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Understanding the Relationships Among Students' Goal Orientations, Self-Efficacy, Anxiety, and Accelerated Academic Success in the Redesign of Developmental Mathematics

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Abstract

The low success rates of increasing numbers of underprepared students taking developmental mathematics classes—often minority and economically disadvantaged—are challenging community colleges across the United States. These students, who must start in the lowest levels of precollege mathematics courses, are unlikely to pass the first course and earn a credential. Using a mastery goal orientation theoretical framework, a quantitative, survey research design was used to ascertain any correlations between students' goal orientations, self-efficacy, test anxiety, and success in a new model of learning. Survey data were used to answer 3 research questions: (a) the relationship between success and students' perceptions of self-efficacy, goal orientation, and beliefs about test anxiety; (b) the relationship between demographics and students' perceptions of self-efficacy, goal orientation, and beliefs about test anxiety; and (c) the degree to which students' perceptions and experience predict success. Approximately 500 new students in the course were invited; 36 participated. Spearman's rho, chi-square, and ANOVA were used to answer the research questions. Based on Spearman's rho correlations, there were statistically significant relationships between self-efficacy and success as well as between intrinsic goal orientation and success. However, the sample size limited the generalizability of the findings. Further, there were no significant predictors of success. The white paper developed from this project study is intended to guide the development and expansion of accelerated developmental mathematics to increase academic success, broaden career choices, and improve the long-term economic futures of disadvantaged students enrolling in college.

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Table of Contents

Section 1: The Problem

Students entering college academically underprepared in mathematics have been failing and withdrawing at excessive rates (Complete College America [CCA], 2012). With a changing workforce requiring education and skills beyond that of a high school diploma, every student who fails to overcome the mathematics prerequisite to college courses is less likely to reach her or his earning potential and less likely to impact her or his community in as significant a way. This is especially true for people who are in low socio-economic and minority groups. In this study, I addressed this problem by examining the relationships between students' goal orientations, perceptions about self-efficacy, beliefs about test anxiety and about success in a newly redesigned course, one that provides an accelerated alternative to the traditional precollege math course sequence at one particular community college.

Definition of the Problem

This study was set in a large, urban Midwestern community college that offers developmental mathematics. To preserve the anonymity of the institution, neither the name of the college nor its website address will be given. Like many community colleges, this one has a high enrollment in precollege level or developmental math courses but a low success rate (AACC, 2012; Complete College America [CCA], 2012; Sherer & Grunow, 2010). Currently, students placed at some level of algebra below the first college-credit course may have to complete up to four semester courses before starting college-level math. Data presented at the institution's early 2013 Board of Trustees meeting indicated that success rates for the Autumn 2012 semester traditional mathematics course ranged from 48–54% for the 6564 students enrolled. The success rate for the 407 students enrolled in the redesigned course that same semester was 69%. Though some faculty may recommend tutoring or advising to students as an academic strategy, poor success rates remains consistent across all of the traditional classes. Academically underprepared students enter the community college with hope—only to repeat a pattern of failure from high school that led to their entry as developmental students. Many factors contribute to this problem, such as poor academic history, family and work obligations, and lack of understanding of college processes and procedures. These are often characteristics of academically underprepared, at-risk, first-generation community college students (Bulger & Watson, 2006).

The mission of the open admission community college is to educate all learners, despite their varied levels of preparedness. The goals of access and support for students are both important to this mission; thus, designing programs that facilitate a pathway to successful completion is critical. According to the institution's website, Autumn 2011 enrollment for the two campuses, the nine regional learning centers, and the online classes was over 30,000. According to state Board of Regents Higher Education Information System (HEI) reported by the college, in Autumn 2011 half of the student body was 20-29 years, 19% were 30-39 years, 14% were 40 or older, and the remaining 16% were 15-19 years of age. The Board of Regents also reported in 2011 that about 60% of students enrolled at the college were White, 24% were African-American, and the remainder were multi-racial, Hispanic, Native American, International, or unknown. In 2012, the college became a participant in the Achieving the Dream initiative for community colleges. Its mission is to educate all students. As indicated on the college website, the decision to use the Achieving the Dream (2012) principle of evidence-based decision making demonstrates a commitment to continuous improvement based on research and data.

Rationale

Evidence of the Problem at the Local Level

As a member school in the national Achieving the Dream network—a nonprofit organization striving to help community college students earn a credential, particularly minority and low-income students—the college research office collected success data by course as well as catalogued demographic data on race, gender, and economic status (Achieving the Dream, 2012). From this information, precollege mathematics courses were deemed critical barriers to student success. In this study, success is defined as a passing grade in the developmental course, persistence into the following term, as well as readiness for the subsequent course beyond the remedial sequence. The series of traditionally taught developmental courses challenged most students with over a year of developmental mathematics. Each term the majority of students failed. Without success in these courses, students were unable to move into their program of study course work according to the prerequisite system noted in course descriptions in the online catalog of courses. The algebra series that leads to college algebra, the first math course that counts for college credit in a program of study, is comprised of several courses. Students who take the placement test and are placed into a course in this series must pay for, and pass, the course. These are prerequisite courses to college algebra that must be completed even though they do not count for college credit. According to postings on the college website, in Autumn 2012 there were 73 sections of pre-algebra, 32 sections of Beginning Algebra I, 60 sections of Beginning Algebra II, 76 sections of Elementary Algebra (which includes both Beginning Algebra I and Beginning Algebra II as a semester course), and 46 sections of Intermediate Algebra. Each of these sections can hold 25 to 35 students. However, not all of them were filled to capacity as was clear from the number of seats available on the college website. Students enrolled in the traditional remedial or developmental mathematics at this institution pass at close to a 50% success rate and seldom complete the series or graduate (Achieving the Dream data reports, 2012). Because of rising numbers of students being placed in remedial mathematics courses—and a growing awareness of failure rates in these courses—like many other colleges, this institution made a commitment to helping students pass precollege math courses.

To address this problem, a variety of innovations have been implemented by sister institutions across the country, such as "accelerated classes, self-directed learning labs, online and other technology-rich learning models, course modules that 'chunk' material into manageable parts, and contextualization" (Le, Rogers, & Santos, 2011, p. 3). Following the general principles of a new model of redesign, the college scaled up a program that was proposed by a group of college faculty. The program uses computer technology to deliver course modules in an individualized, mastery approach to student learning. In this institution, college mathematics faculty studied state and national programs and then implemented a new teaching and learning model to help accelerate students through the math series, according to information presented at the 2013 Board of Trustees meeting. The redesigned math course includes all of the content in the algebra series, but it delivers it in a modularized format where students work individually with the support of their instructor in a computer laboratory. In this self-paced environment, students can develop proficiency through one, two, three, or all four courses in a single semester by demonstrating mastery of each module at a level of 85% on each module assessment. Learning about the students who will be successful in redesigned math courses will help college faculty with course development and revision. It may also improve classroom facilitation and advising. Faculty will be able to use student success data in the classroom to help students learn behaviors that increase the likelihood of success, and academic advisors can use success data related to student attributes as they guide learners into mathematics pathways and help them develop academic and career goals.

Evidence of the Problem from the Professional Literature

According to the American Association of Community Colleges (AACC, 2012), increasing numbers of underprepared students have been admitted to two-year colleges. The current practices in developmental education have been ineffective for the poorly performing high school graduates and for returning adults facing a changing workforce (Daiek, Dixon, & Talbert, 2012). In a recent study by CCA (2012), remediation programs were identified as the bridge to nowhere. Less than 10% of students beginning college in remediation will earn a degree from community college in 3 years; in fact, most of the 1.7 million students who annually start college in remedial programs will not graduate.

(CCA, 2012). While graduation rates are low overall, completion rates are even lower for minorities who begin in these precollege courses (CCA, 2012). For example, African-American and Hispanic students are less successful and often have more risk factors, including first-time college student status, academic underpreparedness, financial need, full-time work, family responsibilities, and cultural challenges (Greene, Marti, & McClenney, 2008). With respect to remediation in college, students were more likely to need assistance with mathematics than English, and most of the students forced to begin in developmental mathematics were not successfully completing their courses (Le et al., 2011). College leadership must acknowledge the issue and address the ever-present initial barrier to student success: developmental mathematics.

Definitions

*Course success***:** The term course success refers to a passing grade that allows entry into the next course in a sequence. Successful course grades include "A", "B", and "C" for traditional sections and "S" for the redesigned course (Achieving the Dream, 2012).

Extrinsic goal orientation: The "degree to which the student perceives herself to be participating in a task for reasons such as grades, rewards, performance, evaluation by others, and competition" (Pintrich, Smith, Garcia, & McKeachie, 1991, p. 10).

Intrinsic goal orientation: The "degree to which the student perceives herself to be participating in a task for reasons such as challenge, curiosity, mastery" (Pintrich et al., 1991, p. 9).

MSLQ: Motivated Strategies for Learning Questionnaire (MSLQ) is a survey "designed to assess college students' motivational orientations and their use of different learning strategies for a college course" (Pintrich et al., 1991, p. 3).

Persistence: The term persistence refers to continuous enrollment from semester-to-semester and year-to-year (Demaris & Kritsonis, 2008).

Remedial and developmental courses: The terms remedial and developmental are used interchangeably. Both refer to prerequisite course work that does not count toward college credit in a degree program (Boatman & Long, 2011).

Redesign and redesign course: The terms redesign and redesign course both refer to the single modular mathematics course in which the curriculum from several distinct developmental algebra courses has been divided into a modular series associated with each traditional course. The modules associated with each of these traditional courses are all available in the redesigned course each term, providing the students with an acceleration opportunity (Twigg, 2011).

Self-efficacy: A personal judgement or belief regarding the capability to complete an assignment and the self-confidence in having the skills to do so (Pintrich et al., 1991).

Test anxiety: The combination of worry where students' negative beliefs disrupt achievement and emotionality including affective and physiological challenges associated with anxiety (Pintrich et al., 1991).

Significance

Approximately 6,000 students registered for one of the four prerequisite mathematics courses that led to college algebra each term according to the college website. According to college data collected for Achieving the Dream (2012), fewer than half of the students successfully completed the series. To address the challenge, a new type of offering was proposed in 2010. A technology-based mathematics course was designed to refresh recent high school graduates during a summer bridge program (Board of Trustees, 2013). An academic advisor was assigned to recruit recent high school graduates who were placed into developmental mathematics, and had successfully completed Algebra II within the last 5 years. In this model students spent twice as much time in a lab setting *doing* math than they would watching or listening in a traditional class. Students were required to demonstrate proficiency in each module at an 85% level over the summer in an effort to begin Autumn at a higher placement level. Summer pilots were offered for 3 years. Successful results in the one section offered in Summer 2010 led to three sections in Summer 2011. Much improved rates of retention and passing grades, at over 80%, led to four sections being offered Summer 2012. Beginning Autumn 2012 the redesigned course became a regular semester offering with a dedicated computer lab for the Autumn, Spring, and Summer sections (Board of Trustees, 2013).

Though Twigg (2011) reported improved course completion rates in colleges using a similar redesigned approach, students' beliefs and perceptions about their progress and success in the new model has not been studied. The purpose of this study was to understand the relationships between the students' goal orientations, perceptions about self-efficacy, beliefs about test anxiety and success in the redesigned course. Recognizing factors that correlate with or predict a greater likelihood of success could impact decisions to scale up the initiative and to redesign other developmental course offerings.

Guiding Research Question

The following research question guided this study: What is the relationship among students' goal orientation, self-efficacy, and beliefs about test anxiety and their academic success in the redesigned, accelerated course? The redesigned course created a new role for the instructor as facilitator, a new motivator for accelerating students, and a unique mastery learning experience in the classroom that deserve examination. Beyond data on course success rates, there is little research on the student experience in the redesigned model. More research into the impact of an instructor—who now works as a guide rather than a lecturer—may help in understanding how specific student groups feel about passing a course and their sense of self-efficacy. Also, the importance of offering opportunities for acceleration in light of students' goal orientations, and understanding the impact of a mastery approach to testing and retesting on students' feelings about test anxiety, is critical to helping more students meet their goals. Strides made in technology have enabled personalized approaches to self-paced learning that are unique to education today. Understanding the connection between goal orientation and academic success is critical in confronting the problem of the lack of success of underprepared students who are placed into developmental mathematics classes. In this study I evaluated the impact of the redesigned course experience with a survey. The goal was to find any correlations between the following four variables: goal orientation, self-efficacy, anxiety, and success.

The following three research questions guided this study:

RQ1: What is the relationship between success in the redesigned course and students' perceptions of self-efficacy, intrinsic and extrinsic goal orientations, and beliefs about test anxiety?

*H*1 There is a positive relationship between self-efficacy and success as well as intrinsic goal orientation and success, and a negative relationship between test anxiety and success.

RQ2: What is the association between age, race, gender, past experience with high school Algebra II, and students' experiences with the redesigned course factors that impact perceptions of self-efficacy, intrinsic and extrinsic goal orientations, and beliefs about test anxiety?

*H*2 There is an association between age, race, gender, past experience with high school Algebra II, and students' experiences with the redesigned course factors that impact perceptions of self-efficacy, intrinsic and extrinsic goal orientations, and beliefs about test anxiety.

RQ3: To what degree do students' perceptions about self-efficacy, goal orientations, beliefs about test anxiety, and recent high school experience predict success in the redesigned course?

*H*3 There is a linear relationship between self-efficacy, goal orientations, beliefs about test anxiety, recent high school experience, and success.

Review of the Literature

Theoretical Framework: Bloom's Mastery Learning

Mastery learning has its roots in Bloom's (1973) work that supported the ability of every child to learn using strategies that incorporated progress checks, correction of errors, small group study, tutoring, re-reading approaches, new ways to look at problems, practice, and technology options. Bloom's mastery learning strategy is devised as a way to reduce the achievement gap so as to help all students learn and be successful. Components of mastery learning include breaking content into shorter units of material, delivering formative assessments, prescribing corrective work based on errors on diagnostics, and testing or re-testing when necessary to meet an established standard. The focus is on mastering specific learning objectives associated with the course content (Puzziferro & Shelton, 2008).

Opponents of mastery learning theory have questioned the meaningfulness of the task-oriented nature of mastery programs as well the students' perceptions of teaching that is so regimented and prescribed (Giroux, Penna, & Pinar, 1981). Wiggins (2014) also challenged Bloom's theory, claiming that it is too easy for schools to set invalid scores using low-level tasks since Bloom failed to define mastery. Using mastery learning to merely test recall of facts or vocabulary or some other discrete information rather than a more complex work is inadequate. Wiggins (2014) challenged the common practice of norm-referenced, individualistic grading that does not authentically connect grades with level of performance. Developing appropriate mastery standards across a program using common assessments will address the problem of valid feedback and grades. Otherwise, “they’ll find out too late – through external tests and through their need to take remedial courses in college – that their performance is not good enough” (Wiggins, 2014, p. 6) and suffer the consequences when they enter college.

Mastery learning was designed to raise the ability level of every student in the class. According to Guskey (2010), there are core elements of mastery learning that are linked to current intervention strategies including diagnostic preassessments, high quality instruction, monitoring formative assessments, corrective instruction, parallel assessments for those who are not successful on an initial attempt, and extension activities. This could be challenging for teachers since having successful learners wait or do busywork while others are engaged in corrective instruction is not part of the program (Guskey, 2010). Technology has made it possible to overcome this challenge. Mastery learning can now be a useful tool in the self-paced arena where instruction must be individualized in both time and space, students set their own pace, materials are supplemented by a teacher rather than the reverse, mastery can be set at high achievement levels, as many re-tests as needed can be supplied, and repetition of material can be available before any and all retests (Guskey, 1988).

Self-paced learning that uses mastery learning strategies is a method that may significantly increase the success rates of developmental mathematics learners who enter higher education academically underprepared. Acceleration may be a critical motivating factor in this type of course. Talbot (1996) who measured the motivations and perceptions of ability of 100 undergraduates discovered that those who believed that their effort, rather than mere capacity, was directly affecting their ability used resources more effectively and were more academically successful. Offering faster paths to college work by utilizing well-established mastery learning theory within an intrinsically goal-oriented course may be the creative approach that will support student success in developmental pathways that have recently been labeled the bridge to nowhere (Complete College America, 2012).

Purpose Statement

The purpose of this study was to understand the relationship between students' goal orientations, self-efficacy, test anxiety and their accelerated academic success in the redesigned course. In collecting data for this literature review, I used the following portals: EBSCO Education Source, ERIC, Education Research Complete, and Sage Premier Journals. The following keywords were used: *research motivation, mastery, remediation, developmental education, mathematics, self-efficacy, anxiety, modular*, and *hybrid*. Beyond learners' experiences and beliefs about themselves, other experiences and successes with similar reform methods are explored.

Learners' Experiences and Self-Efficacy

Self-efficacy is a product of the experiences and messages that students have received over time, and positive self-efficacy will influence future successful work (Arnold, Lu, & Armstrong, 2012). A recent study on the trajectories of developmental students in community colleges found that math ability when entering college is a strong predictor of success (Bremer, Center, Opsal, Medhanie, Jang, & Geise, 2013). Students with greater feelings of confidence in their abilities will accept more challenging opportunities, like attending college after high school. In their study from a sample of 185 college freshmen who started in either developmental or college-level mathematics in a 4-year institution, Hall and Ponton (2005) found that students who started in a college-level mathematics class had both stronger math skills and greater self-efficacy, and they suggested that teaching methods for remedial students be developed to enhance math skills and self-awareness of increased capability in the subject. Wathington, Pretlow, and Barnett (2016) tracked participants in a 2009 summer bridge program for recent high school graduates in eight colleges across Texas and discovered that student success in college classes was statistically improved compared with the control group for a year and a half. However, neither persistence nor credit hour completion was improved, indicating that addressing readiness, placement, and success strategies is a complex undertaking (Wathington, Pretlow, & Barnett, 2016)

Because students with a wide range of ability in mathematics are drawn to the community college, most institutions use some type of placement exam to determine the appropriate starting point for each student. Unfortunately, the majority of students continue to place into precollege coursework. Abraham, Slate, Saxon, and Barnes (2014b) reported on college readiness in math for students from 70 community colleges in Texas. Comparing data from 2003 and 2008, they found no significant change in students' placement rates into developmental mathematics nor in the rates of college-level mathematics course completion within three years of placement into developmental mathematics. Being required to enroll in a remedial course significantly lessens the traditional student's probability of succeeding in a college-level class and thriving in college, according to a study of traditional-age community college students in North Carolina's state system (Clotfelter, Ladd, Muschkin, & Vigdor, 2014). Accounting for factors including eighth-grade tests scores, free lunch status, parent level of education, and identification as gifted or disabled, findings from Clotfelter et al. (2014) indicated that forcing students into remedial classes most negatively impacted success in college for traditional learners with low eighth-grade test scores, females, and students from families with higher incomes. Also, students with the lowest eighth-grade test scores were least likely to pass a college-level class in that discipline. With regards to self-efficacy, these students are hearing the same message as in their past, and it's one of failure.

Low placement scores resulting in required remedial courses that consume students' time and deplete students' finances, but do not count toward a degree, are discouraging and impact success. Students testing into developmental education classes are a diverse group including students who are older, economically disadvantaged, minority, and those who chose to take fewer math classes in high school (Boylan & Bonham, 2011). Survey responses from developmental math faculty at one state college and six community colleges across a four-state region indicated that instructors found the time delay, either due to time elapsed since high school graduation or the time elapsed since completing a high school math class for the graduates who chose to skip math their senior year, to be the top reason so many students placed into developmental education (Zientek, Schneider, & Onwuegbuzie, 2014). Reporting on the California acceleration project, Hern and Snell (2014) shared that only 6% of students who start at least three levels below college math pass a college-level math class within 3 years, a fact that is especially distressing since the majority of Latino and Black students place at this low level in the community college. According to Bahr (2012), students placing at the lowest levels of remedial mathematics suffer from greater attrition partially because they have more classes to take, giving them more opportunities to opt out of the next course in the sequence or to delay their enrollment.

Given the impact on students' reported retention and success, the accuracy of placement test results is critical. However, a Community College Research Center study of data on tens of thousands of community college students in urban settings found severe under-placement of students into remedial courses. Using multiple factors including students' performance in secondary schools, placement scores, and demographics, analyses of the prediction models led researchers to conclude that almost 25% of students who placed into remedial math could have passed a college class with at least a B (Scott-Clayton & Stacey, 2015). Further, high school transcript data proved a more accurate method for appropriate placement than a single test (Scott-Clayton & Stacey, 2015). Kurlaender's (2014) assessment of placement scores for California students in the community college system indicated that students testing just below and above the cut-off for college-level courses lacked consistent positive results indicating that a single assessment is not sufficient for proper placement. In the summer of 2015, there was an announcement that one of these popular placement tests, the COMPASS placement exam, would be eliminated by the end of 2016 due at least in part to the inability of the test to accurately measure college readiness (Fain, 2015).

Placement into remedial course work impacts students' self-efficacy. Colleges are trying to address the problem. However, though faculty and administrators are working toward improving placement practices, they "possess little knowledge about which test works most effectively to place students, how to rigorously evaluate cut scores, and which multiple measures can adequately address short-comings inherent in placement tests" (Melguizo, Kosiewicz, Prather, & Bos, 2014, pp. 714, 716). In California, where more than 80% of community college students are assessed and placed into remedial courses, Ngo and Melguizo (2015) reported that the district colleges that slightly raised the cut-off scores found no significant effect and the district colleges that switched to computer-adaptive tests only exacerbated the number of placement errors for marginal students. Instead of a single test, some institutions are considering multiple measures for assessment and placement, while others are experimenting with alternatives like accelerated remediation (Hughes & Scott-Clayton, 2011). According to Ben-Jacob (2016), Mercy College has eliminated the requirement of a mathematics placement test and has implemented a set of online, self-paced modules that students complete in conjunction with the appropriate college-level math class required in their academic majors. Replacing the developmental course with this accelerated program is an intentional strategy to enroll students in college courses immediately and challenge them to become self-motivated, self-learning students who are comfortable with technology, thereby building upon their self-efficacy.

As explained by Wlodkowski (2008), self-efficacy is one's own assessment of one's capability of completing a task; adult self-efficacy in particular is situation focused, future oriented, and based primarily on perceptions from past performance. Drawing on Bandura's work, Wlodkowski (2008) suggested enhancing self-efficacy for adults engaged in new learning experiences using mastery-learning or direct experiences of failure and success, vicarious experiences or successful experiences observed by someone viewed as similar to self, and social persuasion or encouragement by someone who is trusted.

Community colleges attract many underprepared students who begin in developmental mathematics. Wheeler and Montgomery (2009) categorized these students as active learners who may not like math but believe they can work hard and be successful, as skeptical pupils who believe most strongly in the instructor's pivotal role in their success, and as confident learners who see themselves as good at math and not anxious about the subject. Wheeler and Montgomery (2009) reported that during their study active learners shared how they overcame difficult problems and frustration, skeptical learners shared their lack of self-confidence, and confident learners attributed their achievements to their great teachers. Among all types, learners identified the teacher as the critical element to success. Another interesting finding was that unlike some other previous work they cited, "no significant differences were found among factors based on demographic characteristics such as age or level of mathematics completed" (Wheeler & Montgomery, 2009, p. 301), supporting the notion that individual beliefs may be more relevant to success than other suspected dimensions. As college faculty redesign mathematics programs, they must consider the beliefs that students bring to the setting. Wheeler and Montgomery (2009) highlighted the critical role of the teacher and the influence of past experiences on students' beliefs about their abilities. Experiences should be developed and evaluated in light of student self-efficacy and motivation, academic challenge, and instructor support.

Learners' Experiences and Goal Orientations

Underprepared students taking developmental mathematics classes are motivated by specific goals. One of their goals is successful completion of the mathematics course or courses that are prerequisite to entry into their programs of study. Achievement goals have been studied in psychology, and the two goal types that emerge from this theory are mastery goal orientation and performance goal orientation (Poortvliet & Darnon, 2010). According to Poortvliet and Darnon (2010), mastery goals that revolve around improving performance, rather than performance goals that focus on outperforming others, help us understand how "individuals perceive, interpret, and react to achievement situations" (p. 324). Striving for mastery implies improvement from past performance while focusing on performance goals means comparing progress with others. Concentrating on personal goals and mastery rather than competition with classmates leads to a different way of thinking and relationship building in the classroom. Students focused on mastery may perceive instructors and peers as collaborators more so than traditional students who may view competitive classmates as threats and teachers as unfair. These perceptions are important as we evaluate students' relationships with teachers and other students as positive or negative.

The nature of traditional academia may seem more oriented toward a performance model since grading may be viewed as judging the skills of individuals within the context of the membership of a class, or it may be viewed as an individualistic endeavor since students travel through many different pathways and programs. Regardless of the broader perspective of the college, a classroom that is redesigned to develop individualized progress using a mastery learning approach to developmental mathematics through a mastery goal orientation framework makes sense. Given the influence of the teacher on any type of learner, the changed role from lecturer to facilitator is likely to have an effect on students' perceptions and success. In fact, according to Mesa (2012), students know when teachers create a competitive environment that judges them based on achievement relevant to classmates rather than a cooperative setting that focuses on individual improvement. Mesa's (2012) results from a survey of 777 mathematics students at a community college indicated a preference for mastery over performance. Of significance, the remedial students reported higher motivation toward mastering content as well as greater appreciation for teachers pressing them to make progress than the students taking college-level math. Dompnier, Darnon, and Butera (2009) explained that the link between mastery goal orientation and academic achievement is facilitated by a belief that mastery goals lead to a successful experience in higher education.

Similar to the connection between mastery goal orientation and achievement, students are also motivated by their goals. The Attitudes Toward Math Inventory survey was distributed to 233 students enrolled in developmental algebra in a large urban community college to study affective characteristics and course success. A positive correlation between the final exam score and motivation was statistically significant (Guy, Cornick, & Beckford, 2015). Students' levels of self-efficacy affect their motivation. Self-efficacy contributes to setting goals, expending effort to reach goals, persevering when facing obstacles, and beginning again in the face of failure. Students who are not deemed ready for college math do not have to be made to feel like their goals are unachievable. Accelerated opportunities to remediate can address poor or inaccurate placement and set students up for success.

It's important to understand students' perspectives as they enter college. In his survey of 82 students regarding their perceptions on placement testing into precollege level math classes in a community college in the Southwest, Goeller (2013) found that students who agreed with their placement results of low-level remedial mathematics also shared their wish for faster-paced courses. Though some may associate lack of ability with poor completion rates for students testing in low-level remedial math, acceleration models have proven that "students in redesigned, accelerated remediation have higher completion rates of college-level courses, including students who score low on standardized placement tests" (Hern & Snell, 2014, p. 30). At Utah Valley University, students who chose to enroll in Math Pass, an accelerated, technology-enhanced remedial class, were able to successfully accelerate through remedial course concepts and were more apt than those who registered in the conventional remedial series to enroll in and be successful in subsequent math courses (Brinkerhoff & Sorenson, 2015). The students enrolled in the Community College of Denver's accelerated developmental mathematics FastStart program were more likely than their peers to complete the college math course within three years (Jaggars, Hodara, Cho, & Xu, 2015). Also, in a comparison study of 78 students in traditional remediation and 124 students in an accelerated, mastery-based, redesigned course in a community college in California, accelerated program participants were more likely to advance to a college credit math course regardless of gender, PELL status, or ethnicity and maintained a higher GPA in the math subject area (Silverman & Seidman, 2011). Developmental programs that accelerate students through the sequence may help students overcome some of the factors that impede student progress such as placement test errors, instruction and curriculum that students find lack relevance, and external challenges like childcare and job responsibilities (Jaggars et al., 2015). It may be the case that working from a mastery goal orientation framework will help explain students' behavior and the influence of the instructor as they relate to students' persistence and success within this redesigned model of teaching and learning for developmental mathematics students.

Learners' Experiences and Anxiety

Improving success rates of students placing into developmental mathematics in colleges is being researched and discussed at state and national levels (Complete College America, 2012; American Association of Community Colleges, 2012). In a large study of 85,894 new college students in 107 community colleges in California, Bahr (2008) found that learners passing developmental and college math requirements persisted and attained a credential or transferred like students who tested college-ready in mathematics. Thus, there is evidence that effectiveness of developmental programs is critical to long-term student success. However, based on his 8-year study of academic attainment, Bahr (2008) shared that most students were not successful with the remedial work. In VanOra's (2012) qualitative study, 18 community college students placing into developmental reading and writing described time management, rigor of coursework, and poor pedagogy as critical challenges, and their two central motivators were reported as the intrinsic desire to learn and the hope of becoming a role model to friends and family. Boylan (2011) reported that reasons for a lack of success in developmental mathematics included lengthy course sequences, failure to master concepts in a sequence that builds on content knowledge, need for abstract reasoning skills, poor study skills, personal problems, lack of diversity in instructional styles, and anxiety.

According to Andrews and Brown (2015), some students have so much anxiety that they put off the developmental mathematics as long as possible. Students with low confidence in their mathematics ability due to math anxiety tend to avoid or delay enrolling in math courses, limiting their potential. Using math anxiety survey data, standardized test scores, placement scores, and final grades of 180 freshmen in a 4-year institution in the southeastern portion of the country, Andrews and Brown reported a negative relationship between math anxiety and final course grades, and they recommended that faculty help students overcome their feelings of inferiority with supportive programs that included successful experiences rather than avoidance of the subject. Math anxiety is related to students' feelings of inadequacy with course content. To support anxious students earlier, faculty should consider utilizing an anxiety survey at the start of the term to identify participants who are most likely to be affected by their anxiety (Rancer, Durbin, & Lin, 2013).

Though the majority of remedial work is done in community colleges, there are historically Black colleges (HBCs), Hispanic-serving institutions (HSIs), and some universities that also offer some precollege precollege level mathematics. In their study of one HIS, Fike and Fike (2012) compared the academic success of students who tested college ready with those who tested into developmental math and chose to defer or begin their math course work, the students who were college ready and those who did not defer and successfully passed their developmental course showed the same outcomes in terms of GPA, Fall-to-Spring and Fall-to-Fall persistence. However, the learners who failed the developmental math course in the first semester demonstrated even poorer outcomes than those who deferred which emphasized the importance of an effective developmental mathematics approach. Greene, Marti, and McClenney (2008) shared that the greater level of academic underpreparedness of many African-American students meant a greater distance for them to travel in terms of number of courses and a greater amount of effort to persist than that faced by peers who are less at-risk academically. What Greene et al. (2008) called the effort-outcome gap for African-American students was not a major issue for Hispanic students who were more prepared, though this could be unique to Florida where the Hispanic population tends to be better educated with stronger English-speaking skills than other areas with sizeable Spanish-speaking populations.

Students who start college with stronger academic skills tend to be more confident and successful. Using institutional data and survey responses from 351 college students enrolled in a beginning college math class for non-math majors, Daughtery, Rusinko, and Grigggs (2013) found that students with stronger pre-course math abilities were less likely to fail, students who felt more susceptible to failure were more apt to fail, and students who saw benefits in accepting early interventions were more prone to success over time. According to a study by Tariq and Durrani (2012), the results of 566 undergraduate students in a university in the United Kingdom included evidence that students with greater confidence in their math skills have a more cohesive understanding of math, are more positive about math, and have lower math anxiety. The more confident students were younger, entered with stronger math skills, and were part of degree programs that required use of math skills. Two predictors of success included attitude toward math and strength of math knowledge at the point of entry into college; negative predictors included being older, being less academically prepared, and being anxious about math.

Given the number of students who fail to persist beyond 1 year of college, understanding students' beliefs at the start of class could make a difference. That knowledge could lead to revised pedagogy and additional academic and student support made available to learners at the very start of college, before they are in serious academic distress.

Age may also be an important consideration as related to anxiety. Analyzing data gleaned from 60 traditional-age (under 25 years old) and 166 older (over 25 years old) undergraduate students, Jameson and Fusco (2014) learned that the older students indicated a lower sense of self-efficacy and greater math anxiety than the traditional students. In an item analysis, they also observed that adults' levels of math self-efficacy were lower in academic areas like geometry and trigonometry but not in basic math like fractions and decimals, where they were likely more experienced. Upon surveying 368 college students from a university in Pennsylvania in their math classes regarding their beliefs, Hendy, Schorschinsky, and Wade (2014) also realized that age was an important factor. Because younger students tended to devalue class time while older students felt less confident, the researchers suggested that younger students would benefit from interventions that address overconfidence such as sharing correlations between final grades and attendance. The authors indicated that less confident, anxious older students would benefit from frequent, predictable activities that included specific feedback on areas in which they had improved to build their confidence and supportive feedback on the topics in which they still need improvement so they could set goals (Hendy et al., 2014).

However, Wolfle's (2012) study of students in a community college in Virginia found that neither age nor ethnicity impacted success in developmental or the first college-level math course completed. Wolfle (2012) observed that older students, rather than traditional, and White students, rather than non-White, were more apt to be successful in their initial college math course; further, age, ethnicity, and developmental placement did not impact persistence to the second year. Although adult students may benefit from past experience, greater intrinsic motivation, and self-direction, they are challenged by personal commitments such as family, work, child care, finances, transportation, and anxiety about taking classes.

Developmental Mathematics Reform

Given the diverse population applying to college, there is not a single answer to this issue. California initiated the Basic Skills Initiative, Oregon the Proficiency-based Admission Standards System (PASS), Tennessee the Developmental Studies Redesign, Maryland the Developmental Education Initiatives, Washington the Integrated Basic Education and Skills Training Mathematics, all in hopes of addressing the developmental challenge (Abraham, Slate, Saxon, & Barnes, 2014a). According to Bonham and Boylan (2011), colleges are instituting reform measures and teaching practices that include the following:

> greater use of technology as a supplement to classroom instruction, integration of classroom and lab instruction, offering students a variety of delivery formats, project-based instruction, proper student assessment and placement, integration of counseling for students, and professional development for faculty. (p. 3)

When surveyed about their perspectives on a research agenda in developmental education, 141 professionals in the field suggested learning more about best practices, efficacy of new instructional models, student persistence and retention, assessment and placement systems, faculty credentials and training, student characteristics, curriculum, technology use, college readiness, and student motivation (Saxon, Martirosyan, Wentworth, & Boylan, 2015a, 2015b). This lengthy list developed from experienced practitioners demonstrates the many factors that may impact student success within an evolving environment.

In developmental mathematics classes students are expected to learn or re-learn elementary and secondary school concepts. Due to the spotlight on developmental mathematics in two-year colleges, the emphasis has changed from access to success leading to redesign and redevelopment of content, organization, and delivery of programs (Bonham & Boylan, 2011). With this multitude of recent innovations happening in small-scale “boutique” style, data on success is slowly collected and shared. Reports like Sherer and Grunow’s (2010) on success rates of a variety of math intensive programs including summer math boot camps and bridges designed to remediate basic math skills in an intense one or two week period, sponsored by the Carnegie Institute, using a 90-day cycle process, reinforces the need to study and report on the successes and challenges of the many innovations in a timely and scholarly fashion.

One of the methods colleges are experimenting with is acceleration. Hern (2012) shared that the key principles behind streamlining curricula include backwards design, on-demand remediation, and intentional support for affective issues. Twigg’s (2011) Emporium Model is founded upon the belief that pupils learn math by doing it rather than observing someone else do it. The model creates the opportunity for students to use technology to move and accelerate in a self-paced fashion through the mathematics content specific to their programs of study. Interactive software is the key to the program which requires that students demonstrate mastery of course content within each section or module of the course. The five critical elements for success in this model include redesign of an entire course, engaged participation, personalized support, constant assessment with immediate feedback, as well as sufficient time on task with progress monitoring (Twigg, 2011). The importance of required, active homework on the part of the student is affirmed in the literature by Bembenutty (2011) as he explained meaningful homework, the process of self-regulation, and the role of self-efficacy. Bembenutty’s (2011) findings included a positive relationship regarding homework and self-efficacy- as well as homework and responsibility. This point supports Twigg’s model and the idea that the self-regulatory processes associated with such a redesign will develop motivation and impact student achievement.

Course redesigns that follow Twigg's approach are unique in that they promote "mastery learning, active learning, individualized assistance, modularization, or personalized assistance" and implement technology where most important, including "homework, quizzes, and exams" (Bonham & Boylan, 2011, p. 4). Zavarella and Ignash (2009) studied different delivery styles including web-based, hybrid, and face-to-face to determine the impact on retention only to report that instructional formats using computer-based instruction negatively affected retention rates. Their study was limited to computer-based instruction types that included little classroom time and instructor intervention. According to Ashby, Sadera, and McNary (2011) in their study of 167 developmental mathematics students in a community college, comparing student success among participants in online, hybrid, and face-to-face situations led to findings that students in blended courses had the least success when attrition was not taken into account, and face-to-face students performed the worst when looking solely at results of those students who completed the class.

These data do not reflect the success rates of Twigg's (2011) model that uses technology in coordination with intrusive assistance and rigorous assessment measures. According to Twigg (2011), students participating in the Emporium Model who successfully completed one precollege mathematics course increased on average 51% and further improved the college-level mathematics completion rate by 25%. These calculations are based on over 200,000 community college students participating at a combined 37 institutions over an 11-year period (Twigg, 2011). Twigg's (2013) more recent work highlighted best practices in the redesigned model that made it effective including holding class in a computer lab where students used instructional software and were provided individualized assistance, establishing course consistency with a modular course structure and individual student progress plans with deadlines, requiring attendance and monitoring progress, and requiring mastery learning.

Undoubtedly much of the responsibility for learning falls on the student. College success requires determination and motivation. Workforce readiness and global competitiveness are reliant on a college-educated citizenry, and there is a correlation between college-readiness in math and attaining a college degree (Abraham, Slate, Saxon, & Barnes, 2014a). Not only are the majority of underprepared students not earning a college degree, but they are also not seeking out an alternate credential, like a career and technical certificate, that does not include traditional college math courses. Bahr (2013) attributed this further lack of success to difficulty navigating the system, declining community college enrollment, and poor academic performance. These students need support during enrollment in remedial math, and they need just as much assistance if they leave prematurely.

When students enter college they learn that mathematics requirements are embedded in almost all programs of study. Students enrolling in developmental mathematics classes often enter with a history of unsuccessful experiences. In a qualitative study, Howard and Whitaker (2011) posed the question "What common phenomena accompany students' shift from unsuccessful to successful math experiences?" (p. 3). Using interviews, observations, journals, and assessments of 14 newly successful students who were recommended as top developmental math students by faculty, the authors determined there were three themes to both students' perceptions of success and lack of success: turning point, motivation, and strategies. In order to set students up for success as they enter higher education, changes are taking place including accelerated developmental sequences, redesign options, co-requisite models, and even elimination of developmental courses (Saxon & Morante, 2014). Understanding how these ideas support or diminish student success in a math redesign will be critical to helping present and future students.

Implications

It is the practice of the college to collect course success data based solely on final grades; therefore, it may be useful to offer a survey to understand correlations between motivational factors and success. Delivering the survey to students new to the redesigned course during the term provided insight into students' perceptions of the new model and their performance. Using a tool like the MSLQ that assesses a variety of factors, specifically self-efficacy beliefs about learning, intrinsic and extrinsic goal orientation, and test anxiety, may adequately answer the research questions regarding correlations or predictions regarding these factors and student success. Using the literature and findings from the study, I developed a white paper. This white paper is intended to guide the development and expansion of accelerated developmental mathematics opportunities in institutions of higher education that serve disadvantaged and academically underprepared populations.

Summary

The problem of the lack of success of students placing into developmental mathematics courses, and the subsequent impact on earning potential and career options for those students, their families, our communities and our nation, are quite clear. Because these students often reside in community colleges, where research is not the highest priority, studies of these students' experiences are relatively neglected. Learning more about students' perceptions and experiences in a redesigned, accelerated learning opportunity, especially for students who represent minority groups and have socio-economic challenges, is critical to improving the instructional delivery of courses to meet their needs and increase their opportunity for success. In this study I provided information about the perceptions and experiences of developmental students regarding goal orientation, self-efficacy, and test anxiety. I also offered insights into new methods including accelerated learning and mastery learning strategies that may be helpful to and replicable within other academic opportunities. A survey, as described in the following methodology section, was used to quantify any correlations with student success.

Section 2: The Methodology

In this quantitative study, I examined students' acceleration in a redesigned course and their sense of self-efficacy, goal orientation, and beliefs about test anxiety. A convenience sample of first-time students enrolled in the redesigned course received the MSLQ, which measures students' perceptions about self-efficacy, goal orientations, and test anxiety. The data were imported electronically into the Statistical Package for the Social Sciences (SPSS), version 20.0. Assumptions and limitations of the study are discussed in this section as well as measures to protect the rights of participants.

Approach and Design

Survey research was used to gather information from students in a newly designed, accelerated approach to learning mathematics. Surveys have become a common methodology in social science research because they focus on the relationships between variables and help the researcher answer research questions without using an experimental group (Punch, 2003). Since the redesigned course is a new offering, the survey was chosen as the best way to investigate relationships between students' successful acceleration and completion through the course and the variables of self-efficacy, goal orientations, and test anxiety.

Setting and Sample

Students enrolled in the redesigned course on the campus of a large, urban Midwestern community college volunteered to participate in this study. From this population of 1200, a convenience sample was obtained. All students new to the course were invited. Students repeating the class were excluded because the study focused on perceptions only during the first semester of exposure to the redesigned course. Students who were invited to participate in the survey were assured that their participation would be confidential. Students interested in participating in the study signed an informed consent. A power analysis indicated that, for a confidence level of 95%, 218 was the recommended sample size.

Instrumentation and Materials

The MSLQ survey was "designed to assess college students' motivational orientations and their use of different learning strategies for a college course" (Pintrich, Smith, Garcia, & McKeachie, 1993, p. 801). It was cocreated in the 1980s by scholars from the National Center for Research to Improve Postsecondary Teaching and Learning and the School of Education at the University of Michigan as a grant-funded project from the Department of Education. The survey's properties were statistically analyzed and the results demonstrated internal consistency reliability and predictive validity (Pintrich et al., 1993). The survey contains 81 items, scored on a 7-point Likert scale, ranging from 1 (*not at all true of me*), to 7 (*very true of me*). All 31 survey questions on motivation were founded on a social-cognitive motivational model. Scaled items were organized into subscales. Two expectancy-related subscales measured perceptions of self-efficacy and control beliefs about learning. Three value belief subscales measure intrinsic goal orientation focusing on mastery and learning, extrinsic goal orientation focusing on grades and the approval of others, and task value beliefs which are judgments about the importance and practicality course content. The third motivational scale revolves around affect or test anxiety (Pintrich et al., 1993).

Confirmatory factor analyses and coefficient alphas were used to analyze internal consistency; correlations of MSLQ scales with later course grades were analyzed for predictive validity. Coefficient alphas for Intrinsic and Extrinsic Goal Orientation were .74 and .62, respectively, Task Value was .90, Control of Learning Beliefs was .68, Self-Efficacy was .93, and Test Anxiety was .80. When used together, "the factor analysis and alphas of the motivational items suggest that the general model of motivational components with six scales is a reasonable representation of the data" (Pintrich et al., 1993, p. 808). Further, according to Pintrich et al. (1993), other than extrinsic goal orientation, the motivational subscales demonstrated statistically significant correlations with final grades with r ranging from .13 to .41, and test anxiety at $r = -.27$, since students who were more anxious did not perform as well as less anxious students.

I requested permission to use this free survey and made adjustments to include demographic data. This tool and confidentiality measures required IRB approval. Once the revised survey was approved (IRB number 08-22-14-0265707), I administered it to the students who were 18 years of age and older via a link from an email to their student account. I collected their responses during the semester of enrollment. The items in the questionnaire may be found in Appendix B.

Data Collection and Analysis

Persistence and success data was gathered by the college's Office of Institutional Effectiveness to document students' ongoing progress. Persistence includes students' registration for the subsequent term or year. Student success is successful completion of the course. Because institutional success data was sorted by demographics including age (under 20, 20-24, and over 24), race/ethnicity (White, African-American, multiracial, Hispanic, and Unknown), gender (male/female), and socio-economic status (Pell eligible/ineligible), I used these same groupings in the demographics section of my survey.

I administered the edited MSLQ survey to understand if success in the redesigned course was correlated with students' motivational constructs of self-efficacy, mastery goal orientation, and lessened test anxiety. I delivered the electronic survey to enrolled students during a single semester. No names or other revealing information was asked or collected. The survey quantified students' self-perceptions during the semester of enrollment in the redesigned remedial mathematics class. Data from the MSLQ survey are presented. The independent variables include demographics (age, gender, race, and successful completion of Algebra II in high school). The dependent variables include subscales within the three general motivational constructs of expectancy (self-efficacy), value (goal orientation), and affect (test anxiety). In the Likert scale of the MSLQ, the 1 denotes a response of *not at all true of me* while the 7 denotes a response of *is very true of me*, and the values between indicate progressive levels of agreement or disagreement.

Survey data were imported to SPSS for analyses. To answer the first research question, Spearman's rho correlations were run between success and self-efficacy, success and intrinsic goal orientation, success and extrinsic goal orientation, and success and test anxiety. To answer the second research question, chi-square tests were run using the demographic variables of age, gender, race, and successful completion of Algebra II in high school and the variables of self-efficacy, intrinsic and extrinsic goal orientations, and test anxiety. An alpha level of $p < .05$ was used to determine statistical significance (Lodico et al., 2010).

To answer research question three, an ANOVA was used with the independent variables, self-efficacy, intrinsic and extrinsic goal orientation, test anxiety, and time since successful completion of high school Algebra II, with the dependent variable of success. The calculated R^2 indicates how much of the variance in the dependent variable, success, is due to the independent variables. The beta weight indicates how much change in the dependent variable, success, is due to the change in each independent variable. These weights indicate which of the variables has more of an effect.

Assumptions, Limitations, Scope, and Delimitations

It was assumed that all participants were willing and interested in participating in the study and not influenced by their instructor to answer questions in any particular fashion.

One limitation of the study was a mortality threat due to the high withdrawal rate of students in developmental courses. This threat to internal validity may have impacted the number of students who completed the survey. Students who dropped the class may have ignored the e-mail reminders that the survey was available. In contrast, students who successfully accelerated and ended the course extremely early may have failed to continue checking e-mail and forgotten about their agreement to participate in the survey.

Based on the demographic data collected from the surveys, there was limited diversity among participants. There was also a low rate of participation. Results are less generalizable with a small sample. As a result of the sample size of 36, with a confidence level of 47% found using the Raosoft® online calculator, there are threats to statistical conclusion validity.

In my research I focused on self-efficacy, goal orientations, test anxiety and success. Because there was no study of other concurrent activities or courses that may include topics which impact motivation, other variables that may influence students' levels of persistence and success may not be accounted for.

Protection of Participants' Rights

All eligible participants who were at least 18 years of age were invited to participate. In my invitation I explained the value of participation including how participants' responses could lead to recommendations for course improvement to support student success in the redesigned course. Messages inviting students to engage in the study were emailed multiple times to encourage participation. Further, after survey links were sent to students who gave consent, emails were sent to remind students to complete the survey. There were no incentives for participating nor were there punishments for not participating. Students in the study were informed of their rights regarding participation and confidentiality using a consent form included in the electronic survey. Steps were taken to ensure confidentiality including maintenance of data in a locked file and creation of a unique password-protected mailbox for correspondence between me and participants.

Data Analysis Results

I used the data from the MSLQ survey to address the three research questions. Of the more than 500 new students in the course, 51 consented to participate. Of those 51 who agreed, 36 answered the survey during the semester. Importing the survey data into SPSS, I used Spearman's Rho calculations to address the first research question, Chi-square calculations to address the second research question, and ANOVA to address the third research question. The results are reported in tables below.

In this study, student success was assigned a value based on rate of acceleration and completion as self-reported by students. The number of completed courses that they self-reported for the single semester were assigned a number. This calculation was based upon the modules completed compared to the number available. In the self-paced course there are at most four distinct courses that a student may complete in a single semester using the self-paced modules. Based on their goals, pacing guides are implemented to ensure successful progress. However, students' initial placement levels determine their starting course, so some students need only one set of modules, because they placed at the highest level of developmental mathematics, while others need all four sets of modules, because they placed at the lowest level. Though all students who completed the modules for at least one course pass with an "S" or "Satisfactory" grade, the goal was successful completion *and acceleration* through as many developmental courses as possible each semester. The numbers in Table 1 indicated the values based on the self-reported data and corresponding credit hour equivalency. For example, students who place at the lowest level of developmental mathematics face four courses of work, which is the equivalent of 14 traditional credit hours. If they complete all the modules of all four courses, the calculation is 14/14, but if they complete the modules of only one course then the calculation is 4/14. To compute the Spearman's rho correlation coefficients, high successful acceleration ranging from 0.8 - 1.0 was assigned 5 points, medium successful acceleration ranging from 0.4 - 0.79 was assigned 3 points, and low successful acceleration ranging from 0 to 0.39 was assigned 1 point.

Table 1

Values for Course Completion and Acceleration Success Data

Number of courses available	Number of course completions reported			
	4	3	2	1
4	14/14 = 1	9/14 = .64	6/14 = .43	4/14 = .29
3		10/10 = 1	5/10 = .5	2/10 = .2
2			8/8 = 1	3/8 = .38
1				5/5 = 1

The first research question asked: What is the relationship between success in the redesigned course and students' perceptions of self-efficacy, intrinsic and extrinsic goal orientations, and beliefs about test anxiety? To answer this question, the values assigned to represent high, medium, and low successful acceleration, and data collected from the students' self-efficacy, intrinsic, extrinsic, and anxiety responses, were used to calculate the relationships between success and the other variables.

According to the results of Spearman's rho, significant correlations were not found between success and test anxiety nor between success and extrinsic goal orientation. However, correlations between success and self-efficacy as well as success and intrinsic goal orientation were statistically significant. These results are provided in Table 2.

Table 2

Results of Spearman's Rho

Students' perceptions	Successful acceleration
Self-efficacy	.34**
Intrinsic goals	.20*
Extrinsic goals	.02
Test anxiety	-.14

**$p < .01$; *$p < .05$

The relationship between success and intrinsic goal orientation was $r_s = .20$, $p = .01$. Also, the relationship between success and self-efficacy was $r_s = .34$, $p < .01$. There was a negative correlation with test anxiety ($r_s = -.14$, $p = .07$), which was not statistically significant. As hypothesized, there was a positive relationship between self-efficacy and success as well as intrinsic goal orientation and success.

The second research question asked: What is the relationship between age, race, gender, past experience with high school Algebra II and students' experiences with the redesigned course that impact perceptions of self-efficacy, intrinsic and extrinsic goal orientations, and beliefs about test anxiety? The hypothesis was there is an association between age, race, gender, past experience with high school Algebra II, and students' experiences with the redesigned course factors that impact perceptions of self-efficacy, intrinsic and extrinsic goal orientations, and beliefs about test anxiety.

Table 3 includes the results regarding the association between self-efficacy and the demographic variables. Chi-square results on self-efficacy were significant for each demographic variable except gender. The results on self-efficacy and age were X^2 (49, N=288) = 102.76, p < .01. The results on self-efficacy and race were X^2 (14, N=288) =

23.94, $p < .05$. The results on self-efficacy and success in high school Algebra II were X^2 (7, N=288) = 27.93, $p < .01$.

Table 3

Results of Chi-square Test for Self-Efficacy and Demographics

	Likert Scale Survey Results of Self-Efficacy Questions							
Demographic	1	2	3	4	5	6	7	X^2
Gender								
Male	1 (1%)	1 (1%)	1 (1%)	13 (16%)	12 (15%)	28 (35%)	24 (30%)	14.09
Female	0 (0%)	5 (2%)	29 (14%)	34 (16%)	30 (14%)	62 (30%)	47 (23%)	
Age								
18-19 yrs	0 (0%)	2 (3%)	7 (10%)	19 (26%)	12 (17%)	14 (19%)	18 (25%)	102.76*
0-24 yrs	1 (1%)	0 (0%)	6 (8%)	10 (14%)	11 (15%)	30 (42%)	14 (19%)	
25-29 yrs	0 (0%)	0 (0%)	1 (3%)	0 (0%)	5 (16%)	20 (63%)	6 (19%)	
30-34 yrs	0 (0%)	0 (0%)	0 (0%)	4 (13%)	5 (16%)	8 (25%)	14 (44%)	
35-39 yrs	0 (0%)	1 (3%)	8 (25%)	6 (19%)	0 (0%)	8 (25%)	9 (28%)	
40-44 yrs	0 (0%)	1 (13%)	4 (50%)	2 (25%)	0 (0%)	1 (13%)	0 (0%)	
45-49 yrs	0 (0%)	0 (0%)	2 (13%)	4 (25%)	5 (31%)	5 (31%)	0 (0%)	
50 yrs or older	0 (0%)	2 (8%)	2 (8%)	2 (8%)	4 (17%)	4 (17%)	10 (42%)	
Race								
Black	0 (0%)	3 (4%)	8 (10%)	15 (19%)	20 (25%)	19 (24%)	15 (19%)	23.94*
Hispanic	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (38%)	1 (13%)	4 (50%)	
White	1 (1%)	3 (2%)	22 (11%)	32 (16%)	19 (10%)	70 (35%)	52 (26%)	

Successful completion of high school Algebra II								
Yes	1 (1%)	0 (0%)	13 (7%)	24 (14%)	22 (13%)	62 (35%)	54 (31%)	27.93*
No	0 (0%)	6 (5%)	17 (15%)	23 (21%)	20 (18%)	28 (25%)	17 (15%)	

Note. Numbers in parentheses indicate row percentages; *$p < .05$

The Chi-square analyses on intrinsic goal orientations were only statistically significant for age, X^2 (42, N=144) = 60.47, p = .032. Results are recorded in Table 4.

Table 4

Results of Chi-square Test for Intrinsic Goal Orientation and Demographics

	Likert Scale Survey Results of Intrinsic Goal Orientation Questions							
Demographic	1	2	3	4	5	6	7	X^2
Gender								
Male	0 (0%)	0 (0%)	1 (3%)	10 (25%)	9 (23%)	11 (28%)	9 (23%)	6.33
Female	5 (5%)	4 (4%)	10 (10%)	20 (19%)	19 (18%)	26 (25%)	20 (19%)	
Age								
18-19 yrs	0 (0%)	0 (0%)	1 (3%)	11 (31%)	10 (28%)	5 (14%)	9 (25%)	60.47*
20-24 yrs	2 (6%)	2 (6%)	2 (6%)	6 (17%)	7 (19%)	11 (31%)	6 (17%)	
25-29 yrs	0 (0%)	0 (0%)	1 (6%)	3 (19%)	3 (19%)	7 (44%)	2 (13%)	
30-34 yrs	3 (19%)	0 (0%)	0 (0%)	2 (13%)	2 (13%)	6 (38%)	3 (19%)	
35-39 yrs	0 (0%)	1 (6%)	2 (13%)	3 (19%)	0 (0%)	4 (25%)	6 (38%)	
40-44 yrs	0 (0%)	0 (0%)	2 (50%)	0 (0%)	2 (50%)	0 (0%)	0 (0%)	
45-49 yrs	0 (0%)	0 (0%)	2 (25%)	2 (25%)	3 (38%)	1 (13%)	0 (0%)	

50 yrs or older	0 (0%)	1 (8%)	1 (8%)	3 (25%)	1 (8%)	3 (25%)	3 (25%)	
Race								
Black	2 (5%)	3 (8%)	3 (8%)	9 (23%)	9 (23%)	7 (18%)	7 (18%)	9.89
Hispanic	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (25%)	1 (25%)	2 (50%)	
White	3 (35%)	1 (1%)	8 (8%)	21 (21%)	18 (18%)	29 (29%)	20 (20%)	
Successful Completion of High Sch Alg II								
Yes	2 (2%)	2 (2%)	4 (5%)	17 (19%)	16 (18%)	29 (33%)	18 (20%)	9.07
No	3 (5%)	2 (4%)	7 (13%)	13 (23%)	12 (26%)	8 (14%)	11 (20%)	

Note. Numbers in parentheses indicate row percentages; **p* < .05

The Chi-square results indicated a statistically significant association between extrinsic goal orientation and age, χ^2 (42, N=144) = 72.35, *p* = .002, and between extrinsic goal orientation and gender, χ^2 (6, N=144) = 16.06, *p* = .013. Complete results are provided in Table 5.

Table 5

Results of Chi-square Test for Extrinsic Goal Orientation and Demographics

	Likert Scale Survey Results of Extrinsic Goal Orientation Questions							
Demographic	1	2	3	4	5	6	7	χ^2
Gender								
Male	1 (3%)	5 (13%)	3 (8%)	9 (23%)	6 (15%)	9 (23%)	7 (18%)	16.06*
Female	6 (6%)	4 (4%)	10 (10%)	6 (6%)	26 (25%)	18 (17%)	34 (33%)	

Age								
18-19 yrs	0 (0%)	2 (6%)	0 (0%)	9 (25%)	8 (22%)	12 (33%)	5 (14%)	72.35*
20-24 yrs	3 (8%)	4 (11%)	4 (11%)	2 (6%)	7 (19%)	4 (11%)	12 (33%)	
25-29 yrs	0 (0%)	0 (0%)	2 (13%)	2 (13%)	3 (19%)	3 (19%)	6 (38%)	
30-34 yrs	2 (13%)	0 (0%)	0 (0%)	1 (6%)	2 (13%)	4 (25%)	7 (44%)	
35-39 yrs	0 (0%)	0 (0%)	3 (19%)	0 (0%)	3 (19%)	2 (13%)	8 (50%)	
40-44 yrs	1 (25%)	1 (25%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (50%)	
45-49 yrs	1 (13%)	0 (0%)	3 (38%)	0 (0%)	3 (38%)	1 (13%)	0 (0%)	
50 yrs or older	0 (0%)	2 (17%)	1 (8%)	1 (8%)	6 (50%)	1 (8%)	1 (8%)	
Race								
Black	2 (5%)	3 (8%)	1 (3%)	2 (5%)	13 (33%)	9 (23%)	10 (25%)	10.07
Hispanic	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (25%)	1 (25%)	2 (50%)	
White	5 (5%)	6 (6%)	12 (12%)	13 (13%)	18 (18%)	17 (17%)	29 (29%)	
Successful Completion of High Sch Alg II								
Yes	3 (3%)	7 (8%)	9 (10%)	10 (11%)	18 (20%)	16 (18%)	25 (28%)	2.95
No	4 (7%)	2(4%)	4 (7%)	5 (9%)	14 (25%)	11 (20%)	16 (29%)	

Note. Numbers in parentheses indicate row percentages; $*p < .05$

Based on the Chi-square analyses, the only statistically significant association was test anxiety and age, χ^2 (42, N=180) = 80.51, $p < .01$. There were no statistically significant findings between test anxiety and the other demographic variables. Results are included in Table 6.

Table 6

Results of Chi-square Test for Test Anxiety and Demographics

	Likert Scale Survey Results of Test Anxiety Questions							
Demographic	1	2	3	4	5	6	7	X^2
Gender								
Male	10 (20%)	6 (12%)	6 (12%)	11 (22%)	8 (16%)	5 (10%)	4 (8%)	6.67
Female	20 (15%)	21 (16%)	15 (12%)	16 (12%)	20 (15%)	11 (8%)	27 (21%)	
Age								
18-19 yrs	7 (16%)	7 (16%)	5 (11%)	9 (20%)	7 (16%)	4 (9%)	6 (13%)	80.51*
20-24 yrs	8 (18%)	5 (11%)	6 (13%)	12 (27%)	6 (13%)	3 (7%)	5 (11%)	
25-29 yrs	0 (0%)	3 (15%)	4 (20%)	2 (10%)	3 (15%)	4 (20%)	4 (20%)	
30-34 yrs	9 (45%)	3 (15%)	1 (5%)	1 (5%)	1 (5%)	2 (10%)	3 (15%)	
35-39 yrs	0 (0%)	0 (0%)	0 (0%)	1 (5%)	5 (25%)	3 (15%)	11 (55%)	
40-44 yrs	2 (40%)	1 (20%)	0 (0%)	1 (20%)	1 (20%)	0 (0%)	0 (0%)	
45-49 yrs	2 (20%)	4 (40%)	0 (0%)	0 (0%)	3 (60%)	0 (0%)	1 (10%)	
50 yrs or older	2 (13%)	4 (27%)	5 (33%)	1 (7%)	2 (13%)	0 (0%)	1 (7%)	
Race								
Black	11 (22%)	10 (20%)	8 (16%)	8 (16%)	5 (10%)	4 (8%)	4 (8%)	13.50
Hispanic	1 (20%)	0 (0%)	0 (0%)	0 (0%)	2 (40%)	0 (0%)	2 (40%)	
White	18 (14%)	17 (14%)	13 (10%)	19 (15%)	21 (17%)	12 (10%)	25 (20%)	
Successful Completion of High Sch Alg II								
Yes	17 (15%)	16 (15%)	12 (11%)	20 (18%)	17 (15%)	9 (8%)	19 (17%)	2.50
No	13 (19%)	11 (16%)	9 (13%)	7 (10%)	11 (16%)	7 (10%)	12 (17%)	

Note. Numbers in parentheses indicate row percentages; $*p < .05$

The hypothesis about statistically significant associations between perceptions and demographic variables was supported in certain cases. Self-efficacy and age, race, and successful completion of Algebra II were statistically significant. Intrinsic goal orientation and age were significant. Extrinsic goal orientation and both age and gender were statistically significant. And, finally, test anxiety and age were statistically significant. The most consistent demographic variable of statistical significance with each self-perception was age.

Finally, the third research question asked: To what degree do students' perceptions about self-efficacy, goal orientations, beliefs about test anxiety, and recent high school experience predict success in the redesigned course. The hypothesis was there is a linear relationship between self-efficacy, goal orientations, beliefs about test anxiety, recent high school experience, and success. Success points were assigned for high, medium, and low success and the predictors: self-efficacy, intrinsic and extrinsic goal orientations, test anxiety, and length of time since Algebra II in high school. The values assigned to quantify the length of time since successful completion of high school Algebra II are provided in Table 7.

Table 7

Length of Time Since Completing Algebra II in High School

Time in years since Alg II was completed	Value assigned to how recently Alg II was completed
Within 1 year	High = 5
Within 2 years	High = 5
Within 5 years	Medium = 3

More than 5 years	Low = 1
Never successfully completed	Low = 1

To answer Research Question 3, ANOVA was used to predict success based on self-efficacy, intrinsic goal orientation, extrinsic goal orientation, test anxiety, and time since successful completion of Algebra II. There were no statistically significant results, as is indicated in Table 8.

Table 8

Analysis of Variance Results with Self-Efficacy, Goal Orientation, Test Anxiety, Time since Alg II, and Success

Source	*df*	*SS*	*MS*	*F*	*p*
Regression	5	25.85	5.17	1.78	.15
Residual	30	87.04	2.90		
Total	35	112.89			

In summary, there were no significant predictors of success from the analysis of the students' survey responses.

From this study, self-efficacy and intrinsic goal orientation appear to have the strongest relationship with successful acceleration through the redesigned course; however, the sample size limits the generalizability of the findings. Even so, students' self-appraisals of their capacity to accomplish a learning goal and their confidence to execute the skill in the classroom may be critical to success. Also worthy of note is that when considering demographics, the relationships between age and self-efficacy, age and intrinsic goal orientation, age and extrinsic goal orientation, and age and test anxiety were all statistically significant. Self-perceptions of students in the age range of 25-40 years were particularly strong in these areas. Community colleges attract students of all ages, and these results suggest that age is an important factor in students' perceptions of the learning experience and their level of anxiousness.

Self-efficacy and intrinsic goal orientation have a relationship with success, but there is no clear predictor of student success in this learning environment. Students in a self-paced learning environment, with a learning coach in the classroom, have the opportunity to experience success by accelerating through modules. Offering this unique learning opportunity to students who come to college underprepared academically undergirds the learning experience with a foundation for success regardless of the progress of everyone else in the room. This course may help students learn to expect that they will be successful in mathematics, changing the question from "Will I finish?" to "When will I finish?"

Conclusion

The use of a survey delivered during a semester-long, redesigned, developmental mathematics course that measured students' perceptions regarding self-efficacy, goal orientations, and beliefs about test anxiety documented students' beliefs. The statistically significant relationship between success and self-efficacy, as well as the relationship between success and intrinsic goal orientation, was the primary finding from the study. Understanding the connections among student success, self-efficacy, and goal orientation is critical if colleges hope to improve retention, persistence, and completion rates for academically underprepared students.

Section 3: The Project

Introduction

I designed this project study to better understand the relationship between accelerated student success and students' perceptions of self-efficacy, goal orientation, and anxiety in a redesigned, self-paced, developmental mathematics course delivered in a large, Midwestern community college. The IRB approval number was 08-22-14-0265707. The project, a white paper, sought to summarize the problem, report the findings supporting the relationship between student success and self-efficacy and intrinsic goal orientation, discuss the literature including the importance of faculty professional development, and share recommendations for further improving students' success and support strategies at the college for this population of precollege level students.

The following section will include the goals of the study, rationale for the project, review of the literature, results about self-efficacy and goal orientation from the study, and implications for social change.

Description and Goals

This study sought to better understand and address the impact of a redesigned learning opportunity for developmental mathematics students at a community college since the success rates of college students starting developmental mathematics are extremely low (AACC, 2012; Complete College America, 2012; Sherer & Grunow, 2010). The goal of this white paper (see Appendix A) was to share the findings of the study and make recommendations for further program improvements to increase student success and completion in developmental mathematics. From the surveys collected from students in the redesigned, self-paced courses, the results were used in conjunction with college-reported data and the literature to provide a thorough understanding of student success in the redesigned course. There are two audiences for the white paper: (a) the mathematics faculty who facilitate the courses and make academic recommendations; (b) the administrators in the Academic Affairs and Student Services Divisions of the college who make decisions about facilities, technology, resources, staffing, and professional development. Ultimately, the white paper will focus on two key elements essential to program success: (a) understanding and capitalizing on a student's goal orientation or motivation and (b) developing the teacher's role as facilitator of learning.

Rationale

A white paper can highlight findings in simple, straightforward ways and distill related concepts into clear, key points. A white paper will be used to inform the campus community of the lack of students' success in developmental mathematics classes and help them consider new strategies showing promising results based on local and national data. Information reported to upper-level, decision-making administrators can build support for new approaches and expansion of successful innovations. Thus, it is critical that a comprehensive, well-researched document delivered in a readable format is made available to every potential audience member.

Review of the Literature

This literature review will concentrate on the dominant factors that emerged from the study – self-efficacy and goal orientation. According to Pintrich, Smith, Garcia, and McKeachie (1991)—who authored the manual for implementing the MSLQ to assess the motivational orientations and learning strategies of college students—self-efficacy is one aspect of the expectancy component of the assessment. They explained that expectancy for success relates to task performance and that “self-efficacy is a self-appraisal of one’s ability to master a task” (Pintrich et al., 1991, p. 13). Self-efficacy is faith in the capacity to successfully complete a task as well as the confidence to do so. As self-efficacy relates to expectancy of success and ability to perform in the redesigned environment, the following search terms were explored using portals EBSCO Education Source, ERIC, Education Research Complete, and Sage Premier Journals: *self-efficacy, mastery learning, facilitator, technology, goal orientation, acceleration,* and *confidence* were explored. The following discussion will address two critical factors: the goal orientation of the student in this educational endeavor and the responsibility of instructor as facilitator in this academic environment.

Goal Orientation in a Self-Paced Learning Environment

Due to the increasing focus on college completion and the lack of success in remedial programs, acceleration strategies are being studied (Venezia & Hughes, 2013). One theme that emerged from a two-year, cross-site evaluation of five community colleges and four universities across Texas conducted by The Public Policy Research Institute at Texas A & M University was curriculum design and instructional strategies. A component upon which they focused was acceleration. Reviewing a variety of acceleration measures such as shortened terms, self-paced options, and blended courses, successfully accelerating completion is documented; however, the report states that "it is apparent that the accelerated options do not work for students who lack a higher level of commitment and motivation" (Booth et al., 2014, p. 4).

Student motivation should be a consideration when designing and implementing a program for the underprepared college students beginning their studies in developmental classes. A mastery learning program that allows learners self-paced experiences, focusing on improving their individual performance rather than trying to outperform their peers, is one method that can support these students; a mastery goal orientation focuses students on improving upon past performance, allowing them to concentrate on their personal goals and mastery of course material rather than competing with others for a grade (Poortvliet & Darnon, 2010). The beliefs a student has about their abilities within the learning environment may be more important to their success than other factors such as demographics and past experiences (Wheeler & Montgomery, 2009).

The community college attracts a diverse population of students, including young and older learners. In a Community College Research Center (2013) report, Crosta revealed findings from a 6-year analysis of 14,429 first-time community college students' transcripts indicating that 28% never returned to the same college after the first term and that the most notable difference demographically between early dropouts who did not return after one term and early persisters enrolled in at least two of the first four terms of enrollment was age – the average beginning age was 27 for early dropouts and 22 for early persisters. These early dropouts were 5% more likely than the early persisters to place into all developmental content areas including reading, writing, and mathematics and to be at lower levels of developmental placements in these subjects (Crosta, 2013).

Studying the impact of age and self-confidence on success, in a study of 60 traditional and 166 adult learners, Jameson and Fusco (2014) discovered that adults had less self-efficacy in math and greater math anxiety than the younger participants. The negative self-perceptions of the adult learner in mathematics can create a barrier to his or her success. Jameson and Fusco (2014) emphasized addressing their needs in a variety of ways, such as connecting them with campus resources, finding them a peer mentor, and enrolling them in courses with mastery learning so they experience success as well as stressing learning rather than performance. These strategies support the intrinsic goal orientation and the growth of self-efficacy and confidence through students' successful progress through each step or module associated with mastery learning.

One institution that has observed very positive results over 10 years by moving to a redesigned, modular, self-paced developmental mathematics classroom is Daytona State in Florida. They believe the key elements to success of their accelerated program include committed leaders with an inclusive philosophy, a consistent curricula and course delivery by their adjuncts and full-time faculty, a faculty-driven program, and an expansive supplemental instruction program created in an academic support center (Ajose, Bhatt, & Kaur, 2011). Further, because their program is designed with their students' psychological, emotional, and life situations in mind, there are half-semester classes that have more meeting days per week to shorten their number of weeks until eligibility for the college-course, the classes are modularized to allow students to learn topics and move forward without waiting for everyone else, and the end of course is scheduled before the long breaks to prevent truancy and attrition after the break in consideration of a local festival that meant brief but lucrative employment. According to the report from Ajose et al. (2011), these changes have led to increased completion rates of more than 20%.

Understanding the students entering developmental courses in community colleges will help with program design and support for their success. Navarro (2012) described the underprepared students who come from a life in poverty. Using the data from over 2,400 students, the risk factors that made these students vulnerable were underperforming schools, unsafe neighborhoods, financial concerns, drugs, gang violence, arrests, teen pregnancy, and stress (Navarro, 2012). Further, describing risk factors as students' external experiences and vulnerability as students' internal sense of self that comes from their experiences and environment, Navarro explained that those who were not encouraged toward college were more likely to have their confidence undermined. Finding ways to reestablish that self-confidence by addressing vulnerabilities and needs includes accelerating progress to college course work, connecting students with support services, and providing direction for identified personal and family needs. Without addressing the social challenges, academic success will not be a priority and will not be achieved.

There are many reasons institutions of higher education should prepare for and invest in the academic programming for the growing numbers of developmental students entering the college. First, the mission of the community college is one of access. An open access institution that admits everyone, including first generation students, may be able to influence students to stay in college by better understanding intrinsic and extrinsic factors that motivate them (Petty, 2014). Accepting students' dollars for tuition and fees implies an obligation to meet their needs. Challenging the work being accomplished, Cross (1971) explained that it was the progress, not merely access, in higher education that had to be studied, and her talk of the *open* door to higher education became more a question of the *revolving* door for the unsupported students in the community college who did not persevere. The question of the balance between access and success remains a current one decades later as leaders in the field continue to study and discuss the issue (Casazza & Bauer, 2006; Pierce, 2015) and state legislatures develop new models of success funding based on completion models (Bers & Schuetz, 2014; Hillman, Tandberg, & Gross, 2014).

Beyond what some may call the moral obligation to serve these underprepared students, there are also financial benefits to doing so. There is an economic benefit to the institution when students persist and meet their academic goals that comes from tuition, fees, and state subsidies as well as any performance funding for milestones such as completion of developmental courses and progress to degree. There is also a benefit to society should students persist and graduate. According to one study in Hillsborough Community College, there is a positive economic impact on the community due to increasing numbers of graduates including "better health, higher productivity, higher earnings, reduced crime, and other societal factors" (Gallard, Albritton, & Morgan, 2010,

p. 14). And, individually, a post-secondary degree opens more employment opportunities, which can lead to continuing education (Gallard et al., 2010). With such moral, financial, and social considerations, planning and implementing programs that align with the needs, abilities, and goal orientations of students must be a priority.

Development of the Teacher as a Facilitator of Learning

The teacher is a critical factor in student success, especially for students who face the challenge of placement into precollege-level course work. In Wheeler and Montgomery's (2009) study, students they identified as active, skeptical, or confident all indicated that they perceived the teacher as the key element for their success in developmental mathematics courses. Developmental students face one or more semesters of course work that does not count toward the degree and may be pessimistic about their performance based on their past experiences. Offering a new model of teaching and learning to accelerate student progress must be supported by careful recruiting and training of instructors. In a qualitative study of 20 developmental mathematics instructors, of whom 12 had experience teaching in a redesigned, accelerated program, Cafarella (2014) reported that instructor comfort should be considered when implementing new strategies and suggested conducting future correlational studies that measure the relationship between instructor comfort level with a particular pedagogical approach and overall student success. According to one study of an accelerated, modular program for developmental students at Tarrant County College, the faculty identified as more well-suited to the self-paced environment were organized, knew students' names early in the semester, and were flexible (Fong & Visher, 2013).

Given the new role of the teacher as facilitator in the redesigned model and the wariness of the students, the importance of professional development around new teaching pedagogy and strategies is vital. Facilitating a class may seem easier than teaching a class, but facilitating "actually requires increased attentiveness to what is happening in individual and groups of learners" (Knowles, Holton, & Swanson, 2011, p. 257). As teacher, professionals tend to visualize their role as one who plans, provides, and assesses content knowledge. However, as facilitator, practitioners must design and manage the learning process including building relationships, reviewing needs assessments, developing individualized academic plans and schedules in collaboration with students, directing students to resources, and supporting student acceleration and personal goal achievement. Professional development and collaboration will ensure that faculty have the teaching support they require and that students have the learning support they need. In a study of acceleration programs that included mathematics at the Community College of Denver, English at Chabot College, and writing at Baltimore County, Jaggars et al. (2015) found that there were difficulties scaling up successful strategies. They indicated that a stable, collaborative faculty professional development infrastructure may be required to develop the accelerated strategies while addressing the affective needs of students (Jaggars et al., 2015). Given the heavy reliance on part-time faculty to deliver developmental education, scaling professional development to address both pedagogy and technology may be a considerable challenge (Zientek, Skidmore, Saxon, & Edmonson, 2015). Establishing and sustaining professional development, as well as managing obstacles such as facilities, technology, and staffing that may threaten scaling up programs, may require administrative support as well as solid faculty collaboratives.

The redesigned program classroom is like a one-room schoolhouse model, which makes one-on-one faculty conversations with the coordinator, training sessions, adjacent class labs for new and veteran faculty, and leadership fostering consistency in classroom practices important for professional development (Fong & Visher, 2013). In a study of nine institutions in Texas, the most successful professional development for developmental instructors of innovative programs was perceived to occur at campuses where committees customized the opportunities to the specific needs of the campus (Booth et al., 2014). Though not every institution highlights professional development as a critical component to success, institutions like Daytona State have standardized their program by creating video instruction for all classrooms so they have consistent instruction, customizing a textbook with directly-related practice work, and standardizing daily schedules designed to have most work completed in the classroom (Ajose et al., 2011). With a large adjunct contingent, such a carefully designed program of this nature can support the work of the teachers if professional development is not easily delivered.

The climate created by the teacher in the classroom is critical to the foundation of student success. Peters (2013) completed a study of 15 college algebra instructors and 326 of their students to better understand the relationships among classroom climate developed by the faculty, students' self-efficacy, and academic achievement. She found that learners demonstrating greater self-efficacy in mathematics were also higher achieving. Peters also found that the classroom climate alone did not predict success.

According to her interpretation, “it would appear that the influence of classroom climate on mathematics achievement is being mediated by student mathematics self-efficacy” (Peters, 2013, p. 475), and faculty should engage in professional development training on strategies to learn how to create a classroom climate that enhances students’ levels of self-efficacy.

There is little doubt that educators recognize the value of professional development. However, that does not mean that strong programs, small or large, have become a priority. To support access and completion, colleges will have to invest in and cultivate talent of diverse faculty, structuring meaningful professional learning opportunities that clearly connect to outcomes (Robinson, Byrd, Louis, & Bonner, 2013). Considering developmental education as a field, there is still a lot to be done to address the progress of developmental educators toward professionalization. Across the country, there are few opportunities to earn a degree or credential in the field, practitioners are more dedicated to teaching than research so they are less likely to publish and share findings, organizational structures are inconsistent challenging establishment of best practices, and there is no self-regulating structure that creates standards for those in the field (Bannier, 2008).

In her report on innovations in developmental mathematics instruction that involved new curriculum without simultaneous faculty support, Merseth (2011) advocated for a network of professionals to improve and innovate in this field as well an infrastructure for research and development to support the innovation. Mellow, Woolis, and Laurillard (2011), who studied the teaching practices of 26 developmental faculty with high success rates, organized instructional themes in an effort to create a developmental pedagogy and an online community of practice to connect faculty. Given the importance of the teacher in the developmental mathematics classroom, the heavy reliance on part-time instructors, and the challenges associated with implementing new models of teaching and learning, developing the facilitator for the redesigned classroom is crucial. Faculty professional development must become part of the planning, implementation, and continuous improvement process associated with any new learning opportunity for college students if the initiative is going to be a successful one.

Project Description

Using the findings from the study of the students in the redesigned developmental mathematics class and the information from the literature reviews, the white paper (see Appendix A) will be distributed to the academic leadership of the college as they consider expanding the number of sections offered, highlighting the importance of understanding student motivation and strategies that encourage success as well as presenting the case for planned, expansive professional development for part-time and full-time faculty. Both administration and faculty should consider the findings and discuss the impact of the program should it expand, considering not only student success data but also practical considerations such as space, facilities, technology, and staffing. The next step may be expansion of the acceleration model which builds in more supports for students and teachers such as implementation of the MLSQ survey with analysis of the results to help instructors understand the motivation of their students. Professional learning communities to encourage more collaboration among the faculty would be an important strategy in a program expansion.

Potential barriers to implementation of an expansion of the redesigned learning opportunity could include computer classroom availability, willingness of teachers to facilitate the classes, and hesitation to change to a less traditional model of teaching and learning. Using data from other institutions that have found success, findings from this study, and early planning for space and staffing could alleviate these concerns. A one-year planning and professional development time period for expansion should be manageable. However, it would take the collaboration of faculty and administration to assess the implications of a large-scale implementation.

Evaluation of the redesigned courses would be measured by student satisfaction surveys, a current practice of the college, and success data including course pass rates as well as success rates for completers continuing in the college-level mathematics courses. This data could be provided by the research area of the college and could be used for making ongoing decisions regarding the offering. This is appropriate because these measures consider the student attitude as well as academic progress. Given the importance of self-efficacy and goal orientation, knowing the level of confidence students have in their ability to learn will help teachers target students who may need more support early. Evidence from the college research office that the new acceleration strategies are working and that students are successful in subsequent college courses will alleviate the concerns of cautious faculty who are reluctant to move to a new model. Ultimately, engaged faculty and administrators will have to educate faculty, academic advisors, and students on this new opportunity until self-paced, accelerated learning redesign becomes college practice.

Project Implications

The implications of expanding this redesigned offering and helping more students succeed are far-reaching. Within the walls of the college, this is an opportunity for more students to move successfully from developmental into college courses and then complete a college credential. College course success is a self-image builder, and college degree completion is a life-changing experience. A credential leads to new job and career opportunities with greater earning potential. Collecting a higher salary builds our communities locally and our economy globally. Education is the gateway to a better life. Completing developmental education is often the first step toward that gateway. Designing new strategies that use current technology will guide our students beyond that first step and into the life they choose, impacting their future and that of our local and global society.

Section 4: Reflections and Conclusions

Introduction

This project was completed in response to the challenge of supporting the success of students during the implementation of an innovative redesign model. The literature reviews focused on factors critical to student success – students' self-efficacy and goal orientations as well as faculty professional development. Section 4 will discuss the quality of this project with respect to scholarship, project development, leadership, and change. The implications for social change and recommendations for future research will be included.

Project Strengths and Limitations

A variety of acceleration strategies to move students through remedial mathematics have become a national trend; at this college, one strategy has become an innovative program. Thus, offering research-based ideas to support the redesign is timely. The white paper is a straightforward approach to offering information and insight. It can be used to identify the local issue, present findings from this study, and summarize current research that supports accelerating developmental students in the redesign model. In the white paper, I support the acceleration strategy, help with stronger buy-in for the growth of the program, and clarify the goals and vocabulary of the program for those less familiar with the strategy. However, because it would likely put off the faculty, I did not cover the overall design of the program nor its implementation. Instead, I focused on the supplemental considerations that may not be as obvious – student self-efficacy and goal orientation as well as faculty professional development. Because some mathematics faculty may be unfamiliar with student motivation theory and goal orientation, they may be willing to learn about these factors and consider how their practices can motivate students. Professional development is a next step in building knowledge and awareness of best practices within a new academic endeavor. Faculty may appreciate support for time to develop improved practices, especially when they are encouraged to do so with respect to innovative programs that they have initiated. In the white paper I have provided strong research-based rationale for administrative support: Professional development requires resources. Some of the research from the literature review can be generalized to support expanded professional development in other areas where academic innovations have been implemented.

A limitation of my study was the low rate of survey participation. Although the paper is grounded in research, the findings regarding self-efficacy and goal orientation were based on a small sample. If I were to do this study again, I would not limit it to new students in an effort to enlarge my sample size. Beyond the small number of participants, faculty may not be swayed by findings and recommendations if they believe that some students would be unsuccessful regardless of the learning environment. Faculty must be willing to (a) embrace new ways of teaching and relating to students, (b) understand how different students learn best, and then (c) develop strategies to meet those needs. Not everyone may be comfortable with such change.

Beyond personnel concerns, the resources for additional computer labs, survey distribution and dissemination of results, and compensation for professional development could create barriers. Colleges are facing budget crises and requests for renovations, technology, and other types of financial support for improvements could be denied because funding is not available.

Recommendations for Alternative Approaches

There are alternate ways to address the challenge of success for developmental mathematics students. Other acceleration strategies discussed in the literature, such as shorter term courses or paired courses, could be implemented. Providing more support for students in traditional courses in terms of professional tutoring or supplemental instruction could also be an alternative. Peer tutors, mentors, and study groups could also make an impact. There are many ideas, but new strategies should be assessed for effectiveness so that limited funding dollars support successful means, especially for disadvantaged students.

Regardless of the strategy, understanding students' self-efficacy and goal orientations and acknowledging faculty professional development as foundational is critical. Understanding the student perspective means recognizing how a learning environment can best facilitate educational success. Organizing and implementing faculty professional development ensures that faculty have an opportunity to share and learn from one another as they contribute to a sense of continuous quality improvement in their work. How institutions or departments choose to assess students' levels of self-efficacy and design faculty professional development can be unique to the situation which will directly affect costs.

Scholarship, Project Development, and Leadership and Change

Throughout the development of this project, I was immersed in the literature involving the student and the teacher in this new model. This innovation is taking place in the community colleges where teaching, rather than research, is the priority. However, the topic has garnered enough interest that there is a small body of newly published research. From my study of this literature I learned about the common problem across the nation regarding lack of success of developmental students and the various strategies being implemented to address that challenge. I also discovered a body of work around student goal orientation and self-efficacy as well as new approaches to faculty development within the specific context of developmental education reform. From my survey research of students in the institution, I learned the importance of crafting data analysis plans that directly address the research questions. Further, the challenge of having students actually complete surveys became very clear. If I were to study this population again, I would try to find another strategy that did not involve a survey approach.

One of the most important aspects of this entire project study process has been my professional growth. I understand scholarly work and strived to demonstrate this in my writing. I used my research, carefully following protocols to ensure all work benefitted human subjects, to guide my project study development in a way that grounded the work within a body of literature and yet remained relevant and responsive meeting today's challenges. The pragmatic approach of my work is reflective of the challenges and practical undertakings of the community college leaders. I want to continue this work to enable more students to find success in college and ultimately in their career field. With such knowledge and scholarship, I may be able to expand upon the opportunities for students who need greatest support. I hope to change the way in which we meet the needs of learners who are most challenged and support the faculty who will implement and sustain the innovations.

Reflections on the Importance of the Work

The importance of studying and attempting to address the problem of the lack of success of developmental mathematics students in community colleges became more obvious as my research progressed. From the literature I learned that more disadvantaged populations are more likely to fail their classes, affecting their futures. I strongly believe that education is the gateway to improved career opportunities, employment, higher wages, and important social concerns around stronger families, less crime, and greater economic security for our communities. Educational opportunities should not focus only a segment of our population. To impact lives across socio-economic, race, gender, and age demographics, we have to consider the students' needs and create the supports for a successful academic experience.

Implications, Applications, and Directions for Future Research

Innovative redesign principles may especially impact academically underprepared students who come to college from economically disadvantaged circumstances. Academic success may translate into a chance at a professional position and improved career opportunities. The success of a diverse population of developmental students may mean improved standards of living and stronger communities. Education is a significant factor in a person's potential for career growth and earning potential. The foundation is laid with success at the start of college that leads to persistence toward completion of a credential.

This study was focused on students' perspectives, the classroom experience, and the role of faculty. There are far-reaching potential social implications that are directly related to the community college mission. First, improved persistence rates of developmental students enrolled in redesigned courses implies greater numbers of students eligible for subsequent college-level courses. More students will be able to continue their education because they are passing classes, and colleges will grow their enrollment to support student success strategies. Second, colleges become better at retaining diverse populations that improve the educational experience for everyone on the campus because learners are supported and successful. Third, early student success and persistence leads to improved completion rates, again elevating students to new opportunities and raising funding for schools facing new state completion funding structures.

Additional research is needed to gauge the success of innovative programs. Also, given that institutions are trying multiple strategies, determining the effects of each of the innovation will be important. It is unlikely that the impact of multiple innovations is additive, so determining the practices that are most effective will be useful data points. Additional study regarding self-efficacy and student success in different educational contexts could also be useful as faculty consider how students are motivated. Learning from the most successful faculty who implement these new programs and developing methods to coach new faculty toward greater success would also serve planning groups well.

Conclusion

There is substantial documentation on the problem of the lack of success of developmental students in college. However, there is no single solution for the many students who fall in this population. Instead there are new and exciting approaches being developed and implemented that require professional study and discussion. There is a growing body of literature around this issue, a national spotlight on the need to address it, and a variety of innovative approaches that are being undertaken. This project study is one that supports the work being accomplished and challenges more researchers and practitioners to learn about and address the issue for the hope and future of our students, our institutions, and our larger communities.

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Appendix A: Improving Student Success in Course Redesign: A White Paper

Executive Summary

Course redesign is being implemented across the nation to address the need to accelerate underprepared students through developmental mathematics. The initial successes achieved via forward-thinking faculty must be sustained and scaled. Capitalizing on the study results correlating intrinsic goal orientations and self-efficacy of learners with success and developing faculty as facilitators of learning will further enhance this successful strategy in terms of retention, academic success, and degree completion.

Introduction

Students entering college academically underprepared in mathematics have been failing and withdrawing at excessive rates (Complete College America, 2012). With a changing workforce requiring education and skills beyond that of a high school graduate, every student who fails to overcome the mathematics prerequisite to college courses is less likely to reach as great earning potential and less likely to impact the community in as significant a way. This is especially true for people who are in low socio-economic and minority groups. Since the community college serves many of these students, the faculty must be prepared to instruct and support these learners in new ways, and the administration must support the professional development of faculty as they implement new methods of course design and instruction based on their understanding of students' goal orientations and perceptions regarding self-efficacy.

The Problem

Many community colleges have a high enrollment in precollege level or developmental math courses but a low success rate (AACC, 2012; Complete College America, 2012; Sherer & Grunow, 2010). Academically underprepared students enter the community college with hope only to repeat a pattern of failure from high school that led to their entry as developmental students. There are many factors contributing to this problem, such as poor academic history, family and work obligations, and lack of understanding of college processes and procedures which are often characteristics attributed to academically underprepared, at-risk, first-generation community college students (Bulger & Watson, 2006).

According to the AACC (2012), two-year institutions have continued to admit greater numbers of underprepared students. The current practices in developmental education have been ineffective for the poorly performing recent high school graduates and for the returning adults facing the demands of a changing workforce (Daiek, Dixon, & Talbert, 2012). In a recent study by CCA (2012), remediation programs were identified as the bridge to nowhere. Most of the 1.7 million students who annually start college in remedial programs will not graduate, and, in fact, less than 10% of students beginning college in remediation will actually graduate from community college in three years (Complete College America, 2012). Though graduation rates are low overall, the success rate is even lower for minorities who begin in these precollege level courses (Complete College America, 2012). African-American and Hispanic students were less successful and often had greater numbers of at-risk factors including first-time college student status, academic under-preparedness, financial need, full-time work, family responsibilities, and cultural challenges (Greene, Marti, & McClenney, 2008). With respect to remediation in college, students were more likely to need assistance with mathematics than English, and most of the students forced to begin in developmental mathematics were not successfully completing their courses (Le, Rogers, & Santos, 2011).

Due to the increasing focus on college completion and the lack of success in remedial programs, various acceleration strategies are being studied (Venezia & Hughes, 2013). Student motivation is a consideration when designing and implementing a program for the underprepared college students beginning their studies in developmental classes. A mastery learning program that self-paced work, focusing on improving individual performance rather than trying to outperform their peers, is one method that can support these students; a mastery goal orientation focuses students on improving upon past performance, allowing them to concentrate on their personal goals and mastery of course material rather than competing with others for a grade (Poortvliet & Darnon, 2010). The beliefs a student has about their abilities within the learning environment may be more important to their success than other factors such as demographics and past experiences (Wheeler & Montgomery, 2009).

Pintrich, Smith, Garcia, and McKeachie (1991) authored the manual designed to support implementation of the Motivated Strategies for Learning Questionnaire (MSLQ) which assesses college students' goal orientations and learning strategies. They explained that expectation of success relates to performance and that "self-efficacy is a self-appraisal of one's ability to master a task" (Pintrich et al., 1991, p. 13). Self-efficacy is faith in the capacity to successfully complete a task as well as the confidence to do so. Of the 81 items on the MSLQ, the 31 items involving motivation were used in this study along with added demographic questions. Scaled MSLQ items are broken down into subscales. Two expectancy-related subscales measure perceptions about self-efficacy and learning. Three value belief subscales measure intrinsic goal orientation focusing on mastery and learning, extrinsic goal orientation focusing on grades and external approval, and task value beliefs which are judgments about the importance and practicality of the course content. Finally, the third motivational scale revolves around affect or test anxiety which hones in on students' worry about taking tests (Pintrich et al., 1993).

Self-efficacy is a personal judgement or belief regarding the ability to complete a task and the confidence in the skills necessary to do so.

Using the MSLQ survey with new students in the redesigned math course at the college during Fall 2014 semester, there was a positive relationship between self-efficacy and success as well as intrinsic goal orientation and success. Self-efficacy and success had the strongest relationship, though the sample size limits the generalizability of the findings. Even so, students' self-appraisals of their capacity to accomplish a learning goal and their confidence to execute the skill in the classroom may be critical to success. Students in a self-paced learning environment, with a learning coach in the classroom, have the opportunity to experience success in modules until they complete the series and ultimately find success in one or more courses within the semester. Offering an individualized learning opportunity to students who come to college underprepared academically undergirds the learning experience with a foundation for success regardless of the progress of everyone else in the room. This course may help students learn to expect that they will be successful in mathematics, changing the question from "will I finish?" to "when will I finish?"

The Challenge of Scale

Scaling up the effective practice associated with the redesigned course includes the challenge of resources and facilities planning as well as faculty training and development. The need to create classrooms with appropriate technology and design for this initiative requires collaborative planning that is likely common when creating learning spaces for other unique programs at the community college; however, the planning for the development of faculty within this scenario is just as critical and probably more complex an undertaking.

The teacher is a critical factor in student success, especially for students who face the challenge of placement into precollege level course work. In Wheeler and Montgomery's (2009) study, students they identified as active, skeptical, or confident all indicated that they perceived the teacher as the key element for their success in developmental mathematics courses. Developmental students face one or more semesters of course work that does not count toward the degree and may be pessimistic about their performance based on their past experiences. Offering a new model of teaching and learning to accelerate student learning must be supported by careful recruiting and training of instructors. In a qualitative study of 20 developmental mathematics instructors, of whom twelve had experience teaching in a redesigned, accelerated program, Cafarella (2014) indicated that instructor comfort should be considered when implementing new strategies and suggested conducting future correlational studies that measure the relationship between instructor comfort level with a particular pedagogical approach and overall student success. According to one study of an accelerated, modular program for developmental students at Tarrant County College, the faculty identified as more well-suited to the self-paced environment were organized, knew students' names early in the semester, and were flexible (Fong & Visher, 2013).

Given the new role of the teacher as facilitator in the redesigned model and the wariness of their students, the importance of professional development around new teaching pedagogy and strategies must be a priority. Professional development and collaboration will ensure that faculty have the teaching support they require and that students have the learning support they need. In a study of acceleration programs that included mathematics at the Community College of Denver, English at Chabot College, and writing at Baltimore County, Jaggars, Hodara, Cho, and Xu (2015) found that there were difficulties scaling up successful strategies. They indicated that a stable, collaborative faculty professional development plan would be needed to sustain a rigorous curriculum while meeting students' non-academic needs (Jaggars et al., 2015). Establishing and sustaining professional development, as well as managing obstacles such as facilities, technology, and staffing that may threaten scaling up programs, may require administrative support as well as solid faculty collaboratives.

The redesigned program classroom is like a one-room schoolhouse model, which makes one-on-one faculty conversations with the coordinator, training sessions, adjacent class labs for new and veteran faculty, and leadership fostering consistency in classroom practices important for professional development (Fong & Visher, 2013). In a study of nine institutions in Texas, the most successful professional development for developmental instructors of innovative programs was perceived to occur at campuses where committees customized the opportunities to the specific needs of the campus (Booth et al., 2014). Though not every institution highlights professional development as a critical component to success, institutions like Daytona State have standardized their program with consistent instruction, customized practice work, and standardized daily schedules designed to have most work completed in the classroom (Ajose et al., 2011). With a large adjunct contingent, such a carefully designed program of this nature can support the work of the teachers if professional development is not easily delivered.

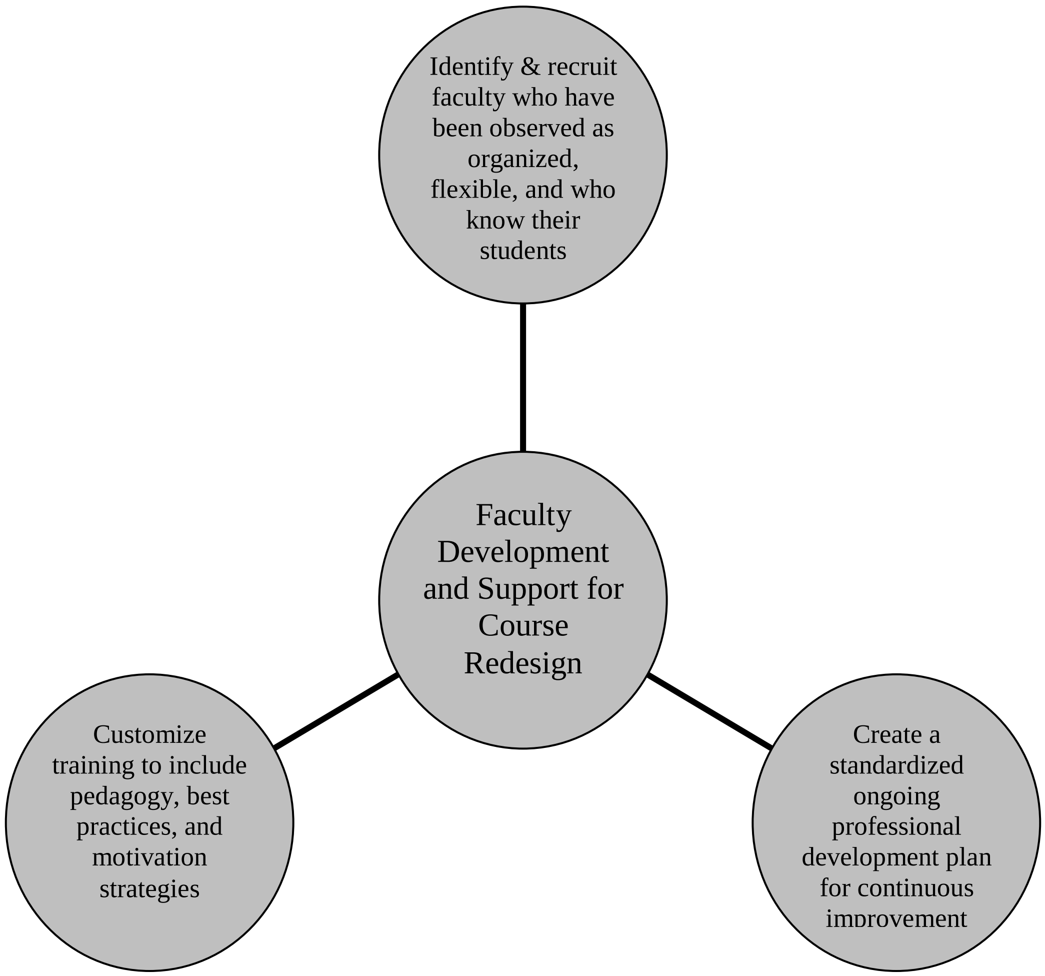
The climate created by the teacher in the classroom is critical to the foundation of student success. Peters (2013) completed a study of 15 college algebra instructors and 326 of their students to better understand the relationships among classroom climate developed by the faculty, students' self-efficacy, and academic achievement. She found that learners demonstrating greater self-efficacy in mathematics were also higher achieving. Peters also found that the classroom climate alone did not predict success. According to her interpretation, "it would appear that the influence of classroom climate on mathematics achievement is being mediated by student mathematics self-efficacy" (Peters, 2013, p. 475), and faculty should engage in professional development training on strategies to learn how to create a classroom climate that enhances students' levels of self-efficacy.

There is little doubt that educators recognize the value of professional development. However, that does not mean that strong programs, small or large, have become a priority. To support access and completion, colleges will have to invest in and cultivate talent of diverse faculty, structuring meaningful professional learning opportunities that clearly connect to outcomes (Robinson, Byrd, Louis, & Bonner, 2013). Considering developmental education as a field, there is still a lot to be done to address the progress of developmental educators toward professionalization. Across the country, there are few opportunities to earn a degree or credential in the field, practitioners are more dedicated to teaching than research so they are less likely to publish and share findings, organizational structures are inconsistent which challenges establishment of best practices, and there is no self-regulating structure that creates standards for those in the field (Bannier, 2008). In her report on innovations in developmental mathematics instruction that involved new curriculum without simultaneous faculty support, Merseth (2011) advocated for a network of professionals to improve and innovate in this field as well an infrastructure for research and development to support the innovation. Mellow, Woolis, and Laurillard (2011), who studied the teaching practices of 26 developmental faculty with high success rates, organized instructional themes in an effort to create a developmental pedagogy and an online community of practice to connect faculty. Given the importance of the teacher in the developmental mathematics classroom, the heavy reliance on part-time instructors, and the challenges associated with implementing new models of teaching and learning, developing the facilitator for the redesigned classroom is crucial. Faculty professional development must become part of the planning, implementation, and continuous improvement process associated with any new learning opportunity for college students. Understanding who the instructors are who have the highest student success rates and sharing their best practice strategies will do a lot to encourage and support the growing number of faculty recruits who have to implement this innovation as it is scaled up to serve greater numbers of students.

The Solution

It is clear that the instructor is critical to students' success in a redesigned course. To improve the likelihood of success at scale, the following priorities are recommended: identification and recruitment of faculty who are considered organized, flexible, and connected with their students; customization of training to emphasize pedagogy, best practices, and motivational strategies; creation of ongoing regular professional development plan for continuous improvement as success data is reviewed.

Faculty Development for Course Redesign



These three priorities should not be overshadowed by the general practices around recruiting and developing faculty in general. Due to the increasing focus on college completion and the lack of success in remedial programs, acceleration strategies are being studied (Venezia & Hughes, 2013) and new professional development strategies must support the initiatives. One theme that emerged from a two-year, cross-site evaluation of five community colleges and four universities across Texas directed by The Public Policy Research Institute at Texas A & M University was curriculum design and instructional strategies. Reviewing a variety of acceleration measures such as shortened terms, self-paced options, and blended courses, successfully accelerating completion is documented; however, the report states that "it is apparent that the accelerated options do not work for students who lack a higher level of commitment and motivation" (Booth et al., 2014, p. 4). Since traditional developmental education practices appear unsuccessful, developing motivational strategies to help students find success may be part of the answer.

Student motivation must be a consideration when designing and implementing a program for the underprepared college students beginning their studies in developmental classes. A mastery learning program that allows self-paced experiences, focusing on improving individual performance rather than trying to outperform their peers, is one method that can support these students; a mastery goal orientation focuses students on improving upon past performance, allowing them to concentrate on their personal goals and mastery of course material rather than competing with others for a grade (Poortvliet & Darnon, 2010). The beliefs a

The beliefs a student has about their abilities within the learning environment may be more important to their success than other factors such as demographics and past experiences.

student has about their abilities within the learning environment may be more important to their success than other factors such as demographics and past experiences (Wheeler & Montgomery, 2009). Faculty can capitalize on this knowledge.

Serving the At-Risk Student

The community college attracts a diverse population of students, including young and older learners. In a Community College Research Center (2013) report, Crosta revealed findings from a 6-year analysis of 14,429 first-time community college students' transcripts indicating that 28% never returned to the same college after the first term and that the most notable difference demographically between early dropouts who did not return after one term and early persisters enrolled in at least two of the first four terms of enrollment was age – the average beginning age was 27 for early dropouts and 22 for early persisters. These early dropouts were 5% more likely than the early persisters to place into all developmental content areas including reading, writing, and mathematics and to be at lower levels of developmental placements in these subjects (Crosta, 2013). To consider the impact of age and self-confidence, in a study of 60 traditional-age (under 25 years old) and 166 older (over 25 years old) undergraduate students, Jameson and Fusco (2014) learned that the older students indicated a lower sense of self-efficacy and greater math anxiety than the traditional students. The negative self-perceptions of the adult learner in mathematics can create a barrier to their success. Jameson and Fusco (2014) emphasized addressing their needs in a variety of ways such as connecting them with campus resources, finding them a peer mentor, and enrolling them in courses with mastery learning so they experience success as well as stressing learning rather than performance. These strategies support the intrinsic goal orientation and the growth of self-efficacy and confidence through students' successful progress through each step or module associated with mastery learning.

Students are motivated by their goals. The Attitudes Toward Math Inventory survey was distributed to 233 students enrolled in developmental algebra in a large urban community college to study affective characteristics and course success. A positive correlation between the final exam score and motivation was statistically significant (Guy, Cornick, & Beckford, 2015). Students' levels of self-efficacy affect their motivation. Self-efficacy contributes to setting goals, expending effort to reach goals, persevering when facing obstacles, and beginning again in the face of failure. Students who are not deemed ready for college math do not have to be made to feel like their goals are unachievable. Accelerated opportunities to remediate can address poor or inaccurate placement and set students up for success.

It's important to understand students' perspectives as they enter college. In his survey of 82 students regarding their perceptions on placement testing into precollege mathematics classes at a community college in the Southwest, Goeller (2013) found that students who agreed with their placement results of low-level remedial mathematics also shared their wish for faster-paced courses. Though some may associate lack of ability with poor completion rates for students testing in low-level remedial math, acceleration models have proven that "students in redesigned, accelerated remediation have higher completion rates of college-level courses, including students who score low on standardized placement tests" (Hern & Snell, 2014, p. 30). At Utah Valley University, students who chose to enroll in Math Pass, an accelerated, technology-enhanced remedial class, were able to successfully accelerate through remedial course concepts and were more apt than those who registered in the conventional remedial series to enroll in and be successful in subsequent math courses (Brinkerhoff & Sorenson, 2015). The students enrolled in the Community College of Denver's accelerated developmental mathematics FastStart program were more likely than their peers to complete the college math course within three years (Jaggars, Hodara, Cho, & Xu, 2015). Also, in a comparison study of 78 students in traditional remediation and 124 students in an accelerated, mastery-based, redesigned course in a community college in California, accelerated program participants were more likely to advance to a college credit math course regardless of gender, PELL status, or ethnicity and maintained a higher GPA in the math subject area (Silverman & Seidman, 2011). Developmental programs that accelerate students through the sequence may help students overcome some of the factors that impede student progress such as placement test errors, instruction and curriculum that students find lack relevance, and external pulls like childcare and job responsibilities (Jaggars et al., 2015).

One institution that has observed very positive results over 10 years by moving to a redesigned, modular, self-paced developmental mathematics classroom is Daytona State in Florida. They believe the key elements to success of their accelerated program include committed leaders with an inclusive philosophy, a consistent curricula and course delivery by their adjuncts and full-time faculty, a faculty-driven program, and an expansive supplemental instruction program created in an academic support center (Ajose, Bhatt, & Kaur, 2011). Further, because their program considers their students' psychological, emotional, and life situations, there are half-semester classes that have more meeting days per week to shorten their number of weeks until eligibility for the college-course, the classes are modularized to allow students to learn topics and move forward without waiting for everyone else, and the end of course is scheduled before the long breaks to prevent truancy and attrition after the break in consideration of a local festival that meant brief but lucrative employment. According to the report from Ajose et al. (2011), these changes have led to increased completion rates of more than 20%.

Understanding the students entering developmental courses in community colleges will help with program design and support for their success. Navarro (2012) described the underprepared students who come from a life in poverty. Using the data from over 2,400 students, the risk factors that made these students vulnerable were "underperforming schools, unsafe neighborhoods, parental worries about money, drugs, gangs, arrests/convictions, teenage pregnancy, and violence – with its attendant post-traumatic stress disorder"(Navarro, 2012, p. 45). Further, describing risk factors as students' external experiences and vulnerability as students' internal sense of self that comes from their experiences and environment, Navarro explained that those who were not encouraged toward college were more likely to have their confidence undermined. Finding ways to reestablish that self-confidence by addressing

Reestablish self-confidence and address vulnerabilities and needs by accelerating progress to college course work, connecting students with support services, and providing direction for identified personal and family needs.

vulnerabilities and needs includes accelerating progress to college course work, connecting students with support services, and providing direction for identified personal and family needs. Without addressing the social challenges, academic success will not be a priority and will not be achieved.

There are many reasons institutions of higher education should prepare for and invest in the academic programming for the growing numbers of developmental students entering the college. First, the mission of the community college is one of access. An open access institution that admits everyone, including first generation students, may be able to influence students to stay in college by better understanding intrinsic and extrinsic factors that motivate them (Petty, 2014). Accepting students' dollars for tuition and fees implies an obligation to meet their needs. Challenging the work being accomplished, Cross (1971) explained that it was the progress, not merely access, in higher education that had to be studied, and her talk of the *open* door to higher education became more a question of the *revolving* door for the unsupported students in the community college who did not persevere. The question of the balance between access and success remains a current one decades later as leaders in the field continue to study and discuss the issue (Casazza & Bauer, 2006; Pierce, 2015) and state legislatures develop new models of success funding based on completion models (Bers & Schuetz, 2014; Hillman, Tandberg, & Gross, 2014).

Beyond what some may call the moral obligation to serve these underprepared students, there are also financial benefits to doing so. There is an economic benefit to the institution when students persist and meet their academic goals that comes from tuition, fees, and state subsidies as well as any performance funding for milestones such as completion of developmental courses and progress to degree. There is also a benefit to society should students persist and graduate. According to one study in Hillsborough Community College, there is a positive economic impact on the community due to increasing numbers of graduates including "better health, higher productivity, higher earnings, reduced crime, and other societal factors" (Gallard, Albritton, & Morgan, 2010, p. 14). And, individually, a post-secondary degree opens more employment opportunities, which often lead to continuing education. With such moral, financial, and social considerations, planning and implementing programs that align with the needs, abilities, and goal orientations of students must be a priority.

Conclusion

Though acceleration strategies and course redesign show documented success, maintaining and expanding these gains in the challenging area of developmental education will continue to be a trial if faculty recruitment and development are not also reconsidered. The burden of understanding how to motivate students and deliver new methods to address the remediation crisis is accepted by the community college with every underprepared student accepted. Addressing the challenge will take the collective thinking, planning, assessment, and improvement strategies designed by the faculty and supported by the administration of the college. Faculty may be the most critical factor the college introduces in the student success initiative, so their collaboration, leadership, and ongoing professional development remain essential to the initial and ongoing success of any academic program.

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Appendix B: MSLQ Survey Questions 1-31

1. In a class like this, I prefer course material that really challenges me so I can learn new things.
2. If I study in appropriate ways, then I will be able to learn the material in this course.
3. When I take a test I think about how poorly I am doing compared with other students.
4. I think I will be able to use what I learn in this course in other courses.
5. I believe I will receive an excellent grade in this class.
6. I'm certain I can understand the most difficult material presented in the readings for this course.
7. Getting a good grade in this class is the most satisfying thing for me right now.
8. When I take a test I think about items on other parts of the test I can't answer.
9. If is my own fault if I don't learn the material in this course.
10. It is important for me to learn the course material in this class.
11. The most important thing for me right now is improving my overall grade point average, so my main concern in this class is getting a good grade.
12. I'm confident I can understand the basic concepts taught in this course.
13. If I can, I want to get better grades in this class than most of the other students.
14. When I take tests I think of the consequences of failing.

15. I'm confident I can understand the most complex material presented by the instructor in this course.
16. In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.
17. I am very interested in the content area of this course.
18. If I try hard enough, then I will understand the course material.
19. I have an uneasy, upset feeling when taking an exam.
20. I'm confident I can do an excellent job on the assignments and tests in this course.
21. I expect to do well in this class.
22. The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.
23. I think the course material in this class is useful for me to learn.
24. When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.
25. If I don't understand the course material, it is because I didn't try hard enough.
26. I like the subject matter of this course.
27. Understanding the subject matter of this course is very important to me.
28. I feel my heart beating fast when I take an exam.
29. I'm certain I can master the skills being taught in this class.
30. I want to do well in this class because it is important to show my ability to my family, friends, employer, or others.

31. Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.

Intrinsic Goal Orientation Scale Questions: 1, 16, 22, and 24

Extrinsic Goal Orientation Scale Questions: 7, 11, 13, and 30

Task Value Scale Questions: 4, 10, 17, 23, 26, and 27

Control of Learning Belief Scale Questions: 2, 9, 18, and 25

Self-Efficacy for Learning and Performance Scale Questions: 5, 6, 12, 15, 20, 21, 29, and 31

Test Anxiety Scale Questions: 3, 8, 14, 19, and 28