who

are underprepared and need remediation attended community colleges and then transferred. Of the states Wilson (2012) listed as having developmental education policies, over 20 of those states were also identified as being in the process of undergoing significant changes in developmental education design including task forces to examine the success and need for developmental education programs.

Studies exploring the effectiveness of developmental education have raised many questions regarding the worth of remediation. Because each state has its own program, the ability of developmental education to positively affect student achievement could be seen only in specific and small scale situations (Bettinger et al., 2013). Bettinger et al. (2013) asserted that being labeled as underprepared causes frustration and is discouraging for students. Students in Florida took an average of nine developmental education credit hours, hours that do not bear credit, at the extra cost of $504 per semester: this alone is a discouraging obstacle for students entering the college system (Bettinger et al., 2013).

With national initiatives' focus on increasing access and achievement for higher education, specifically community college, funding from the federal government, the Carnegie Foundation, and the Bill and Melinda Gates Foundation was allocated to student developmental education. Several national studies worked to evaluate the effectiveness of developmental education programs. The debate over developmental education has grown as access has expanded, but the success of the students who enrolled in developmental education declined (Zachry Rutschow & Schneider, 2012). In the review of the literature from the past several decades of research on developmental

education, Zachry Rutschow and Schneider (2012) discussed several flaws. Much of the research was conducted using only descriptive statistics; this resulted in general recommendations with no specific implementation plan or strategic guideline and the research was ignoring the long-term effect of developmental education on the students' success. This study, based on the literature reviewed and the lack of research providing a strong case for developmental education along with the staggering statistic that 60% of community college students start in developmental education and only 30-40% of these students will earn a degree or certificate, led to the recommendation that interventions should include removing developmental education requirements (Zachry Rutschow & Schneider, 2012).

Funding from the Bill and Melinda Gates Foundation and the Lumina Foundation allowed 15 colleges to participate in the Developmental Education Imitative (DEI) in an attempt to assess current developmental education programs and make recommendations for best organizational practices to increase college retention. This funding and the resulting study concluded that developmental education was a "stumbling block in the path to college graduation" (Quint et al., 2013, p. 1). This conclusion that developmental education would hinder, not help, academically underprepared students drove the DEI, an outgrowth of *Achieving the Dream,* to develop best practices for avoiding developmental education or getting students through the developmental education sequence as quickly as possible.

Achieve the Dream data from 256,672 students who entered college from 2003 to 2004 was used to place students into one of four categories: no remediation, remediation one level below college-level, two levels below college ready, or three or more levels below college-level (Bailey et al., 2010). According to the study, students who did not listen to placement assessments or advisors and self-placed into college-level instead of enrolling in remediation had a much stronger success rate, passing their gateway courses at an only slightly lower rate than those who placed at college-level (Bailey et al., 2010). 72% of students who ignored placement advice and enrolled into college-level courses passed those courses, 27% of students who completed their remediation sequence passed their gateway course (Bailey et al., 2010). The results from this large study clearly demonstrate that developmental education can be an obstacle rather than a benefit for achieving college-level competency.

The overall, statistical effect of developmental education programs nationwide was presented in the research overview from Teacher's College at Columbia University (2014). According to this report, approximately 68% of community college and 40% of students at open-access four-year colleges took at least one developmental education course, but the number of students referred to developmental education and not enrolled is not reported with accuracy (Columbia University, 2014). Furthermore, with a national price tag estimated at 7 billion dollars for developmental education, the fact that only 28% of developmental education students earned a degree within eight years of enrollment is staggering (Columbia University, 2014). Using a regression discontinuity

study, the report found several important trends. The metrics used examined the effect of developmental education courses on short term persistence, passed college gateway course, and grade in college-level subject area as well as the long-term effects of persistence, college credits earned, and credential or transfer from the community college. The results of the seven college systems studied showed null or negative effect of developmental education on the studied metrics with only a few exceptions. In Tennessee and Ohio, developmental math students show a positive effect of developmental courses on earning a credential (Columbia University, 2014). Students in developmental reading courses saw a positive effect on credits earned and persistence in Tennessee (Columbia University, 2014). Finally, in Tennessee, there was a positive effect on persistence and grade in college-level English class for students who enrolled in developmental writing courses (Columbia University, 2014). Overall, the developmental education sequences studied had negative or null effect on student success.

Another aspect discussed in the literature is the number of classes in an institution's developmental education sequence. Bettinger and Long (2008) argued that despite the intent of providing under-prepared students with the necessary skills for college-level work, the pattern of increasing requirements causes students to view remediation as a hindrance, not a necessary supportive aid. The long-term effects of remediation on student success, however, were widely unknown, and to address this gap in the literature, Bettinger and Long used an instrumental variable analysis strategy of 28,000 full time college students in two campuses in Ohio. The study found a slight

positive correlation in the developmental program at one institution, but not the other. This supports the assertion that each developmental education program must examine itself to determine the program's effectiveness for its students. Bettinger et al. (2013) wrote that despite increased efforts to retain students, dramatic changes in the student population as a result of economic downturn created a strong need for non-traditional supportive measures. Researchers discussed the need for daycare, mentoring, and financial assistance; however, these types of interventions are difficult for institutions to support financially. More realistic, however, are the recommendations that placement tests no longer be the focus of placement and that students are placed into college credit as well as institutions creating more customized pathways through college for students who may need remediation (Bettinger et al., 2013)

According to Baldwin et al. (2012), the ability to measure the effect of these national efforts to increase student retention is limited and, therefore, warranted the study of the 2003 cohort for longitudinal indicators of developmental education success. Researchers found that though the overall success and persistence of students may have increased based on the previous measures of credit hours earned and persistence from semester to semester, the picture for developmental education students remained bleak. Baldwin et al. (2012) reported that despite initiatives to help students through developmental education courses, only about 32% of the students in Florida reached and passed their gateway math courses by their third year of enrollment. The results are staggering when considering that less than a third of students at a two-year college are

able to pass their gateway math courses by their third year of enrollment. In an attempt to understand why students who enrolled in developmental education courses do not complete their sequences, Bailey et al. (2010) analyzed data from two data sources, Achieving the Dream and the National Education Longitudinal Study (NELS) databases, to conduct a multivariate analysis of student enrollment and progression through the developmental education sequences. The analysis found that 20% of students never enrolled in a developmental math course after being referred to the developmental education sequence. Using factors of student demographics, college characteristics, and state specific regulations, the analysis revealed that younger students at smaller colleges had a better chance of enrolling in and completing the developmental education courses in both math and reading. This study looked at both institutional and student demographic information, finding the type of developmental education student who was most likely to persist, but also allowing for institutions to adopt characteristics that were more conducive to successful progression through the developmental education course (Bailey et al., 2010). Lake State College does offer smaller classes for developmental education students (classes capped at 25 as opposed to 35 for college credit courses), the overall pattern of low enrollment and completion in the developmental sequences is still evident.

In Florida, these same national trends and issues are explored at the state level. Melguizo et al. (2011) utilized a regression discontinuity study through a review of the literature to determine what assertions could be made about developmental education. The regression discontinuity specifically discussed studies conducted in Florida and

demonstrated that even though the developmental education sequences for 144,000 students did increase the likelihood of continued enrollment semester to semester, the long term effect on persistence and grades in college-level work was not significant (Melguizo et al., 2011). This study, with an emphasis on Florida's developmental education program, allowed a more specific look at contextualized developmental education effect. With the research demonstrating the influence specific contexts have on developmental education effectiveness, a detailed look at past studies focused on Florida is helpful.

Preliminary research from the state of Florida after the introduction of SB1720 demonstrated that students are not choosing to take developmental education courses. Statewide, only 41.9% of students referred to developmental math enroll in a remedial course; 22.5% enroll in a college-level course and 35.7% do not enroll at all in a math course. In writing, 32.5% of students referred enroll in a developmental course, 27.4% enroll in college-level course and 41.3% do not enroll in a writing course (Hu et al., 2015). In reading courses, only 8% of students enroll in a developmental education course after advisor recommendation, 36.1% enroll in college-level English, and 56.2% of students do not enroll in an English class (Hu et al., 2015). Hu et al. (2015) found several trends in enrollment choices in Florida; students who considered their career goals important enrolled in developmental education courses. Other factors that affected the decision were time to degree, high school grades, low income, gender, and perceived academic ability. Important to the current study is the finding that students who do not

take any developmental education courses showed a lower rate of consideration and decision-making ability (Hu et al., 2015). These preliminary statistics, however, do not include the important elements of student satisfaction or confidence in decision-making that the current study seeks to address. Hu et al. (2015) demonstrated that students who traditionally would be referred remediation and choose not to enroll in any developmental courses were in need of more help with decision-making.

Despite the negative results in much of the research on developmental education, there are still some who argue that developmental education has a positive effect on student success metrics. Using a regression discontinuity analysis, 3,589 students were examined a slight positive effect on students after taking developmental English courses with an effect size of .20 (Moss & Yeaton, 2013). One of the strengths of this study is the easily replicable structure of the descriptive analysis to be reproduced. The use of this study could be used to help inform policy at institutions.

The issue of validity and reliability in the research practices of developmental education journals is another problem when examining the literature. Skidmore et al. (2014) specifically studied the reporting and research practices of empirical studies regarding developmental education effectiveness. Several prominent developmental education and community college publications were examined, and it was found that only 29 of the 132 articles submitted over a ten year period were quantitative; furthermore, among those studies, 10% did not have a goal or purpose statement and a theoretical framework was utilized less than 41% of the time (Skidmore et al., 2014). Based on this

analysis, the field of developmental education research leaves much to be desired if the results of the field as a whole are to be considered valid and generalizable.

Other studies argued that developmental education is a necessity and has been poorly represented through flawed research (Boylan & Trawick, 2015; Goudas & Boylan, 2012; Neuburger, Goosen, & Barry, 2013). One trend in the research is that studies conducted are descriptive in nature and simply compared outcomes of students who were not in need of remediation with students who were assigned developmental education courses; this comparison is not valid because of the fundamental differences in the types of students being compared (Bettinger et al., 2013). Instead of research allowing for generalizability of trends, the state and institution specific policies and differing student demographics being assigned remediation support a need for each institution to inquire into the effectiveness of its own developmental education program and the needs of its own demographic of student.

Goudas and Boylan (2012) argued that much of the research demonstrating the ineffectiveness of developmental education have false biases and assumptions and are written without a true understanding of the purposes and nature of developmental education. One contention in this study asserted that the metric of grades in the gate-keeper courses for non-remedial students and remedial students is not a valid comparison. Goudas and Boylan also asserted that a fundamental misunderstanding of what developmental education's goal mislead researchers and politicians, resulting in a negative judgement regarding developmental education. Developmental education's goal

is to holistically educate students in all areas of college life, not just cognitive content skills, which are not measured through empirical research. This study proposes an alternative lens through which to examine developmental education: the purpose of developmental education was to boost students who were not academically prepared for college-level work to complete gateway courses at the same success rate as students who did not need remediation, and the current research does not acknowledge this (Goudas & Boylan, 2012). This literature review offers an alternative explanation for the dismal studies published exploring developmental education.

The limitations of the research in the developmental education arena create a wariness for practitioners and policy makers when attempting to make sound, research based decisions to help students. With the forced redesign that Lake State College was required to complete because of SB1720, the lack of strong, generalizable research regarding best practices in developmental education can make redesigning the developmental program difficult. Specifically citing the lack of reliable research as problematic in developing programs for students in need of remediation, Scott-Clayton and Rodriguez (2012) examined 100,000 students from a college system and found that developmental education did not help students persist or achieve more in their college-level courses, but it also did not appear to be a strong discouragement for students' progression. Instead, developmental education programs serve as a diversion from the degree a student was seeking, which was more detrimental to a student's progress (Scott-Clayton & Rodriguez, 2012).

When examining the literature regarding the effect of developmental education, several important patterns emerge. First, it cannot clearly be determined if developmental education is a useful requirement for college success. Secondly, the debate around developmental education comes from a lack of sound research practices. Finally, the more quickly a student is in college-level courses, the better his or her chances of success are. It is this final theme that applies to the current study; as this study attempts to help advisors and students find the correct level of course for a student, the foundation of those placement decisions should always be enrolling the student in the highest level of developmental education courses possible.

Developmental Math

Research tends to treat developmental math differently than developmental writing or reading. Ngo et al. (2013) argued that mathematics can be one of the most difficult obstacles for developmental education students, and, as such, great measures should be taken to enroll the student in the highest level of math possible. The study examined several different community colleges for placement procedures and found that students who are boosted into a higher level of math than their placement test scores indicated were just as likely to succeed as their peers (Ngo et al., 2013). Based on this study, it can be concluded that even though developmental math may be necessary for some students, placement tests are not a valid placement tool for math and instead background and GPA should be used to boost a student as close to college-level as possible.

The importance of enrolling in and completing a math sequence was demonstrated by Fong et al. (2013). This study argued that despite the research declaring that remedial math classes do not help students achieve their degrees, remedial math is, in fact, helping students reach college-level competency. By altering the statistical analysis to include only students who persist through the developmental math sequences, ensuring that all students who were included in the data set were, in fact, enrolling in math courses, this study proved that developmental education math students are able to perform at the college-level with the same skills as students who are not referred to developmental math courses (Fong et al., 2013). This study demonstrated the value of remedial math for students working towards their degree.

But what are the characteristics that will determine if the students will persist through the developmental math sequence? Davidson and Petrosko (2015) used logistic regression to determine the relationship between demographic, academic, work, and family factors and persistence. A three year study of students enrolling in developmental math in the Kentucky State College System demonstrated that only two of these factors had a significant coefficient; female students had a higher level of persistence, and family factors were as significant to student persistence as academic factors (Davidson & Petrosko, 2015). This study recommended that as advisors work to place students in the correct levels of math, family life should be a consideration.

Using databases from the California Community College System and the National Education Longitudinal Study, Bahr (2013a) examined what happened to students who

enrolled in developmental math courses after completing their remedial programs. The sample size being 190,637 students, and the dependent variables studied were the type of math course the student enrolled in after completing remedial math, the grade earned, and credit load; independent variables in this study were the number of vocational credits the student enrolled in, successful completion of credits, and mean course credit load (P. R. Bahr, 2013a). The results of the study showed that students who did not reach college-level math competency needed supportive measures to help them credential. Bahr (2013a) argued that clear goals and clear information regarding options were necessary to support students after remedial math. This same concept can be applied to the students enrolling in courses at Lake State College; students need to have their goals in mind and need clear information regarding the pathways to completing those goals.

Mesa's (2012) study also emphasized the importance of student goals in their persisting in developmental mathematics courses. Seven hundred seventy-seven students that enrolled in math courses, both remedial and college-credit, were examined. The results found that despite teacher misperceptions regarding developmental education students' abilities, most students had the belief that they were competent and able handle challenging work in math courses. This study was supported by Rehak and McKinney (2015) who argued that developmental math courses could be improved through student perception inventory results to create a more engaging and supportive classroom.

Despite Bonham and Boylan's (2011) assertion that developmental math was a barrier to degree attainment and not a statistically significant support for students seeking

a degree, the need for developmental math is still recognized. However, the focus of this study was to challenge institutions to create a better math program for students. Bonham and Boylan (2011) argued that many students do not enroll in college because of developmental math requirements. The average developmental education students in math took 3.4 developmental education courses and 72% of students enrolling needed at least one mathematics course to reach college-level according to traditional placement methods (Bonham & Boylan, 2011). Because math is considered the most significant barrier to degree attainment, and because students suffer from math anxiety and low confidence in the ability to do math at the college-level, significant supportive measures are needed to help students persist (Bonham & Boylan, 2011).

Researchers have examined some of the interventions to help students through their math courses. Sommo et al. (2014) studied the effect of specific institutional interventions to help students achieve college-level math. Scholarships, tutoring, and advising support were given to students at another college in Florida with significant results in the persistence of developmental mathematics courses. Students who were part of the Math Access Performance Scholarship (MAPS) program were 38% more likely to seek tutoring help, accumulated more credits, and were 11% more likely to complete college-level math courses than the control group (Sommo et al., 2014). Sommo et al. (2014) demonstrated that the ability to achieve and persist is not the stumbling block to college-level competency in math, and showed that institutional factors significantly affected the ability of students to persist through developmental math sequences.

With the understanding that developmental math does not demonstrate the same detrimental effects of student persistence as reading and writing (J. Scott-Clayton & Rodriguez, 2012), supported by the above mentioned studies demonstrating the need and benefit of developmental math courses, developmental math alone was focus of the current study at Lake State College.

Redesign and Acceleration

Many states' governments required redesigns of their developmental education programs. Venezia and Hughes (2013) provided a synopsis of the major reforms in developmental education. In California, the Basic Skills Initiative of 2006 provided significant funding for professional development and the creation of programs had higher success rates than traditional developmental education programs. The focus of this program is to fund local interventions and gain understanding of what the best practices are for the developmental education student. Virginia and North Carolina, on the other hand, required the modularization of math courses and the combination of English and reading courses into one, integrated course. In Connecticut, as a response to discouraging progress made by developmental education students, the state created the requirement for developmental education courses to be combined with entry level college courses starting in 2014. Florida is not alone in the changes to developmental education courses, but the lack of requirements for placement testing and remedial courses is an anomaly among the other state-wide redesign programs in the country (Venezia & Hughes, 2013).

As a result of the federal focus on college access and success, the state legislative policies and budgetary allocations dwindling, as well as the forced redesign of developmental education under SB1720, the landscape of developmental education programs are shifting quickly. Under new legislation, schools are no longer permitted to offer the traditional, 16 week long classes for developmental education. Instead, under SB1720, all developmental education courses in Florida are required to be compressed, accelerated, modularized, or contextualized. Each of these redesign models have been implemented in other contexts.

These redesigned course options had an effect on institutional practices resulting in the number of students receiving a method of support rising from 18% in 2009 to 41% in 2011 (Quint et al., 2013), and over 70% of colleges were experiencing an increased persistence for developmental education students (Baldwin et al., 2012). According to Lake State College's redesign plan, courses are offered in accelerated, compressed, and modularized courses. This adds another element to the decision-making process for incoming students at Lake State College.

Many of the redesign models are still too new and not researched extensively for longitudinal effect, but several studies demonstrated preliminary trends and best practices for developmental education students to succeed in their developmental education courses and future college credit courses. The initial research shows that accelerating students through the developmental education sequence is a promising intervention, despite the newness of these programs (Edgecombe, 2011). According to one study, the

majority of colleges under redesign policies chose modularized or compressed courses as the method of developmental education delivery (Quint et al., 2013). In those redesigned course offerings, 27% of colleges used a computerized, individualized, or modularized method of compression. Zachry Rutschow and Schneider (2011) conducted a literature review to find patterns in emerging developmental education research. In this literature review, several trends were found concerning acceleration and contextualization that were promising for student outcomes. Based on the reviewed literature, acceleration and contextualized courses increased student outcomes significantly and offered promise for institutions trying to serve the developmental education student (Zachry Rutschow & Schneider, 2011).

An intervention in the Colleges and Universities in New York (CUNY) showed promise in acceleration models. The Accelerated Study in Associates Program (ASAP) helps to increase student enrollment, credits earned, and persistence (Scrivener et al., 2012). The ASAP is a program that focuses on accelerating low-income students and resulted in 15% more students completing developmental education sequences, 2.1 more credits earned per semester, and 11% more full-time student enrollments (Scrivener et al., 2012). This study, though based in New York, demonstrated the significant effect of accelerating students through the developmental education sequences.

Other institutional departments are affected by the changes in developmental education. One of these areas is student supportive services, where advisors and tutors work to help students persist, especially for students at the lowest levels of remediation

(Bettinger et al., 2013). Advising, specifically, showed an influence on student persistence, but the ratio of advisors for 55% of community colleges is 1 advisor to every 1,500 students (Bettinger et al., 2013). At Lake State College, four advisors serve a campus of 6,500 students (Office of Institutional Research, 2015). Under SB1720, these advisors have the responsibility of helping guide students into the course option that is most effective for that student. This requirement of advisors is not realistic when examining the number of students each advisor is responsible for.

Even though the redesigning of developmental education courses is the focus of much of Lake State College's redesign plan under SB1720, the research regarding the need for developmental education and the correlation for long term student success has not been proven in the research. The focus of the current study was to examine decision-making patterns and enrollment patterns, followed with later success, and to develop a tool to help advisors guide students into the most appropriate and highest level of math possible.

Program Entry

Along with placing students at the highest level of math courses possible, another important intervention is enrolling students into their course of study. Jenkins and Cho (2012) identified program entry as a significant milestone in a student's college career and, as a result, a milestone that organizations should emphasize in retention programs. There is a more significant correlation between a student entering his or her program of study within the first year and further college success than there is for a student enrolling

in developmental education courses (Jenkins & Cho, 2012). Jenkins and Cho (2012) demonstrated through quantitative analysis that students who enter their program of study in the first year are one third more likely to complete their degrees than students who are delayed in developmental education sequences.

However, enrolling students in the program of study is difficult. Karp (2011) argued that most students do not have a clear pathway when they entered college. Conducting a study of current theory and review of educational evaluation literature, Karp (2011) was able to identify four areas of non-academic support to help students persist; social relationships, clear goals, the how-to of college, and making the college life feasible for students. Most important for the current study was Karp's (2011) assertion that students need a clear plan for achieving a degree or certificate. For students who do not have a clear goal, Lake State College's College Success course would allow them to gain knowledge and skills for social relationships, how to survive college, and how to develop clear career goals. These student success courses are particularly helpful for a community college, such as Lake State College that is traditionally underfunded and understaffed with regard to advising and counseling (Karp, 2011).

The dire need for institutions to examine their enrollment structure and the clarity of the enrollment pathways was argued in Scott-Clayton's (2011) study. According to Scott-Clayton (2011), community colleges do not offer structure in enrollment choices, but allowed students to choose courses and, many times, enroll in the wrong courses. These mistakes in enrollment choices cause serious delays in degree attainment and

dissatisfaction with the college experience (Scott-Clayton, 2011). First generation students, a significant population of Lake State College, are particularly vulnerable to making mistakes because of confusing enrollment structures at most community colleges. Passive decision-making, lack of experience, complexity of enrollment decisions, and lack of a structure cause students to enroll in incorrect courses (Scott-Clayton, 2011). When making course enrollment decisions, more choices are not better for students, as many students experience overload when attempting to register for their courses (Scott-Clayton, 2011); this demonstrates the need for the current study. Under SB1720, students at Lake State College have more options to choose from despite the lack of a clear enrollment structure, which can determine the success of students (Scott-Clayton, 2011).

The correct enrollment is argued to be the most important predictor of student persistence. Moore and Shulock (2011) argued that students who do not enroll in the correct course will withdraw without ever entering a program of study; this is specifically a problem for Black and Hispanic students. However, students who enter their program of study in the first year are two times more likely to graduate than those who remained in developmental and prerequisite courses for their first year (Moore & Shulock, 2011). Because of this, students need accelerated pathways into their program of study, including accelerated developmental education courses. Strong advising is necessary for students as they plan their schedules and enroll in courses (Moore & Shulock, 2011) and I hoped to provide that support through the current study.

Conclusion

Each of these concepts specifically addresses the new challenges of students enrolling in colleges under SB1720. The first major theme discussed in this literature review, the theory of bounded rationality (Simon, 1972) and studies addressing decision-making, demonstrated the need for help and support as students attempt to maneuver through this complicated decision process. It was evident in the reviewed literature that the concepts of college readiness are confusing and inconsistent, and the reliance on the placement tests for course enrollment is not appropriate for students, the concept of self-informed placement being only briefly mentioned. Students at Lake State College, required to make enrollment decisions without a clear understanding of the consequences of that decision, must also decide if developmental education courses are helpful and which mode of developmental math would be most beneficial. The current study hoped to aid students as they work through this decision and accelerate students to the highest level of math possible in order to increase student chances of enrolling in a program of study in the first year, as well as persist until degree completion.

Chapter 3: Research Methods

Introduction

The purpose of this study was to compare the students who chose to take developmental math with those who chose to take college-level math and determine which, if any, variables were significantly different between the two groups. In Chapter 2, I focus on the research design and the methodologies that I used to collect and analyze data. I then discuss the research design and the rationale for the choice, and I provide an in-depth discussion of the methodology used in the study. Finally, I discuss threats to validity, both internal and external, and ethical procedures being followed during data collection.

Research Design and Rationale

The research design for this study is a quantitative survey study. The independent variable in this study, the level of math course chosen, created the two different groups to compare: developmental or college-level math students. The dependent variables that I used to compare the two groups were high school GPA, prior knowledge of enrollment decisions, student typology, confidence in enrollment decision, satisfaction with course, and the predicted course grade. Because several of the variables in this study are considered affective, including confidence, satisfaction, and prior knowledge of enrollment options, the use of a survey study was appropriate. Some questions asked are not appropriate for a Likert scale, including student typology, high school GPA, and expected course grade. These questions were asked separately before the participant

completed the Likert Scale. The sections of the survey related to variables of confidence, prior knowledge, and satisfaction in the courses were asked using a 5-point Likert scale to aid in the validity of student answers and a give more reliable result for each of the variables.

The survey study allowed for a ready comparison of the two groups of students being examined: those who enrolled in developmental education and those who enrolled in college-level math, as well as the isolation of the specific variables in the survey. Using a scale for the survey allowed me to assign a numerical value to the student's confidence, satisfaction, and prior knowledge. I also asked students to report their high school GPA, student typology, and expected course grade along. Anonymity is beneficial when receiving honest student feedback, making the use of an anonymous survey helpful.

The timing of this study was important to ensure the best results from students. The survey needed to be administered early enough in the semester at Lake State College so the withdraw deadline had not passed. If the survey were given after the withdraw deadline, the population of students who did not feel that they were in the right class and withdrew would have been lost to this study. If, on the other hand, the survey was sent too early in the semester, then students would not have a sufficient understanding of how they were performing in the class to provide a reasonable prediction of what their course grade would be. Therefore, the survey was distributed at an appropriate time during the semester to capture as many students as possible in the population, approximately 6 weeks after the first day of class.

The distribution of the survey through Lake State College's institutional email system allowed maximum participants to receive the survey. The use of an electronic survey allowed for electronic consent to be used as opposed to requiring participants to sign a consent form. An electronic survey and consent allowed for participants and their responses to remain anonymous and increased the chances of students responding (Frankfort-Nachmias & Nachmias, 2008). The Office of Institutional Research obtained email addresses for all students who were part of the population and distributed the survey. All exempt students who were enrolled in developmental or the first math course in the Fall of 2016 received the survey.

Methodology

Population

Senate Bill 1720 defined the population for this study. Only students who were exempted from the developmental education requirements and college placement testing at Lake State College were part of the population in the current study. This restricted the population of the study to students who graduated from a Florida high school with a regular diploma since 2007, as defined by SB1720. For the purposes of this study, only students who were enrolled in their first math course at Lake State College and were exempt under SB1720 were surveyed. A student who had already taken a math course and passed into the next level or a student who has failed a math course previously was not appropriate for this study. The Office of Institutional Research at Lake State College

reported that in the Fall of 2017, there were 739 students who were exempt, first-time-in-college, and enrolled in a math course.

From the total population of 739 students, 11, or 1.5% of the students, were enrolled in MAT0018, the lowest level of developmental mathematics. In the total population, 54 students, or 7.3%, were enrolled in MAT0028, the second level of developmental education. Four hundred fifty, or 61% of students, were enrolled in either MAT1033 or MAT1101, the gateway math courses. One hundred seventy-four of the participants, 23.5%, were enrolled in an upper-level mathematics course other than MAT1101 or MAT1033.

A census sample was used for this study, allowing all students who fit the population an equal opportunity to participate in the survey. Using the online sample size calculator through SurveyMonkey, the sample size was calculated. Using 739 students as the total population, a 99% confidence level, and a 15% margin of error, a sample size of 68 students was calculated ("Sample Size Calculator," n.d.). In order to adjust for any errors, I included an additional 10 responses to the sample size. This rendered a sample size of 78 students needed.

Sampling Procedures

The sampling strategy for this study was a census sample, meaning that all students who fulfilled the qualifications of the study were able to participate. All students who enrolled in MAT 0018, 0028, 0057, 1033, 1101, or other upper-level math courses received the survey via institutional email. The Office of Institutional Research

determined which students fit this population and sent the survey only to those students in the population. To eliminate the possibility of a minor participating in the study, the first question asked was "Are you 18 years old or older?" Students who answered "no" to this question were thanked for their participation and the survey then closed to prevent a minor from participating in the study. Using a census model, all 739 students had equal opportunity to participate in the study. Also, the use of a census sample allowed for data to be collected and used for future studies and the probability of finding detailed data within the subgroups of the population was greater (Statistics, n.d.). It was not appropriate to use minors in this study. Therefore, the first question of the study was used to filter any students who were minors out of the participant pool.

Recruitment, Participation, and Data Collection Procedures

All exempted students enrolled in MAT 0018, 0028, 0057, MAT 1033, MAT1101 or other upper-level mathematics course during their first semester at Lake State College received an electronic invitation, including a letter of consent, to participate in the survey through the Lake State College email system. To protect anonymity, the Office of Institutional Research isolated the participants' Lake State email addresses and sent survey. Because of the small number of students enrolled in some of the math courses, demographic identifiers were not included in the survey. When students followed the link to complete the electronic survey, they were provided with the wording and information required by Lake State and, by clicking "I Agree" students gave informed, electronic consent. Students were asked to respond within two weeks. After one week, students

received the same email to remind them to complete the survey. Students who had already completed the survey were not able to open the link in the second email, so there were no duplicate responses.

The Office of Institutional Research at Lake State College compiled the results and sent the data to me with all identifiers removed from the reports. The raw data were inputted to SPSS for analysis. There was no follow up for the survey study or exit procedures needed.

Instrumentation and Operationalization of Constructs

No existing survey had been developed to examine the dependent variables of this study. Therefore, I created a survey original to this study (see Appendix). Lake State College has identified the students in the population based on the criteria I provided, and the Office of Institutional Research at Lake State College maintained the student identifying information. The smallness of the sample required the removal of demographic information. To ensure that no minors participated in the survey, the first question of the survey asked if the student was at least 18. Three questions in the introductory set asked the student his or her high school GPA, expected course grade, and student typology.

1. Are you at least 18 years of age or older?
2. Which math course are you currently enrolled in? (1033, 1101, 0057, 0028, 0018, or other)
3. What was your high school GPA: 4.0-3.5, 3.4-3.0, 2.9-2.5, 2.4-2.0, 2.0-1.0.

4. Which category best fits you (Choose only one)?
    - Transfer student. (I will finish my AA or AS and then transfer to a university or a Bachelor's program at Lake State College.)
    - Vocational student. (My degree here at Lake State College will allow me to enter into my career choice without further school)
    - Experimental student. (I am just trying college out. I am not sure if I will complete my degree or not.)
    - Non-credit/drop-in. (I am not working towards a degree.)

5. What grade to you expect to receive in this class? A B C D F

After this introductory set of questions, the survey used a 5-point Likert Scale, asking students if they strongly agree, agree, neither agree nor disagree, disagree, or strongly disagree to statements regarding their confidence when enrolling, satisfaction with the course, and prior knowledge of options before enrollment. By including the neutral answer and using the 5-point scale, the answers were more likely to be an accurate measure of the concepts being explored (Frankfort-Nachmias & Nachmias, 2008).

The subscales for this survey were confidence in enrollment choices at the time of enrollment, satisfaction with the course enrolled in, and prior knowledge before enrolling. There were five questions in the survey per subscale. Survey items 1, 4, 6, 10, and 15 referred to confidence in decision at the time of enrollment. Survey items 2, 5, 9, 11, and 12 referred to prior knowledge of enrollment options. Items 3, 7, 8, 13, and 14 measured satisfaction with the course after initial enrollment. To ensure that there was internal

validity for the survey, the survey was pilot tested in two upper-level mathematics courses which students would most likely not be enrolled in. The reason for the selection of the two upper-level courses was that this eliminated any crossover between pilot participants and study participants.

To ensure internal validity of the survey, the pilot responses were used to calculate Cronbach's alpha. These responses came from 26 upper-level math students who were not enrolled in their first math courses. The target range for the reliability and validity of the survey was a Cronbach's alpha between .8 and .9, to ensure that the subscales were consistent in their measurements of the variables in the study (Fields, 2013). Adjustments would be made to the survey as needed before the final survey was sent for data collection, establishing the internal validity and reliability of the study.

Data Analysis Plan

I used ANOVA to determine the differences between the two groups of students being examined in this study for each of the dependent variables.

The primary research question in this study was: How do students who enroll in developmental math courses differ from students who enroll in college-level math courses? The primary null hypothesis for this study was: There was no significant difference between students who enroll in developmental education and college credit math courses. The primary alternative hypothesis for this study was: There was a significant difference between students who enroll in developmental and college credit math courses.

The secondary research questions and hypotheses were:

- RQ2: How did students who enrolled in developmental math and students who enrolled in college-level math differ with regard to student typology?
- $H_0$2: There is no significant difference between students who enrolled in developmental math and students who enrolled in college-level math with regard to student typology.
- H_a2: There is a significant difference between students who enrolled in developmental math and students who enrolled in college-level math with regard to student typology.
- RQ3: How did students who enrolled in developmental math and students who enrolled in college-level math differ with regard to high school GPA?
- $H_0$3: There is no significant difference between students who enrolled in developmental math and students who enrolled in college-level math with regard to high school GPA.
- H_a3: There is a significant difference between students who enrolled in developmental math and students who enrolled in college-level math with regard to high school GPA.
- RQ4: How did students who enrolled in developmental math and students who enrolled in college-level math differ with regard to prior knowledge of enrollment decisions?

- $H_0$4: There is no significant difference between students who enrolled in developmental math and students who enrolled in college-level math with regard to prior knowledge of enrollment options.
- H_a4: There is a significant difference between students who enrolled in developmental math and students who enrolled in college-level math with regard to prior knowledge of enrollment options.
- RQ5: How did students who enrolled in developmental math and students who enrolled in college-level math differ with regard to confidence in enrollment decision?
- $H_0$5: There is no significant difference between students who enrolled in developmental math and students who enrolled in college-level math with regard to confidence in enrollment decisions.
- H_a5: There is a significant difference between students who enrolled in developmental math and students who enrolled in college-level math with regard to confidence in enrollment decisions.
- RQ6: How did students who enrolled in developmental math and students who enrolled in college-level math differ with regard to course satisfaction?
- $H_0$6: There is no significant difference between students who enrolled in developmental math and students who enrolled in college-level math with regard to course satisfaction.

- H_a6: There is a significant difference between students who enrolled in developmental math and students who enrolled in college-level math with regard to course satisfaction.
- RQ7: How did students who enrolled in developmental math and students who enrolled in college-level math differ with regard to expected course grade?
- H_07: There is no significant difference between students who enrolled in developmental math and students who enrolled in college-level math with regard to expected course grade.
- H_a7: There is a significant difference between students who enrolled in developmental math and students who enrolled in college-level math with regard to expected course grade.

SPSS was used for data analysis. Student responses were inputted with results from the introductory questions as well as the Likert scale. Likert scale data were added for a total composite score for each subscale and then translated into interval data which represented the five points on the Likert scale. When examining the subscale for prior knowledge, students scoring 25-20 points were classified as having strong prior knowledge, 19-15 as having some prior knowledge, 14-10 as neutral, 9-5 as low prior knowledge and 4-0 as having no prior knowledge. The subscale for confidence in decision at the time of enrollment used the following scale to determine the data interval: students scoring 25-20 points would be classified as having strong confidence in their

decision, 19-15 as having some confidence in their decision, 14-10 as neutral, 9-5 as low confidence in their decision and 4-0 as having no confidence in their decision. Finally, the intervals for satisfaction in the chosen course were as follows: students scoring 25-20 points would be classified as having strong satisfaction in course, 19-15 as being somewhat satisfied with the course, 14-10 as neutral, 9-5 as being somewhat dissatisfied with the course and 4-0 as being very dissatisfied with the course.

For each of the interval data sets, including prior knowledge, decision confidence, course satisfaction (all derived from the Likert scale) and high school GPA, student typology, and expected course grade, an Analysis of Variance (ANOVA) test was used to compare the two groups of students examined in this study: exempted students who enrolled in developmental education courses and exempted students who enrolled in college-level courses. The mean for each of the dependent variables was compared. Using the standard .05 significance level, the data were analyzed to accept or reject the hypotheses.

Threats to Validity

Several threats to the validity of the study were recognized and addressed. The first concern to validity in this study was that I work at Lake State College as an instructor. However, this possible threat to validity has been addressed as the courses being surveyed were only mathematics courses and I teach only writing courses. Furthermore, though students may have taken a course from me in the past or students may take a course from me in the future, the identity of participants was never made

available to me and the survey was anonymous. Students were assured that their participation in the survey had no effect on their relationship with any professor at Lake State College, either myself or their math professor, because their responses only were recorded, not their identities.

As students took the survey, there were some external validity issues, or issues beyond the control of the researcher or participants that may be problematic. One concern was that students may have felt coerced to participate in the study or that participation in the study could cause added stress to the student. To manage this concern, the survey was conducted outside of class time, electronically, and students' participation was emphasized as being voluntary. Another concern to the external validity of this study was that students would not understand or read the questions carefully. In order to avoid this issue, the Cronbach's alpha test was conducted on the final survey results, and those scores which did not demonstrate that the student read and responded to the survey were eliminated or identified as outliers.

Content, predictive, and construct validity could be concerns as this instrument was not an already established survey. In this case, I conducted several statistical analyses and piloted the survey with 26 students to ensure that the Likert scale complies with Cronbach's alpha. The inclusion of a 5-point scale and five questions per subscale also increased the validity of the content in the survey through the inclusion of multiple answers which supported each other within the subscales of the Likert scale (Frankfort-Nachmias & Nachmias, 2008).

I addressed predictive validity through several studies and theories establishing that students were able to make rational decisions when enrolling in college courses. Scott-Clayton (2011) showed that students did not understand the risks of enrolling in the incorrect course and that this directly affected student success. Simon (1972) argued that a rational decision can be measured through confidence and satisfaction, elements I sought to assess through the Likert scale. Finally, Bahr (2011) asserted that students enrolling in developmental or college-level math courses will have success depending on their student typology, classifying students as transfer students, vocational, or experimental. For the purposes of this study, student typology was assessed through Item 4, that asked students about their future goals. As Bahr (2011) argued, students who have clear career goals, falling into the transfer or vocational typologies, will perform better in math. Therefore, students who responded that they were going to transfer or enter the work force would fit into Bahr's typology of transfer or vocational and should have a higher degree of success in their courses than students who would be characterized as experimental or not working towards a degree.

Construct validity was addressed as the subscales were taken directly from the research questions and were written to address the specific concepts being addressed in the study, including satisfaction and confidence in decision-making (Simon, 1972 & Scott-Clayton, 2012b) and student typology (Bahr, 2011). Therefore, the theoretical and conceptual frameworks used in this study were connected to the scale directly. The

variables in the study were represented in either the scale or the preliminary questions asked to students.

Ethical Procedures

In order to conduct this study, I gained permissions from both Lake State College and Walden University Institutional Review Boards (Walden University approval number 04-12-16-0397989). These two approvals allowed me gain access to participants and data.

Participation in this survey was voluntary, and there was no mental, physical, or psychological stress resulting from participation in the study. The information collected was anonymous. I did not have any access to identities or educational records of the participants. No further emails, request for interviews, or solicitation took place after the survey was completed. I did not approach participants directly. Participants received the survey electronically through their email addresses from Lake State's Office of Institutional Research. There was no social or economic loss participants experienced as a result of the study. There was no risk to the participants' health, academic standing, or relationship with Lake State College. There was no intervention in this study, so no manipulation of subjects, exposure to different treatments, or changes in behavior were anticipated.

The recruitment procedures for this study consisted of an email sent to the population along with a link to the survey. Students provided electronic consent by agreeing to complete the survey. Students were never recruited personally by me. Stated

in the consent section of the survey, as well as the recruitment email, students were under no obligation to complete the survey. There was no academic, social, or financial consequences for students who choose to not respond to the survey. Students who chose not to participate simply did not complete the survey.

The surveys were collected in an electronic format to reduce the risk of students identities being inadvertently revealed (Frankfort-Nachmias & Nachmias, 2008). The surveys were sent to all students who meet the population criteria; students who were minors and not eligible to participate were filtered out of the data through the survey system. I secured the data in my office and will maintain all records for 5 years on a password protected desktop or a personal, locked file cabinet. After 5 years have passed, I will shred and delete all files to maintain confidentiality and security of the study. Data results were disseminated to the college through SPSS reporting and professional development training conducted by the researcher, and all student who were invited to participate received a summary of the findings through institutional email.

Although I completed this study within my own institution, the classes being surveyed were not courses that I teach, and I am not a part of the math department. I had no knowledge of which students completed the survey in math courses and did not discuss the survey with students in other contexts. There were no incentives offered for the completion of the survey.

Summary

This study used a survey to answer the research questions put forth. Exempt students who enrolled in MAT 0018, MAT 0028, MAT0057, MAT1033, MAT1101, or other upper-level math courses emailed the survey by the Office of Institutional Research. Before the survey was distributed, it was piloted in several upper-level classes to test the instrument's reliability and to calculate Cronbach's alpha. Institutional permissions were gained from both Lake State College and Walden University. I followed ethical procedures to protect the anonymity of the students, guarantee humane treatment of participants, and promise the security of the data.

Chapter 4: Results

Introduction

The purpose of this survey study was to compare exempted students who opted to take lower-level developmental education courses with students who choose gateway or college-level courses for differences with regard to several variables: high school GPA, expected course grade, satisfaction with chosen course, confidence in enrollment decisions at the time of enrollment, prior knowledge of enrollment options, and student typology. The primary research question in this study was: How do students who enroll in developmental math courses differ from students who enroll in college-level math courses? The primary null hypothesis for this study was: There is no significant difference between students who enroll in developmental education and college credit math courses. The primary alternative hypothesis for this study was: There is a significant difference between students who enroll in developmental and college credit math courses. Secondary research questions asked how students who enrolled in developmental education courses differed from students who enrolled in college-level courses with regard to several variables: student typology, high school GPA, prior knowledge of enrollment options, confidence in decision at the time of enrollment, satisfaction with the course, and expected course grade.

In this chapter, I discuss the results of the survey study. First, I demonstrate the validity of the survey through discussion of the pilot study procedures and results. I then describe the data collection process, including a discussion of the descriptive

characteristics of the sample and how the sample is representative of the larger population. Discussion of data analysis results follows, including descriptive statistics and the ANOVA tests that were used to accept or reject the null hypotheses in this study. Finally, I provide a summary of research questions' answers based on data analysis

Pilot Study

To validate the Likert scale portion of the survey used in this study, the survey was distributed by the Office of Institutional Research through email to 138 nonexempt students who were enrolled in an upper-level math course at Lake State College. The students asked to participate in the study were not enrolled in their first math course at Lake State College and, therefore, would not be part of the study's participant pool. During the first week of the survey being distributed, six students responded. Lake State Office of Institutional Research resent the survey to a secondary email for students. After 3 weeks of access to the survey, a total of 26 students responded. The responses were analyzed to demonstrate the Likert scale's reliability and validity for the study.

I examined each subscale, confidence at the time of enrollment, prior knowledge of enrollment options, and satisfaction with the course, and I calculated the Cronbach's alpha (see Table 1). Using the subscale for student confidence at the time of enrollment (Items 1, 4, 6, 10, and 15), I found a Cronbach's alpha of .902. I examined the scales of prior knowledge of enrollment options (Items 2, 5, 9, 11, and 12) and satisfaction with the course enrolled in (Items 3, 7, 8, 13, 14) for Cronbach's alpha, resulting in .881 reliability for prior knowledge of enrollment options and .885 for course satisfaction. The

three Cronbach's alpha calculations were in the acceptable range and the survey was sent to the population for data collection.

Table 1

Cronbach's Alpha

Subscale	Cronbach's alpha
Confidence at time of enrollment	.902
Satisfaction with course	.881
Prior knowledge of enrollment options	.885

Data Collection

The Office of Institutional Research at Lake State College distributed the surveys to students. Three weeks were given for the data collection phase. After the first 2 weeks of the survey being open for participants to respond, only 39 results were reported. The Office of Institutional Research sent the email a second time to the entire population. Students who completed the survey were not permitted to access the survey again, so there were no duplicate responses. One week after the secondary email was sent, 91 students had responded to the survey. Because the target sample size was 78, the survey was closed and the results were compiled and sent via email by the Office of Institutional Research. The entire data collection process took approximately three weeks.

I followed the methodology outlined in Chapter 3. No changes were made to the Likert scale, as the pilot study showed the survey to be reliable. I did have to add

additional course options to the entry college-level courses, as Lake State created another gateway course, MAT 1100, to give students other options besides MAT1033. The only alteration to the data collection method was sending the survey a second time. This step was not included in the previous chapter. It was, however, deemed necessary as the response rate was low after the initial 2 weeks of the survey being opened.

Of the population, 11 students, 1.49%, were enrolled in MAT0018, the lowest level of developmental mathematics. Fifty-four students, or 7.31%, enrolled in MAT0028, the second level of developmental education. Twelve students, 1.62%, enrolled in MAT0057. Five hundred and sixteen students, 69.82, were enrolled in either MAT1033 or MAT1100, the gateway math courses. One hundred forty-six students, 19.76%, reported being enrolled in an upper level mathematics course other than MAT1101 or MAT1033. Therefore, the percentage of students who were part of the developmental education group in the total population is 10.42% and the percentage of college-level students in the sample is 89.58% (see Table 2)

Table 2

Census Population Demographics by Math Course

Math course	Number of students	Percentage of total population
MAT0018	11	1.49
MAT0028	54	7.31
MAT0057	12	1.62
MAT1100 or MAT1033	516	69.82
Other upper-level math	146	19.76

Descriptive Statistics

Ninety-one students completed the survey. Of the 91 students, 2 were identified as minors and eliminated. Five more participants did not complete all the questions from the survey, and their responses were also eliminated. These adjustments left a sample of 84 (n = 84).

Of the 84 students, 5, or 5.95% of the students, were enrolled in MAT0018, the lowest level of developmental mathematics. Eight students, 9.52%, enrolled in MAT0028, the second level of developmental education. Two students, 2.38% of the sample, enrolled in MAT0057. Fifty-one students, 60.71%, enrolled in either MAT1033 or MAT1101, the gateway math courses. Eighteen students, 21.43%, enrolled in an upper level mathematics course other than MAT1101 or MAT1033 (see Table 3).

Table 3

Participant Demographics by Math Course

Math course	Number of students	Percentage of Sample
MAT0018	5	5.95
MAT0028	8	9.52
MAT0057	2	2.38
MAT1100 or MAT1033	51	60.71
Other upper-level math	18	21.43

Because of the low participant response rate for the lower level the developmental education courses, demographic variables were omitted from this study to ensure participant anonymity. However, based on several of the variables examined in the beginning of the survey, descriptive statistics were computed for the sample. First, high school GPA was isolated (see Table 4). Of the 84 participants in the sample, sixteen, or 19.04%, participants reported a high school GPA of a C. Thirty-three students, 39.29%, reported a high school GPA of a B. Finally, 35 students, or 41.67% reported a high school GPA of an A.

Table 4

Frequency of High School GPA

Expected Grade					
		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	C	16	19.04	19.04	19.04
	B	33	39.29	39.29	58.33
	A	35	41.67	41.67	100.0
	Total	84	100.0	100.0	

I also examined the variable of student typology (see Table 5). Based on Bahr's (2011) definitions, a student who is a transfer student has a transfer goal to a four-year university. Vocational students will complete terminal two-year degrees and enter the work force. Experimental students are not sure of their intent, but will enroll in some classes to see if college is the best path for them. The results showed that three students, 3.57%, reported experimental status. Ten students, 11.90%, reported vocational status. Seventy-one students, 84.53%, reported transfer status.

Table 5

Frequency of Student Typology

Student Typology

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	experimental	3	3.57	3.57	3.57
	vocational	10	11.90	11.90	15.47
	transfer	71	84.53	84.53	100.0
	Total	84	100.0	100.0	

The variable of students' expected grade in the course was examined as well (see Table 5). For this study, one student, or 1.19% of the students, reported expecting an F in the course. No students reported an expected grade of a D. The number of students reporting an expected grade of a C was 11, or 13.09%. Students expecting B or an A were 31, 36.91%, and 41, 48.81%, respectively.

Table 6

Frequency of Expected Grade in Current Mathematics Course

Expected Grade

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	F	1	1.19	1.19	1.19
	C	11	13.09	13.09	14.28
	B	31	36.91	36.91	51.19
	A	41	48.81	48.81	100.0
	Total	84	100.0	100.0	

Finally, the question of whether or not the students voluntarily took the standardized college placement examination, the PERT (see Table 7). Of the 84 participants, 64, or 76.19%, did take the assessment. Twenty students, or 23.81%, did not take the PERT.

Table 7

Frequency of Participants Taking the PERT

PERT test					
		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Yes	64	76.19	76.19	76.19
	No	20	23.81	23.81	100.0
	Total	84	100.0	100.0	

Research Question 2

The primary research question for this study was, how do students who enroll in developmental math courses differ from students who enroll in college-level math courses? Because the primary research question requires an analysis of the secondary research questions, research question two was analyzed first: How did students who enrolled in developmental math and students who enrolled in college-level math differ with regard to student typology? The null hypothesis stated there was no significant difference between students who chose developmental education courses and students who chose gateway or college credit courses with regard to student typology. The alternative hypothesis stated there was a significant difference between students who chose developmental education courses and students who chose gateway or college credit courses with regard to student typology.

Using Barh's (2011) study, a numerical value was assigned to each student typology based in that group's persistence. A value of 3 was assigned to transfer students, 2 was assigned to vocational students, and 1 was assigned to experimental students. To answer this question, a one-way Analysis of Variance, or ANOVA, was conducted to compare the mean of student typology between developmental education and college-level math students (see Table 8). Based on the ANOVA, there was no significant mean effect between developmental education students and college-level students $F(1,82) = 3.622$, $p = .061$. Therefore, the null hypothesis is accepted and the alternative hypothesis is rejected: there is no significant between students who enroll in developmental education and gateway or college-level math courses with regard to student typology. Students in developmental education courses did not have a significantly different mean in student typology ($M = 2.60$, $SD = .63$) than students who enrolled in college credit course ($M = 2.86$, $SD = .43$). The effect size of the analysis was 18.95%, partial $\eta^2 = 18.95$. This is a medium effect size and implies that 18.95% of the difference in the two groups' student typology can be accounted for through the classes the students chose to enroll in (the independent variable).

Table 8

ANOVA test for Student Typology, High School GPA, PERT testing, and Expected Course Grade, Confidence, Satisfaction, and Prior Knowledge

		Sum of Squares	df	Mean Square	F	Sig.
Satisfaction	Between Groups	2.487	1	2.487	.094	.760
	Within Groups	2171.072	82	26.476		
	Total	2173.560	83			
Prior Knowledge	Between Groups	26.925	1	26.925	1.128	.291
	Within Groups	1957.217	82	23.869		
	Total	1984.143	83			
Confidence in Enrollment Options	Between Groups	3.354	1	3.354	.166	.685
	Within Groups	1657.217	82	20.210		
	Total	1660.571	83			
High School GPA	Between Groups	2.360	1	2.360	4.365	.040
	Within Groups	44.342	82	.541		
	Total	46.702	83			
Expected Course Grade	Between Groups	.000	1	.000	.000	1.000
	Within Groups	46.667	82	.569		
	Total	46.667	83			
Student Typology	Between Groups	.802	1	.802	3.622	.061

Within Groups	18.151	82	.221
Total	18.952	83	

ns= not significant

Table 9

Descriptive Statistics for ANOVA of Student Typology High school GPA, PERT testing, and Expected Course Grade, Confidence, Satisfaction, and Prior Knowledge

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
sat	dev ed	15	18.3333	6.10230	1.57561	14.9540	21.7127	6.00	25.00
	college-level	69	18.7826	4.92553	.59296	17.5994	19.9659	5.00	25.00
	Total	84	18.7024	5.11737	.55835	17.5918	19.8129	5.00	25.00
prior	dev ed	15	17.0000	5.41163	1.39728	14.0031	19.9969	5.00	25.00
	college-level	69	15.5217	4.77003	.57424	14.3759	16.6676	5.00	25.00
	Total	84	15.7857	4.88931	.53347	14.7247	16.8468	5.00	25.00
Confidence	dev ed	15	18.0000	5.07093	1.30931	15.1918	20.8082	5.00	25.00
	college-level	69	18.5217	4.36769	.52581	17.4725	19.5710	7.00	25.00
	Total	84	18.4286	4.47291	.48803	17.4579	19.3993	5.00	25.00
High School GPA	dev ed	15	2.8667	.91548	.23637	2.3597	3.3736	2.00	4.00
	college-level	69	3.3043	.69249	.08337	3.1380	3.4707	2.00	4.00
	Total	84	3.2262	.75012	.08184	3.0634	3.3890	2.00	4.00
Expected Grade	dev ed	15	3.3333	.61721	.15936	2.9915	3.6751	2.00	4.00
	college-level	69	3.3333	.77964	.09386	3.1460	3.5206	1.00	4.00
	Total	84	3.3333	.74983	.08181	3.1706	3.4961	1.00	4.00
Student Typology	dev ed	15	2.6000	.63246	.16330	2.2498	2.9502	1.00	3.00
	college-level	69	2.8551	.42962	.05172	2.7519	2.9583	1.00	3.00
	Total	84	2.8095	.47785	.05214	2.7058	2.9132	1.00	3.00

Research Question 3

Research Question 3 asked if there was a significant difference in students who enrolled in developmental education courses and students who enrolled in college-level courses with regard to high school GPA. The null hypothesis stated that there was no significant difference between students who enroll in developmental education and gateway or college-level math courses with regard to high school GPA. The alternative hypothesis stated that there was a significant difference between students who enroll in developmental education and gateway or college-level math courses with regard to high school GPA.

A numerical value was assigned to each reported grade: A = 4, B = 3, C = 2. No students reported GPA of a D (1) or F (0). A one-way analysis of variance was conducted to determine the difference of mean scores of high-school GPA in students who enrolled in developmental education courses and students who enrolled in college-level courses. There was a significant difference found in this analysis $F(1, 82 = .54, p = .040$; see Table 8). Therefore, the null hypothesis was rejected and the alternative hypothesis was accepted: there was a significant difference between students who enroll in developmental education and gateway or college-level math courses with regard to high school GPA.

The mean high school GPA for developmental education students (M=2.87, SD = .92) was significantly different than students who enrolled in college credit courses (M = 3.30, SD = .69; see Table 9. The effect size of the analysis was 46.70%, partial η^2 =

46.70. This is a large effect size and indicates that 46.70% of the difference between the two groups tested is due to the course chosen.

Research Question 4

Research Question 4 asked if there was a significant difference in students who enrolled in developmental education courses and students who enrolled in college-level courses with regard to expected course grade. The null hypothesis stated that there was no significant difference between students who enroll in developmental education and gateway or college-level math courses with regard to expected course grade. The alternative hypothesis stated that there was a significant difference between students who enroll in developmental education and gateway or college-level math courses with regard to expected course grade.

A numerical value was assigned to each reported grade: A = 4, B = 3, C = 2, D = 1, F = 0. A one-way analysis of variance was conducted to determine the difference of mean scores of expected-course grade GPA in students who enrolled in developmental education courses and students who enrolled in college-level courses. There was not a significant difference found in this analysis $F(1, 82 = .00, p = .100$; see Table 8). Therefore, the alternative hypothesis was rejected and the null hypothesis was accepted: there was no significant difference between students who enroll in developmental education and gateway or college-level math courses with regard to high school GPA.

The mean expected course grade for developmental education students (M=3.33, SD = .62) was not significantly different than students who enrolled in college credit

courses (M = 3.33, SD = .78; see Table 9). The effect size of the analysis was 46.77%, partial η^2 = 46.67. This is a large effect size and indicates that 46.77% of the difference between the two groups of students compared was related to the independent variable of the course chosen.

Research Question 5

Research Question 5 asked how students who enroll in developmental education courses differed from students who enrolled in college-level courses with regard to confidence at the time of enrollment. The null hypothesis stated that there was no significant difference between students who enroll in developmental education and gateway or college-level math courses with confidence at the time of enrollment. The alternative hypothesis stated that there was a significant difference between students who enroll in developmental education and gateway or college-level math courses with regard to confidence at the time of enrollment.

The variable of confidence at the time of enrollment was computed with the sum of Likert scale Items 1, 4, 6, 10, and 15. A total score in the area of confidence at the time of enrollment was 25. A one-way analysis of variance was conducted to determine the difference of mean scores of student confidence in enrollment choice in students who enrolled in developmental education courses and students who enrolled in college-level courses. There was no significant difference found in this analysis $F(1, 82 = 116, p = .69$; see Table 8. Therefore, the alternative hypothesis is rejected and the null hypothesis is accepted: there was no significant difference between students who enroll in

developmental education and gateway or college-level math courses with regard to confidence at the time of enrollment. The mean confidence for developmental education students (M=17.00, SD = 4.37) was not significantly different than students who enrolled in college credit courses (M = 18.52, SD = 4.38; see Table 9. The effect size of the analysis was 1660.57%, partial η^2 = 1660.57. This effect size is too large to determine the relationship between the dependent and independent variables in this test.

Research Question 6

Research Question 6 asked how students who enroll in developmental education courses differed from students who enrolled in college-level courses with regard to course satisfaction. The null hypothesis stated that there was no significant difference between students who enroll in developmental education and gateway or college-level math courses with regard to course satisfaction. The alternative hypothesis stated that there was a significant difference between students who enroll in developmental education and gateway or college-level math courses with regard to course satisfaction.

The variable of satisfaction at the time of enrollment was computed with the sum of Likert scale Items 3,7,8,13, and 14. A total score in the area of confidence at the time of enrollment was 25. A one-way analysis of variance was conducted to determine the difference of mean scores student course satisfaction in students who enrolled in developmental education courses and students who enrolled in college-level courses. There was no significant difference found in this analysis F(1, 82 = 09, p = .76; see Table 8). Therefore, the alternative hypothesis was rejected and the null hypothesis was

accepted. The null hypothesis stated that there was no significant difference between students who enroll in developmental education and gateway or college-level math courses with regard to course satisfaction. The mean course satisfaction for developmental education students (M=18.33, SD = 6.1) was significantly different than students who enrolled in college credit courses (M = 18.78, SD = 4.92; see Table 9. The effect size of the analysis was 2173.56%, partial η^2 = 2173.56. This effect size is too large to determine the relationship between the dependent and independent variables in this test.

Research Question 7

Research Question 7 asked how students who enroll in developmental education courses differed from students who enrolled in college-level courses with regard to prior knowledge of enrollment options. The null hypothesis stated that there was no significant difference between students who enroll in developmental education and gateway or college-level math courses regarding prior knowledge of enrollment options. The alternative hypothesis stated that there was a significant difference between students who enroll in developmental education and gateway or college-level math courses with regard to prior knowledge of enrollment options.

The variable of knowledge of options at the time of enrollment was computed with the sum of Likert scale Items 2,5,9,11, and 12. A total score in the area of prior knowledge at the time of enrollment was 25. A one-way analysis of variance was conducted to determine the difference of mean scores of student prior knowledge in

students who enrolled in developmental education courses and students who enrolled in college-level courses. There was no significant difference found in this analysis $F(1, 82 = 1.13, p = .291$; see Table 8). Therefore, the alternative hypothesis was rejected and the null hypothesis was accepted: there was no significant difference between students who enroll in developmental education and gateway or college-level math courses regarding prior knowledge of enrollment options. The mean score for prior knowledge of enrollment options for developmental education students (M=17.00, SD = 5.41) was significantly different than students who enrolled in college credit courses (M = 15.52, SD = 4.77; see Table 9. The effect size of the analysis was 1957.22%, partial η^2 = 1957.22. This effect size is too large to determine the relationship between the dependent and independent variables in this test.

Research Question 1

To answer the primary research question, how do students who enroll in developmental education courses differ from students who enroll in college-level courses? The null hypothesis stated that there was no significant difference between students who enroll in developmental education and gateway or college-level math courses. The alternative hypothesis stated that there was a significant difference between students who enrolled in developmental level math courses and students who enrolled in gateway or college-level courses.

Several ANOVAs were conducted to determine the differences of means for several variables. According to the results of the ANOVAs for the variable of high school

GPA, a significant difference was found (p = .040). The analyses of the difference of means for student typology (p = .061), expected course grade (p = 1.00), confidence in course decision (p = .69), satisfaction with course decision (p = .76), and prior knowledge at time of enrollment (p = .29) found no significant differences. Therefore, the null hypothesis was rejected and the alternative hypothesis was accepted: there was a significant difference between students who enrolled in developmental level math courses and students who enrolled in gateway or college-level courses with regard to high school GPA only.

Summary

Based on the data analysis, the research questions in this study can be answered. RQ1 asked how students who enrolled in developmental education courses and students who enrolled in gateway or college credit math courses differed. According to the results of this study, there was a significant difference between students who enrolled in developmental level math courses and students who enrolled in gateway or college-level courses. Therefore, the null hypothesis was rejected and the alternative hypothesis was accepted: there was a significant difference between students who enrolled in developmental level math courses and students who enrolled in gateway or college-level courses. The only significant difference was found in RQ3: how did students who enrolled in developmental education courses and students who enrolled in gateway or college credit math courses differ with regard to high school GPA. Therefore, the null hypothesis was rejected and the alternative hypothesis was accepted: there was a

significant difference between students who enrolled in developmental level math courses and students who enrolled in gateway or college-level courses with regard to high school GPA.

Several null hypotheses were retained as no significant difference was demonstrated in several areas. RQ2 asked how students who enrolled in developmental education courses and college-level or gateway courses differed with regard to student typology. No statistical significance was found, to the null hypothesis was retained: there was no significant difference between students who enrolled in developmental education or college-level math course with regard to student typology. RQ4 asked how students who enrolled in developmental math and students who enrolled in gateway or upper level math courses differed with regard to prior knowledge of enrollment decisions. No significant difference was found, so the null hypothesis was retained: there was no significant difference between students who enrolled in developmental math and gateway or upper level math courses with regard to prior knowledge of enrollment options. RQ5 asked how students who enrolled in developmental math and students who enrolled in gateway or upper level math courses differed with regard to confidence at the time of enrollment. No significant difference was found, so the null hypothesis was retained: there was no significant difference between students who enrolled in developmental math and gateway or upper level math courses with regard to confidence at the time of enrollment. RQ6 asked how students who enrolled in developmental math and students who enrolled in gateway or upper level math courses differed with regard to course

satisfaction. No significant difference was found, so the null hypothesis was retained: there was no significant difference between students who enrolled in developmental math and gateway or upper level math courses with regard to course satisfaction. Finally, RQ7 asked how students who enrolled in developmental math and students who enrolled in gateway or upper level math courses differed with regard to expected course grade. No significant difference was found, so the null hypothesis was retained: there was no significant difference between students who enrolled in developmental math and gateway or upper level math courses with regard to expected course grade.

In this chapter, I discussed the pilot survey process. I then discussed my sampling procedures and the sample's reflection of the total population. Descriptive statistics were included discussing the frequency of reported answers for student typology, PERT testing, high school GPA, and expected course grade. I performed an ANOVA comparing the differences in means for each of the variables and the null or alternative hypothesis was accepted or rejected. Chapter 5 will address further recommendations, implications for practice, and promise for social change.

Chapter 5: Discussion, Conclusion, and Recommendations

Introduction

The enactment of SB1720 created two different classes of students: exempt and nonexempt. *Exempt students* were defined as students who graduated since 2007 with a regular Florida high school diploma. These students were no longer required to take the traditional college placement tests and enroll in courses for remediation in reading, writing, or mathematics. Instead, exempt students could choose whether or not to assess their college readiness through placement testing and take developmental education courses. The colleges in Florida were required to adjust their institutional structures to accommodate SB1720, including course offerings, advising, and student supportive services. However, the question of how to ensure students enrolled in the correct level math and English course needed to be answered.

As a first step to solving this problem, a survey study was conducted at one college in Florida, Lake State College. The purpose of this study was to examine the exempted group of students at Lake State College and determine what, if any, variables were significantly different between the two groups to provide recommendations for alternative placement methods. I surveyed the participants for several variables: high school GPA, student typology, prior knowledge of enrollment options, confidence at the time of enrollment, satisfaction with the chosen level of math, and expected course grade.

Through Lake State College's email system, 739 students received an invitation to participate in the study and 91 responses were received. After adjusting for responses

with missing answers, the final sample for the study was 84 students. Based on the results of a one-way ANOVA, the only variable that showed a significant difference between students who enrolled in developmental education and college-level mathematics courses was high school GPA.

Interpretations of Findings

Based on the review of the literature and the data analysis in this study, there are several findings. When examining the differences between students who chose developmental and those who took gateway or upper level courses the variables directly associated with enrollment (confidence at the time of enrollment, satisfaction, prior knowledge, and student typology), were not found to be significant different. Students who enrolled in developmental education courses are not significantly different from students who enroll in college-level courses except in the area of high school GPA. Based on this finding, advisors who are working with enrolling students can focus on high school GPA as a placement method in place of the placement testing.

In the literature reviewed in Chapter 2, I examined several other variables including college readiness, college placement testing, and alternative placement methods. Because college readiness is a fluid concept applied to each state and institution differently (Hodara et al., 2012; Ngo et al., 2013, Scott-Clayton Rodriguez, 2012) the lack of a required placement test under SB1720, the placement method previously used to determine college readiness at Lake State College, created some difficulty for advisors placing students into the correct level of math. To complicate matters further, research

determined that placement testing did not accurately place students in an appropriate level of math (Bailey et al., 2013; Belfield & Crosta, 2012; Edgecombe, 2011; Kazis & Couturier, 2013; Ngo et al., 2013, Scott-Clayton & Rodriguez, 2012). In this study, students were asked if they took the placement test at Lake State College before enrolling in a math course. Sixty-four students reported voluntarily taking the college placement test and 20 students did not. Because there was no significant difference in satisfaction in the course decision or confidence in student enrollment decisions, the PERT test and advisors were able to inform students and help them place into an appropriate level of math course.

Research I examined in the literature review demonstrated that the use of high school GPA in placement was more effective than other methods of placement, including the traditional placement test. Burdman (2012) argued that placement tests should be supplemented with other measures, including high school GPA, as a placement method. Hodara et al. (2012) indicated that high school GPA was one of the variables used in many institutions that do not rely solely on a placement test for student's enrollment choices. Belfield and Crosta (2012) argued that high school GPA was a better predictor of student success than all other measures combined. Scott-Clayton (2012a) asserted placement error was significantly reduced when institutions utilized high school GPA as a method of placement. Because developmental education courses are meant to review skills that should have been mastered in high school, the performance of a student in high school was more predictive of how a student would perform at the college-level than a

standardized placement test that was designed to be used in conjunction with other factors (Scott Clayton, 2012a). Despite the fact that Lake State College and many other colleges in Florida have moved from a community college to a 4-year college model, the majority of the students served are still characteristically community college students seeking 2-year degrees with less than 15% of students at Lake State enrolled in a bachelor's program (Office of Institutional Research, 2015). The findings of the current study support the research and suggest that high school GPA should be utilized in the placement process for incoming students at Lake State College in place of the current system of utilizing only a placement test score.

Goudas and Boylan (2012) found that students who enrolled in gateway courses and students who enrolled in developmental education courses showed no significant difference in their success rates. The current study supports this as there was no significant difference in the two variables of course satisfaction or student expected grade. Students who enrolled in upper level or gateway math courses and students who enrolled in developmental education courses did not have a difference in their perceived success or satisfaction with the level of math they chose. The conclusion that can be drawn from the lack of significant differences for these two dependent variables is that students will be just as satisfied with a developmental math course as they would be with a gateway or upper level course. Students also do not expect to do any better or worse based on the level of math they selected. Therefore, the dependent variables of course satisfaction and expected course grade are unlikely to affect students' decisions.

Two theoretical frameworks were used in this study: Bahr's (2011) behavioral scheme and Simon's (1972) bounded rationality. Based on Bahr's behavioral scheme, students who enroll in college-level courses and students who enroll in developmental education courses have a difference in their use of college, or their student typology. Bahr argued that students who enrolled in remedial math would be more likely to be students who are experimental, and most students who enrolled in college-level would be transfer students. Based on the results of this study, there was not a significant difference between students who enrolled in developmental education math and students who enrolled in gateway or upper level math courses. Therefore, this study does not support Bahr's (2011) Behavioral scheme.

Simon's (1972) bounded rationality argued that decision making can be affected through having too many options or not fully understanding options available. To assess the students' decision-making ability using Simon's (1972) theory, I asked students to rate their prior knowledge of enrollment options, their confidence at the time of enrollment, and their satisfaction with the course chosen. Each of these variables were assessed through Likert scale subscales consisting of five questions. No significant difference was seen in any of these variables between the two groups of students examined.

Scott-Clayton (2011) applied Simon's theory to higher education, specifically examining the enrollment and advising structures that students enrolling in a typical community college would experience. Scott-Clayton argued that when students have too

many options in courses or are not fully aware of their course options, students are more likely to regret their enrollment decision or enroll in the inappropriate level of math courses. In this study, however, no difference was seen between students who enrolled in college-level or developmental education courses with regard to decision confidence or satisfaction with decision. The students in this study did not express dissatisfaction with their course decision or a lack of confidence in their enrollment choices. This finding demonstrates that Scott-Clayton's assertion does not hold true for students enrolling at Lake State College.

This study used the conceptual framework of decision-making. (Bettinger et al., 2009; Fish & Kowalik, 2009; and Karp, 2013) argued that students struggle to make rational decisions when deciding careers and majors. However, based on the lack of significant difference between students who enrolled in college and developmental education courses in the area of confidence and satisfaction with math courses, with a mean score of 18.43 for confidence in enrollment decision and 18.70 in satisfaction with the courses chosen (out of a possible 25), students not only felt relatively confident when they enrolled in the courses but they also had a high level of satisfaction with the course they chose. These findings demonstrate that students were confident in their decision and they were satisfied at almost the same rate and students did not regret their enrollment decisions 6 weeks into the semester.

Limitations of the Study

Generalizability of this study was limited for several reasons. First, the population of students responding was more likely to be higher performing students who were comfortable with technology. Therefore, weaker students or those who were not comfortable reading and responding to institutional email were not represented in the sample. Also, as this study took place only at one institution and, because of the small population, demographic information was not collected. Generalizations about the students based on their demographic information could not be included in the study, limiting the results applicability to only Lake State College students.

All students who were part of the population received an invitation to complete the study, and 84 responses were usable. This is well within the target sample size for the study. Whereas using a census sample allows for equal opportunity for all students who fit the population to participate, the use of an electronic distribution of the survey may have skewed the results. Discussed in the assumptions in Chapter 1, the students who received and replied to the email survey invitation would be students who conscientiously checked institutional email.

Also, due to the small sample size, conclusion regarding which method of course delivery worked best for students could not be made. Despite the relative newness of redesigned course offerings and, as a result, the lack of longitudinal patterns in success rates for the different course models (Edgecombe, 2011), Scrivener et al. (2012) found promising results for accelerated developmental education courses. However, with only

two respondents from the compressed math course, MAT0057, the findings from the current study were not able to contribute to the effect of course redesign on students' enrollment behavior.

Recommendations

Further studies and data analysis should be conducted. In order to further explore the relationship between college placement testing and high school GPA as placement methods, further statistical analysis should be completed to establish clearer relationships among high school GPA, placement testing, and satisfaction with the course.

There are several layers of data that could be added to the current study to aid Lake State College students and advisors during the enrollment process. There may be a difference between students' expected grades and actual grades in the mathematics courses, and so an ANOVA of the students' actual course grades after the completion of the study would allow Lake State College to have an understanding of the differences in performance from the self-selected developmental education students and the college credit students.

Because of the limitations of this study's sample of responses, the study should be conducted again. However, the survey should be given through the math courses with a paper pencil delivery. This will increase the number of responses, as email surveys receive generally lower results (Frankfort-Nachmias & Nachmias, 2008). This will also allow for enough responses in the different levels of math courses to utilize demographic information without the danger of threatening the anonymity of the responses.

Hu et al. (2015) examined the enrollment practices of students who were exempted under SB1720 across the state of Florida and found that approximately 41.9% of students who were referred to developmental math education courses enrolled in those courses and the others attempted college-level or gateway courses their first semester at college. The variable of advisor recommendations was not examined directly in the current study. Even though there was no significant difference in student confidence in math course at the time of enrollment and the students' prior knowledge of their enrollment options, the advisors at Lake State College are helping students feel confident and understand their enrollment options equally. However, a further helpful line of inquiry for this study would be to ask students if they met with an advisor, whether or not the students took the adviser's recommended course or not, and how that behavior affected the students' expected course grades, satisfaction with the course, and confidence in enrollment decision.

Even though developmental education courses in reading and writing have not demonstrated a correlation between remedial education and graduation (Bettinger et al., 2013; Columbia University, 2014; Quint et al., 2013; Zachary Rutschow & Schneider, 2012), it would be helpful for the study to be repeated examining students who enroll in developmental education reading and writing courses at Lake State College. This extra layer of information would allow Lake State College to understand the enrollment behavior of students in all three developmental education courses in order to guide students through the placement decision. Because mathematics was the only area of

developmental education demonstrating a positive correlational relationship to completing developmental education courses and graduation, this was the only subject area explored in the current study (Bahr, 2013; Bonham & Boylan, 2011; Fong et al., 2013; Ngo et al., 2013). Gathering and analyzing data from reading and writing would further benefit Lake State College advisors and students attempting to place students in the appropriate level of introductory courses without the traditional standardized assessment.

Implications

In this study, I examined a unique enrollment situation. When President Obama urged higher education institutions to create more accessible pathways for people who want a college degree (Wilson, 2012), senators in Florida passed SB1720 and dismantled developmental education programs across the state. Federal directives supported more students having access to college education to further the United States' ability to compete on a global level. On the other hand, SB1720 removed the requirement for students to take a standardized assessment and remedial classes, structures traditionally in place with the intention of making college classes manageable for students were not deemed college ready. With these two seemingly conflicting policies in place, Lake State College and other schools in Florida were faced with the problem of ensuring student placement into the correct level of courses.

The importance of enrolling students in the correct level of course work and avoiding placement error is vital to ensuring students do not waste time or credits in the

wrong course. Scott-Clayton (2011) argued that placing student in the incorrect levels of math directly correlated with low completion, persistence, and success rates. The high stakes of this initial enrollment decision demanded attention to ensure that students who want a college degree are not hindered by not enrolling in the correct level of math course. Correct placement during the first semester at college is vital to a students' ability to succeed in college. This study's findings showed that Lake State College students are satisfied with their enrollment decisions and would make the same decision after being enrolled in the course for several weeks. Lake State College and its advisors are placing students correctly, leading to more accessibility to a college degree and less obstacles for students to receive an education. Students can benefit from this study as high school GPA can be used to place students more accurately into the correct level of math,

Institutionally, Lake State College can benefit from the findings in this study. Performance funding legislation, determines Florida's state colleges' operating budgets, has negatively affected Lake State College's operational budget (Office of Institutional Research, 2016). Some of the areas in which Lake State needed to improve were time to completion, credit hours completed, and cost of degree. All of these metrics can be negatively affected by a poor enrollment choice on the part of the student that could result in a student failing a course, having to retake a course, or taking a course that was not necessary. However, because research has shown that traditional placement methods are not reliable and SB1720 does not allow for the traditional enrollment practice to be followed, and the lack of significant differences between students who enrolled in

developmental education math and gateway or upper level math courses, the significant findings of this study can be applied directly to aid the students enrolling in college, Lake State College, and increase access to education for all students.

Based on the results of the current study, Lake State College should consider using high school GPA of enrolling students to determine the appropriate level of math courses. Though, according to research, placement tests were ineffective, the placement tests used at Lake State College, the PERT, should not be used as the only method of placement. Students who have a strong high school GPA should be directed to upper level math courses. Students have a lower GPA should be directed to either take the placement test or enroll directly into developmental education courses.

Because other variables tested lacked a significant difference between the two groups, the argument can be made that no matter what level of math a student enrolls in, they will have the same feelings and perceptions with regard to expected course grade, course satisfaction, confidence in enrollment decision, and prior knowledge of enrollment options. Therefore, the use of high school GPA is supported by this study.

This study contributes to social change on several levels. Using high school GPA will eliminate the need for students to take the placement exam and place students more accurately in their first math courses at Lake State. This will decrease the likelihood that students will waste time or money in incorrect courses. Lake State College, by using high school GPA instead of the placement test, can place students with more confidence, eliminate costs of placement testing, and improve on several performance funding

metrics that will result in a higher operating budget. This will make education more accessible to the community around Lake State College and, in turn, create a more educated society.

Conclusion

In a time of national reform for developmental education (Burdman, 2012) and the effect of SB1720, a policy that changed the face of developmental education in the state of Florida, institutions like Lake State College had to examine their enrollment and developmental education practices in order to help students credential faster. Many of the aspects of the old developmental education system were ineffective. By removing the traditional and inaccurate placement methods (Scott-Clayton, 2012a) and removing the potential barrier of up to three developmental education math courses before college-level is reached (Bailey et al., 2010, Jenkins & Cho, 2012, Melguizo et al., 2014), Lake State College is now positioned to make a research-based decision, the utilization of high school GPA, as the enrollment metric for placement: a change that will benefit individual students and the institution itself.

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Appendix A: Math Enrollment Survey

1. Are you at least 18 years of age or older? Yes No
2. Which math course are you currently enrolled in: MAT 0018, MAT 0028, MAT 0057(L), MAT1033, MA1101, or Other.
3. What was your overall high school GPA: A B C D F
4. Which category best fits you (Choose only one):

   Transfer student. (I will finish my AA and then transfer to a university or a Bachelor's program at Lake State College.)

   Vocational student. (My AS degree here at Lake State College will allow me to enter into my career choice without further school)

   Experimental student. (I am just trying college out. I am not sure if I will complete my degree or not.)

   Non-credit/drop-in. (I am not working towards a degree.)
5. What is your expected grade for this course? A B C D F
6. Did you take a placement test (PERT) before enrolling in classes at Lake State College?

For the following items, please rate your agreement with the statement.

	Statement	Strongly Disagree	Somewhat Disagree	Neither Agree or Disagree	Somewhat Agree	Strongly Agree
1	When I enrolled in this class, I was sure that it was the best class for me.					
2	Before I registered, I understood Senate Bill 1720.					
3	I would recommend this course to my friend.					
4	When I enrolled in this class, I was not worried about the work being too hard/easy for me.					
5	Before I enrolled in this course, I understood the difference between college credit and developmental courses.					
6	When I enrolled in this class, I understood all					

	of my options clearly.					
7	I am glad that I chose this math course.					
8	The level of work in this class is appropriate for my skill level.					
9	Before I enrolled in this course, I understood if I was exempt or not from developmental education courses.					
10	When I enrolled in this class, I was confident I was making the right decision.					
11	Before enrolling in this course, I understood the difference between developmental and college credit courses.					
12	Before I enrolled in this course, I understood all of the course offerings that were available to me.					

13	This course will benefit me as I learn basic math skills needed for my career.					
14	I am satisfied with the math course I have enrolled in.					
15.	When I enrolled in this course, I did not feel that this course was a risk.					