INSIDE THE COMMUNITY COLLEGE DEVELOPMENTAL MATH CLASSROOM: UNDERSTANDING DIFFERENCES BETWEEN FACULTY AND STUDENTS' ATTITUDES AND EXPERIENCES

A Dissertation Presented to the
Faculty of the Department of the College of Education
University of Houston

In Partial Fulfillment
Of the Requirements for the Degree

Doctor of Philosophy

By

Patricia A. Rehak

August 2015

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August 2015

Dedication

I dedicate this work and all my collegiate endeavors to my parents, Robert F. Parker and Shirley A. Parker. Their unwavering love, encouragement and support has been a beacon in all of my life's journeys. Thank you for instilling a love for learning and life in me. I also dedicate this journey to David and Crystal Rehak, Paul and Kelly Rehak, Mary Rehak, Kinsley Rehak, Parker Rehak and Peyton Rehak. They provide meaning and reason for all I do. To Dr. Tyler G. Pate, who was an incredible inspiration, it's done!

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If you have been lucky enough to have a dinner party at Dr. Alexander Schilt's house, then you are truly a privileged person. I am one of those people. Thank you Dr. Schilt for graciously opening your home and your life to help develop the leader in each of us, and establish a sense of comradery amongst us. I am especially thankful you were there for me with compassion, words of wisdom and encouragement during an unexpected time of change and transition. Yes, it is grit.

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Abstract

This study provides a better understanding of how student and faculty perceive the developmental math classroom experience and the impact on students' ability to successfully complete developmental math courses. A significant contribution of the study is the identification of a positive correlation between students' attitudes and perceptions of the classroom environment and successful course completion. A second major contribution is a detailed description of pedagogical strategies and classroom leadership behaviors exhibited by developmental math faculty who do, and do not, have high student pass rates. The three research questions for this study were:

1. What is the relationship between students' attitudes and perceptions of their developmental math classroom experience and their likelihood for successful course completion?

2. To what extent are student and faculty attitudes and perceptions of the developmental math classroom learning environment congruent?

3. What are the pedagogical strategies and classroom leadership behaviors exhibited by developmental math faculty who do, and do not, have high student pass rates in these courses?

Two theoretical frameworks; Goal Theory Model of Achievement Motivation and Transformational Leadership; were used to guide this research. This mixed methods study was a case study of developmental math students and faculty from a medium sized rural community college in Texas, enrolled and teaching in the fall 2013. The sample included 661students enrolled in developmental math during the fall 2013 semester. There were a total of 17 developmental math instructors, of which three were employed full time, and 14 were employed part time. Quantitative data was collected from all 17 faculty and seven of these faculty were interviewed about the instructional practices they use when teaching developmental math students.

A quantitative analysis was conducted of secondary course evaluation and student success data. A factor analysis was first conducted and reliability established for the course evaluation data. Next, a Pearson product moment r correlation was conducted in to determine the correlation between student perception and student success rates. The qualitative methods employed included 7 interviews (2 full time and 5 part time) with recruited developmental math faculty. Transcribed interview data were organized by thematic data analysis using a deductive process (Creswell, 2008)

The Pearson product-moment r correlation conducted in this study found moderate positive correlations, $r(14) = .64$, $p<.01$ and $r(14) = .51$, $p=.04$, between the two factors extracted from the course evaluation data and student success rates. Primary themes emerging from the qualitative analysis included: Meeting Students' Individual Needs, Facilitating Student Learning and Acquisition of Skills, and Motivating and Inspiring Students. This extends the work of the MET Project to community colleges. The MET Project established that well-crafted student surveys have potential to inform professional development programs and can be used, along with other relevant data, to evaluate teacher effectiveness (Kane & Cantrell, 2010). This study suggests that student success rates increased when faculty demonstrated behaviors associated with transformational leadership and a mastery goal orientation. Recommendations for policy and practice are provided to assist in the rigorous reform efforts needed to help students in developmental math education persist to completion.

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Chapter I

Introduction

There has been a concerted effort nationally, and at state and local levels, to address student success and completion problems facing American higher education today. As reported in “A Nation Accountable Twenty-five Years after a Nation at Risk” (U.S. Department of Education, 2008), Americans are now informed and understand the extent of the widespread problems associated with access and success. However, America continues to fall farther behind in attainment of essential higher education completion outcomes (DeAngelo, Franke, Hurtado, Pryor, & Tran, 2011). In “A Test of Leadership Charting the Future of U.S. Higher Education A Report of the Commission Appointed by Secretary of Education Margaret Spellings” (2006), the commission urged all sectors of the nation to give immediate attention to improving the system of higher education.

Augmenting the problem is the fact that increasing numbers of students are leaving secondary education underprepared, and not ready for the rigors of higher education. Many students find themselves unable to demonstrate academic preparedness and the majority enter a two-year, open-enrollment community college. These students often lack college readiness skills necessary to succeed and persist (Strong American Schools, 2008). According to Kay McClenney, Director for the Community College Center for Student Engagement, “Community colleges currently are experiencing perhaps the highest expectations and the greatest challenges in their history” (Center for Community College Engagement, 2012, p. i).

One of the major obstacles to student success and completion is the lack of college readiness. Bound, Lovenheim and Turner (2010) compared high school classes of 1972 and 1992. Their research demonstrates that declines in student readiness, along with other changing higher education variables (associated with increased enrollments in underfunded community colleges and non-top universities), explains much of the decline in college completion rates. Students lacking college readiness must typically enroll in developmental or remedial education with the hope that developmental coursework will close the readiness gap. However, according to a report by Complete College America (2012) remediation is a "broken system."

Developmental mathematics, specifically, has become a primary barrier for many students wishing to complete a post-secondary degree (Achieving the Dream, 2006; Bailey, 2009; Stigler, Givvin, & Thompson, 2010). It also has significant financial implications for students and for community colleges. Strong American Schools (2008) found in a recent study that the annual cost of remediation to community colleges is $1.9-2.3 billion dollars in America. Not only are there significant financial costs, there are significant costs to student completion rates. Alarmingly, students who are unsuccessful in their first developmental mathematics course are not likely to persist to the second year (Fike & Fike, 2008). A study by Bailey, Jeong and Cho (2010) found that only 33% of students referred to developmental math complete the developmental math sequence within a three-year period. More devastating was the finding that if there are three or more courses in the developmental math sequence, three-year completion rates drop to 17%.

National initiatives, such as Lumina Foundation's Achieving the Dream (ATD), have expended significant resources towards helping increase success among students in developmental coursework. However, a recent report (Mayer, Cerna, Cullinan, Fong, Rutschow & Jenkins, 2014) on the progress made by ATD indicates that little progress towards improving developmental math outcomes, if any, has been made in the 200 colleges participating nationally, even after a decade of work. According to Bailey and Alfonso (2005), it is vital that research about, and at, community colleges be an integral part of strategies to increase student success.

Jacobs (2012) reported that more than a dozen states have restricted funding for developmental education at four-year institutions since 2007. As of 2014, Ohio will no longer fund developmental education at four-year institutions. Thus, students placing in developmental education in those states will be referred to the community college. Bahr (2008) notes that it has been argued that taxes should not be used to pay for students to learn material that they should have learned in prior educational experiences. Many states have started imposing funding formulas related to developmental education (Weisbrod, Ballou & Asch, 2008).

Recently, an Alliance of States, orchestrated by Complete College America, was formed to strategically and collaboratively join forces to address these startling success issues, including those associated with developmental education. The governor of Texas, in partnership with colleges and universities of Texas, was among the first state governors to join the Alliance. Alliance members have agreed to the following three actions. Completion goals must be set, states must collect and report common measures of progress and agree to develop action plans and move key policy levers, such as providing remediation as a co-requisite, not a prerequisite (Complete College America, n.d.). Texas has embraced these three actions required of alliance members.

In the fall 2011, 53.7% of 194,106 first time in college students entering higher education in Texas were not academically prepared to enter college level coursework. Community college students comprised 87% of those students statewide (THECB, 2013). Community colleges in Texas are legally required to provide open access and must provide developmental education opportunities for underprepared students. Of the 121,403 students enrolling at community colleges in fall 2010, 54.6% required at least one developmental education course. Only 33% of 26,662 students in the fall 2008 cohort required to take developmental education in reading successfully completed a first college-level course in a related field by fall 2012, compared to 31% of 19,277 students in writing. What is even more alarming is that there were 41,893 students lacking developmental math readiness in fall 2008 and only 13% of these students completed a first college-level course in a related field by fall 2012 (THECB, 2012a).

In response to the continued dismal student success rates in Texas developmental education, the Texas Congress recently approved a restructuring of curriculum and programming of developmental education and adult basic education. In support of the Complete College American Alliance agenda, Texas has also invested and committed to an innovation in math developmental education known as the New Mathways project. This project is facilitated by The Charles A Dana Center at the University of Texas, Austin (The Charles A. Dana Center at The University of Texas at Austin, 2015). The Dana Center's collaboration with the Texas Association of Community Colleges (TACC) resulted in identification and adoption of the following four guiding principles (p.1):

1. Multiple pathways with relevant and challenging mathematics content aligned to specific fields of study.

2. Acceleration that allows students to complete a college-level math course more quickly than in the traditional developmental math sequence.

3. Intentional use of strategies to help students develop skills as learners.

4. Curriculum design and pedagogy based on proven practice.

This project requires a systemic shift in culture and practice at the district level, institutional level and most importantly at the individual course level.

If institutional leaders have any hope of implementing change initiatives and changes in culture, such as required to successfully implement and sustain the Mathways Initiative, it will require that all institutional members share the vision. Effective leaders have an ability to create a shared vision that is clearly articulated throughout an organization and align the energy and work of followers (Baker, 1992; Gardner, 1995; Hesselbein, Goldsmith, & Beckhard, 1996). Yet, ineffective leadership remains a central obstacle to meeting completion agendas (McPhail, 2011). Effective leadership is needed at all levels of the higher education organization, but most importantly effective leadership is needed in the classroom, if America is to rise above the current abyss of higher education today, especially in regards to developmental education. A case study examining successful interventions in Achieving the Dream colleges, Zachry (2008) found that faculty leadership was instrumental to the successful development and implementation of change initiatives. It is critical that developmental education faculty first share the vision of student success and completion if they are to implement and sustain effective leadership strategies within the classroom environment needed to motivate and energize the growing numbers of students in remediation.

Yet, there is a gap in the literature in understanding leadership characteristics of successful community college classroom leaders. Even less is known about specific leadership needed in developmental math and how it relates to student success in developmental mathematics. According to Bahr (2008) “Identifying methods of increasing the successful remediation in mathematics should be a topic of central concern to all stakeholders in the community college system” (p.446). Prior research by Wheeler and Montgomery (2009) found that the teacher is viewed by students as the most important factor in learning mathematics. Yet, data understanding the practices occurring in the developmental math classroom have not typically been collected and analyzed. Currently, the only types of data being collected in the Texas Mathways project at the course level are quantitative data such as course grades and completion rates. All the reform initiatives associated with the New Mathways Project include professional development that calls for course and pedagogy redesign based on proven practice. What is missing is clear definition and understanding of successful implementation and sustainability of practices occurring in the classroom.

Are the innovations generating the types of learning experiences that research has proven are needed to effect real changes in student success outcomes (see House, 1995b; Kuh, 2008; Stage & Kloosterman, 1995; Thomas & Higbee, 2000; Wheat, Tunnell, & Munday, 1991)? Grubb and Cox (2005) note that there is also a gap in the literature in regards to understanding how students think about their education. An even greater gap exists in regards to understanding the pedagogical strategies and classroom leadership behaviors of successful developmental math faculty with high pass rates in developmental math courses. Yet, accredited community colleges routinely conduct course evaluations as part of ongoing reaccreditation requirements (Southern Association Colleges and Schools Commission on Colleges, 2012). Course evaluations, which are typically administered at the conclusion of the semester, have potential to capture a wealth of useful information about the student experience and classroom practices, often including perceptions of student engagement and pedagogical strategies that are instrumental in shaping student's performance in a developmental math course (Bradley, Kish, Krudwig, Williams & Wooden, 2002; Simpson, Stahl, & Francis, 2004). This routine assessment practice has potential to provide insight into the implementation of change initiatives. Unfortunately, these data are often used primarily for summative evaluation purposes or for accreditation, and are often administered late in the semester, not capturing all the student population.

Purpose of the Study

The purpose of this study was to provide a better understanding of how student and faculty perceive the developmental math classroom experience and the potential impact on students' ability to successfully complete these courses. Research has indicated that is important when evaluating programs to assess the experience of students, as key stakeholders, in order to develop responsive formative improvement plans (Bradley, et al., 2002; Simpson, Stahl, & Francis, 2004). Formative evaluation is a process that is used to make immediate responsive changes based on an evaluation of relevant data. Research has demonstrated that this type of evaluation contributes to successful developmental education outcomes (Boylan, Bliss, & Bonham, 1997; McCabe, 2000).

However, only examining student attitudes and experiences may limit the ability to understand all contextual conditions associated with the developmental math classroom experience. Understanding instructor attitudes and experiences, is also critically important to understanding the developmental math classroom experience. Grubb (2001) recommends using an eclectic approach to understanding what works and what doesn't in developmental education. He refers to this as a "Pandora's box" approach. This approach includes observing and describing classroom practices, in remedial courses in order to understand the practices. The use of a combination of qualitative, interview-based studies and quantitative studies is also recommended. The mixed-method research design and analysis used in this study is intended to help faculty and administrators understand the student and instructor experience at the course level. This provides an opportunity to develop and implement formative assessment processes with potential to result in sustainable implementation of successful change practices. The guiding research questions for this study were:

1. What is the relationship between students' attitudes and perceptions of their developmental math classroom experience and their likelihood for successful course completion?
2. To what extent are student and faculty attitudes and perceptions of the developmental math classroom learning environment congruent?
3. What are the pedagogical strategies and classroom leadership behaviors exhibited by developmental math faculty who do, and do not, have high student pass rates in these courses?

Significance of this Study

Understanding the teacher student relationship has potential to directly impact student success in developmental math education. Research has indicated that effective leaders in the classroom can foster student motivation, and goal oriented behavior (Bass & Riggio, 2006 & Burns, 1978). Students spending time in developmental math education accumulate debt, lose time to degree attainment and are delayed in entering the workforce. It is critical that innovative plans of action that move research into practice more effectively at the institutional and at the course level be identified. Equally important, is the identification of ways to implement and sustain innovations and effective classroom leadership for developmental education.

This study was designed to extend current research on developmental mathematics education, by identifying faculty pedagogical practices and leadership behaviors that are associated with student success. In addition, the study documents processes that faculty and administrators can use to understand student and faculty attitudes in a developmental math classroom. Understanding these faculty behaviors, can lead to the development of targeted improvement plans in the classroom, and has great potential to improve developmental math education at the classroom level.

Definition of Key Terms

In order to operationally define key terms used in this dissertation and increase reader understanding, it is necessary to provide definitions of each, due to the wide disparity and use of terms in the broad literature base surrounding developmental education. Terms most ambiguous in the literature and most relevant to the study have been defined in this section. These definitions will be operationalized and situated within the context provided by the Texas Education Code; which regulates all Texas public higher education institutions, and prescribes practices associated with developmental education in Texas.

College Readiness. The term college ready is quite ambiguous in the literature and the definition and criteria for it varies from state to state, college to college and program to program (Bailey, Jeong & Cho, 2010). According to Byrd and Macdonald (2005) it is very difficult to define because of the complexity of issues related to the phenomenon of college readiness. Typically it is described in cognitive and emotional terms. For example, it may be an assessment of students' academic and intellectual skills. Or it could include an assessment of emotional aptitude, and/or ability to socially adjust to a college environment (ACT, 2011; Byrd & Macdonald, 2005; Conley, 2008).

The Texas Administrative Code, Title 19, Part 1, Chapter 4, Subchapter H, Rule 4.173 defines a college ready student as one who has the knowledge and skills necessary to begin entry-level college courses with a reasonable likelihood of success and does not require developmental education. According to the Texas Education Code, Sec. 51.3062, higher education institutions in Texas must assess the academic skills of entering students to determine their college-readiness. The Texas legislation provides for the use of multiple instruments for the assessment of college readiness. Institutions are required to advise students, as to the best academic pathway based on the results of the assessment, which may require that they enroll in developmental education.

In 2009, the state of Texas assembled a vertical team of secondary and postsecondary faculty to identify what students must know and be able to do to succeed in entry-level courses in higher education (THECB, 2009). The work of the vertical team resulted in a publication known as the *Texas College and Career Readiness Standards*. Standards have been developed for colleges and universities to use as guidelines for what college ready means in Texas for English/language arts, mathematics, science, social studies and cross-disciplinary standards. The implication is that students not mastering skills described by the vertical teams may not be college ready. The Texas definition of college readiness was used for this study to understand the placement of students in developmental math courses. The widely excepted understanding that college readiness may include affective components such as emotional aptitude, and/or ability to socially adjust to a college environment (ACT, 2011; Byrd & Macdonald, 2005; Conley, 2008) was incorporated into the operational definition.

Developmental Education. Developmental education is not a new concept in higher education. The University of Wisconsin had a college preparatory program in 1849 that is often noted as one of the first developmental programs (Brier, 1984). According to Casazza & Silverman (1996) formal organizational structures begin to appear within colleges and universities to serve underprepared students. Developmental math education today is typically comprised of either a course or sequence of courses, designed to provide students performing below college readiness standards in math, opportunities to strengthen their math skills, in order to succeed in college level coursework (Aycaster, 2001; Bailey, et al., 2010; Boylan & Saxon, 1999). Roueche, Roueche and Ely (2001) postulate that developmental education helps to close gaps in achievement between marginalized groups and the normal population. Boylan et al. (1999) describe that developmental education also includes a component of student development that is important to the effectiveness of the instruction as well as the development of the deficit academic skills.

According to the Texas Administrative Code, Title 19, Part 1, Chapter 4, Subchapter C, Rule 4.53, developmental education is defined as “pre-college, non-degree credit courses, interventions, tutorials, laboratories, and other means of assistance that are included in a plan to ensure the success of a student in performing entry-level academic coursework”. This definition is broad and open-ended allowing for the understanding that developmental education may be more than just remediation in a set of skills. Standards have been set in Texas by the Texas Education Coordinating Board for all acceptable instruments used to determine college readiness and all state funded institutions of higher education must use them to determine college readiness. The Texas definition of developmental education was used in this study.

Course evaluation. Defining course or faculty evaluation is also an elusive endeavor. Traditionally, definition and criteria used in the evaluation of teaching, along with the processes including timelines, have been a local governance process established by higher education institutions. Even the Southern Association of Colleges and Schools Commission on Colleges (2012) in the most recent publication of The Principles of Accreditation: Foundations for Quality Enhancement, are ambiguous in terms of definition and requirements in regards to faculty evaluation. Comprehensive Standard 3.7.2 simply states that “institutions regularly evaluates the effectiveness of each faculty member in accord with published criteria, regardless or contractual or tenured status” (p. 31).

However, according to Thomas, Chie, Abraham, Raj and Beh (2014) increasing accountability demands and growing desire to shift higher education from an information transmission approach, to a quality learning approach, has resulted in a need to change traditional methods of teaching evaluation. According to the Texas Education Code Title 3, Subtitle A, Chapter 51, Subchapter A, Sec. 51.974 all funded higher education institutions must conduct end-of-course student evaluations of faculty for each undergraduate course offered. One that reflects student perception and responds to the changing accountability demands to understand the quality of learning in a developmental math classroom. The research in this study reflects this type of faculty evaluation process.

Part-time Faculty. Faculty at community colleges may be employed full time or part time. Typically, it is up to the institution to determine what constitutes a full-time load requirement. While regional accreditors do not usually specify how many full-time faculty are required to ensure the quality of the program, they have indicated that a critical mass of full-time qualified faculty are necessary (SACSCOC Core Requirement 2.8 Guideline, 2014). It is left up to an institution, to determine and make the case, that sufficient ratios of full-time to part-time faculty are adequate, as well as what constitutes a part-time instructional staff. The Integrated Postsecondary Education Data System, the National Center for Education Statistics, also leaves it up to the institution to determine whether an employee is full or part time.

According to the Texas Administrative Code, Title 19, Part 1 Chapter 4, Subchapter B, Rule 4.23, a faculty member is “a person who is employed full-time by an institution of higher education as a member of the faculty whose primary duties include teaching, research, academic service, or administration”. However, the term does not include a person holding faculty rank, who spends a majority of the person's time for the institution engaged in managerial or supervisory activities, including a chancellor, vice chancellor, president, vice president, provost, associate of assistant provost, or dean.” The Texas definition of faculty was used in this dissertation. The institutional policy at the current college of interest defines a full-time faculty instructional load to be fifteen instructional units per full semester with no summer instructional load. Part-time faculty may not instruct more than one-half of a standard load for more than 4 1/2 months in any academic year. This definition of part-time faculty was used.

Student Success. Finally, it is also important to clarify student success for this study. According to Mullin (2012) it is important to acknowledge and clarify the perspective of student success in order to accurately portray the research and findings from the research. Like college readiness, developmental education and faculty evaluation, student success too remains nebulous in terms of consensus of definition. According to Pascarella and Terenzini (2005) students' grades significantly contribute to persistence and attainment. Furthermore, grades may be greatly affected by factors such as motivation, organization, study habits and quality of effort.

Texas Education Code Subtitle B Subchapter C Section 61.0593 states that "it is in state's highest public interest to evaluate student achievement at institutions' of higher education". The 82^{nd} Texas Legislature enacted legislation known as Outcomes-Based Funding. The Legislature also charged the Texas Higher Education Coordinating Board, to incorporate success measures into formula recommendations, and detailed the types of academic progress measures achieved by students that could be considered. Success metrics established for community colleges in Texas include: successful completion of a developmental math, reading and/or writing course; successful completion of the first college level math, reading and/or writing course; successful completion of the first 15 credits; successful completion of the first 30 credits; successful attainment of certificates and/or degrees; successful attainment of certificates and/or degrees in critical fields and transfer to university with fifteen or more credit hours. For the purposes of this research, the definition of student success as defined and operationalized in the state of Texas was used to support understanding of the findings and provide for dissemination to general audiences. Specifically, in regards to this particular study this is successful completion of a developmental math course with a C or higher as legislated.

Summary of Chapter I

America continues to face significant student success and completion problems in higher education with developmental education (specifically developmental math) intensifying the situation. The dismal lack of success and completion of developmental coursework has also led to significant financial implications for students and for higher education institutions. An abundance of literature exists that identifies effective practices, yet the student success gaps continue to widen. Community college leaders, at all levels, need to play key roles in closing the gaps in success and completion, due to the fact that a majority of students lacking key college readiness skills, enroll first in community colleges. More research is needed to understand the how developmental math classroom experiences and characteristics of successful community college classroom leaders relate to student success.

Chapter two opens with a review of literature, related to developmental math in the community college, the developmental math student experience, and developmental math pedagogy. The conclusion of chapter two includes a conceptual and theoretical framework that guided this study.

Chapter II

Review of the Literature

This study examines how student and faculty perceptions of the developmental math classroom experience impact students' ability to successfully complete developmental education math courses. It is important to understand the unique pedagogy related to student success in developmental math education for community colleges. This study also evaluates the relationship between student and faculty attitudes and transformational leadership in the classroom. Transformational leadership has potential to raise the student to higher levels of motivation (Burns, 1978). The following literature review addresses topics that are important to provide relevant context in regards to the research questions used for the current study.

Attention will first be given to barriers developmental education students' face, especially those students requiring math remediation at the community college, as they attempt to push through the pipeline of higher education. Literature identifying effective developmental math instructional pedagogy and successful student experience indicators will be reviewed and learning strategies contributing to individual student success in developmental education will be discussed. An examination of research, regarding the relationship between student and faculty perception, in a developmental math classroom, will also be presented. Next, a review of current practices in course evaluation, and the relationship between course evaluation and student success, is described. Finally, literature surrounding a framework of goal theory of achievement motivation, and a conceptual model of transformational leadership that was used to guide the study, will be presented. Gaps in the literature, in regards to understanding this relationship, and potential impact on student success in a developmental math classroom are emphasized, and demonstrate the need to conduct this research.

Developmental Math in the Community College

Significant cognitive and non-cognitive barriers have been identified for students lacking college level math readiness. Recent research by the National Center on Education and the Economy (2013) found that even though most community college career programs demand little or no use of mathematics, other than middle school mathematics, failure rates in community colleges indicate that students are not entering with math readiness even at those levels. The National Postsecondary Student Aid Study of 2003-2004 found that 43% of freshman and sophomore community college students were required to enroll in at least one remedial course (Horn, Nevell, & Griffith, 2006). According to Bailey et al. (2010) being required to enroll in developmental education creates a financial, psychological and opportunity cost to the student.

A study by the U.S. Department of Education found that developmental math courses had the highest rates of failure and withdrawal in higher education. These dismal rates are also seen in most common credit-bearing, transferable mathematics courses with rates in excess of 50% (Adelman, 2004). This lack of success is also documented by Bailey et al. (2010) with a finding that approximately 67% of community college students, referred to a developmental education mathematics sequence, are not completing the sequence. Bound et al.'s (2010) research specifically associates 33% of the overall drop in college completion rates to increased enrollment in students lacking college readiness skills in math. Further analysis by initial school type found that students lacking math readiness, specifically, explained about 88% of the 2.5% decline in community college completion rates.

Researchers conducting a regression discontinuity study in Florida (Calcagno, 2007; Calcagno & Long, 2008) also found little evidence of the effectiveness of developmental mathematics education. Success rates towards degree attainment are dismal for remedial students, with most never graduating. In a national study (Complete College America, 2013) of fall 2004 cohorts, it was projected that only 9.5% of students receiving remediation at community colleges nationally, persisted to graduation within three years, compared to 13.9% of students who did not take remedial courses.

Bahr (2007) found in California, that less than one in 10 (9.6%) community college students referred to the lowest levels of remedial math had successfully completed a college-level math course within six years. Bailey et al. (2010), using an Achieving the Dream database of 256,672 first-time credential-seeking students who enrolled in fall 2003-2004 in 57 community colleges, identified significant findings in enrollment patterns and individual differences in regards to successful completion of a developmental mathematics sequence. This research found that fewer than 50% of students referred to developmental education completed the remediation process. Their research identified that about 30% of referred students did not even enroll in developmental education and only about 60% of students enrolling in developmental education actually enrolled in the courses they were advised to enroll.

In Texas, graduation rates of full-time students enrolling in remedial education was even lower than national rates with only 2% of students earning a certificate in two years and 5.8% earning a two-year degree in three years (Complete College America, 2013). Race/ethnicity differences were observed in Texas first-time-in-college degree seeking students with 61% of white, 32.8% of African American, and 43.7% of Hispanic incoming students demonstrating college readiness in fall 2010. In addition, college ready differences exist between students entering directly from high school, 49.5% identified college ready and students entering non-directly from high school, 28.8% identified college ready (THECB, 2012b).

Age and financial aid differences in regards to success in developmental education have also been identified in Texas students enrolling in developmental math. Rates for successfully completing remedial and subsequent college-level courses for students between the ages of 17-19 years are at 15.5% , at 11.9% for students between the ages of 20-24, at 15.5% for students age 25 and older and at 14.6% for first-time entry students receiving Pell grants in the fall 2006. The 81st Texas Legislature, in 2009, recognized the dire state of developmental education in Texas and the barrier it creates for students attempting to move up the pipeline of higher education. Significant funds were appropriated, during the 81st session, to improve the quality and effectiveness of Texas developmental education. A statewide Developmental Education Plan was set in place for the 2010-2011 Biennium to jumpstart developmental education reform efforts (THECB, 2009). This plan called for innovative projects that would address students' diverse needs. The need for early academic advising, professional development for faculty and systematic program evaluation was recognized and encouraged.

Developmental Math-Student Experience

Student Attitudes. Understanding the attitudes of students and faculty has potential to directly impact student success. According to Elliot and Shin (2002), research has proven that student satisfaction has a positive impact on student motivation, academic performance, and student retention. Yet research by Wheland, Konet, and Butler (2003) noted that many developmental mathematic education students believe that the developmental math classes will have little impact on their college career. More recent research by Stigler et al. (2010) concluded that students do understand the need to pass the class as it is a barrier that must be overcome in order to reach their goals.

While there has not been an abundance of studies examining student attitudes and success in community colleges, there are a few in the literature examining student success in mathematics in four-year institutions. Students' beliefs, self-concept, study habits and interest in learning have all been examined (House, 1995b; Stage & Kloosterman, 1995; Thomas & Higbee, 2000; Wheat, Tunnell, & Munday, 1991). Findings from these studies indicate that these type of variables are significantly correlated with success in mathematics.

There are several well-researched theories related to attitudes that inform the understanding of student attitudes in developmental mathematic courses and underscore the need for this research. Bandura (1977) proposed that an individual's self-efficacy is directly related to the extent of perseverance. It is an individual's expectations of their own ability that will determine what they attempt and what coping behaviors they employ. Activities they feel capable to handle successfully will be those they engage in and activities they feel threatened by or judge themselves lacking the ability to be successful in, will be discontinued. Often times, students referred to developmental education will try to avoid it (Perin & Charron, 2006). According to Bean and Eaton (2000) first year students entering an institution of higher education are faced with a barrage of new people, expectations and experiences. How likely they are to adapt to and persist in college will be directly related to the coping mechanisms students have developed. They elaborate further and explain that students believing they have the ability to influence their outcomes will be more likely to acclimate to their environment and persist.

A recent survey of remedial students found that a majority of remedial students surveyed believed that they were prepared for college (Strong American Schools, 2008). Mesa (2012) conducted a survey of community college students, enrolled in remedial and credit math courses, achievement goal orientations. Results indicate that these students' achievement goal orientations are consistent with adaptive learning patterns. Students with adapted learning patterns are interested in developing competence, expect and believe they can handle challenging work, avoid self-handicapping behaviors, and exhibit a positive mathematics self-concept. However, in the Mesa (2012) study, interviews with faculty members teaching the courses in which the students were enrolled revealed that instructors indicated a more negative perspective of student achievement goal orientations than did students. This discrepancy suggests that instructors might not be taking advantage of the high confidence and motivation to learn that many bring to the mathematics classroom.

Mesa's (2012) findings further indicated that students in developmental courses indicated higher levels of mastery orientations and self-efficacy than students in credit math courses. This means that math students, especially developmental math students, believe that they can succeed and are prepared to handle challenging work.

Student Learning Behaviors. Wambach, Brothen, and Dikel (2000) report that many developmental students lack the ability to self-monitor their learning progress. Skilled students understand how to self-monitor learning and learning behaviors. However, developmental students may not be able to determine if they have engaged in the type of study behaviors that will result in real learning. In addition, developmental students often learn best in ways not generally accommodated through traditional instruction (Boylan & Bonham, 1998).

In order for learning to occur, students must become active participants in the process. If student success interventions are to be successful students must be engaged, put in the time and effort, be interested in the material, actively participate in class activities, be intellectually excited about projects—and take responsibility for learning (Auken, 2011). Kuh (2008) describes how important student engagement in deep learning experiences is to higher grades, retention and transfer of information. There is a considerable body of research documenting student learning behaviors and the relationship community college student characteristics such as age, prior achievement, ethnicity and patterns of course taking have on retention and success (Adelman, 2005; Feldman, 1993; Goldrick-Rab, 2007; Pascarella, Wolniak, Pierson, & Terenzini, 2003; Stigler, Givvin, & Thompson, 2010; Waycaster, 2001). However, there are few studies that take into account variables such as interaction between instructors and students and even less research that describes how mathematics instruction is related to retention and success in community colleges (Ashwin, 2009; Mesa, 2007, 2012).

Developmental Math-Pedagogy

Instructor Attitudes. While math students' believe they have what it takes to success, faculty may not have the same perception, especially in credit bearing math courses. Overall findings from the Mesa (2012) study seemed to suggest that faculty underestimate students' motivation and goal orientations. The Higher Education Research Institute (HERI) conducted a national survey "the American College Teacher," of 33,785 full-time faculty members who teach undergraduates, including 2,308 from community colleges in 1998-1999 (Sax, Astin, Korn, & Gilmartin, 1999). The HERI survey indicated that only 20 percent of community college faculty agree that most students are well prepared academically and only 32 percent were satisfied with the quality of their students. A 1997 study conducted by the Carnegie Foundation (Huber, 1998) found that more than two-thirds of community college faculty believed that their students are not prepared in mathematics.

A Phi Delta Kappa study assessing 700 full-time Illinois public community college faculty attitudes toward academically disadvantaged students, found that the majority of the participants held less favorable attitudes toward these students (Hagen, 1973). Teachers indicate that motivating students to apply themselves and engage in learning activities is the most difficult task they encounter in instruction (Smittle, 2003). According to Deil-Amen & Rosenbaum (2002) misunderstanding or stigmatizing developmental students may lead to student frustration and resulting withdrawal from college. It is critical that instructors be an engaged learner-centered instructor and adopt the inquiry model of a reflective practitioner (Auken, 2011).

Classroom Learning Environment. According to Volkwein and Cabrera (1998), the classroom experience may be the single most important factor in affecting multiple aspects of student growth and satisfaction. Pedagogical recommendations from the 21st-Century Commission on the Future of Community Colleges (American Association of Community Colleges, 2012) include shifting from a culture of individual faculty prerogative to collective responsibility for student success and focusing on learning rather than teaching. Creating the student engaged learning experience is even more challenging in a developmental education class. According to Cohen and Brawer (2008), guiding and teaching students in developmental education is a significant challenge for community colleges. Smittle (2003) acknowledges the unique challenges associated with providing effective instruction in developmental education. Students entering developmental education have a basic lack of academic skills needed to succeed in a rigorous college curriculum and often have additional adult responsibilities that impact their time and other resources.

But successful program instructional practices have been identified (Casazza & Silverman, 1996; Maxwell, 1997). These include using a variety of teaching methods: aligning developmental curriculum with entry level subsequent coursework; using sound cognitive theory-based courses; supplementing regular class activities with computer-based instruction; integrating classroom and laboratory instruction; providing opportunities for strategic learning that teaches students how to monitor their comprehension and think strategically about learning, providing professional development for faculty and staff; and emphasizing critical thinking required in college-level courses.

Cognitive-based practices have also been identified that emphasize the development of active learners, who are in control of their learning (Simpson et al., 2004). Chickering and Gamson (1987) and Chickering and Reisser (1993) identified the following best instructional practices: encouraging student-faculty contact, promoting cooperation among students, encouraging active learning, giving prompt feedback, emphasizing time on task, communicating high expectations, and respecting diverse talents. Smittle (2003) suggests that all of these instructional practices become even more critical when instructing the developmental education student.

Key non-cognitive issues, in addition to cognitive-based practices have also been identified; along with literature based practices for effective teaching in developmental education (Astin, 1984; Smittle, 2003). It is not enough, according to Smittle (2003) to simply structure and lead activities for developmental students. The effective teacher must also teach developmental students to become independent learners, provide frequent feedback due to their lack of ability to judge their own progress, and recognize the wide range of developmental education students' abilities. Ames (1992) describes pedagogical practices that have a relationship to student motivation. Among these are a focus on effort and learning. These types of strategies focus on meaning and connections in learning experiences.

Active engagement and the use of effective learning and other self-regulatory strategies and exhibiting high tolerances for failure were also identified. Other strategies supporting a mastery goal orientation in the classroom (Ames, 1992b) include those that focus on individual improvement, progress and mastery. It is important to evaluate progress and mastery of students privately with the student and provide public opportunity for recognition. Letting students participate in the decision-making process, giving them opportunities to develop self-management and monitoring skills are critical to developing a mastery goal orientation.

The literature, in regards to successful pedagogy, has clearly demonstrated proven effective practices. So the question remains, why the continued lack of success in the developmental math classroom? There is a gap in the literature in regards to understanding what behaviors faculty use to deploy these pedagogical best practices. However, course evaluations have routinely been conducted in higher education with the promise of understanding the effectiveness of classroom pedagogy.

Course Evaluation. While course evaluations have been routinely administered for quite some time in higher education, they have yet to actualize in documented measurable changes. Problems associated with faculty evaluation have been identified in the literature. Frase and Streshly (1994) noted that good ratings may be given to incompetent teachers because students experience discomfort with confrontation. According to Frase (1992) teachers are not provided meaningful feedback for formative use; yet research (Ilgen, Fisher, & Taylor, 1979) indicates that useful feedback is a critical component of an evaluation process. Most importantly, faculty professional development has not been aligned with the results of faculty evaluation with research indicating only a minimal connection to class practices (Darling-Hammond, 1998; Sandholz & Scribner, 2006; Wilson & Berne, 1999).

Yet, there are a wide variety of course evaluation instruments and/or processes that can provide insights into the student-teacher relationship, and the student experience within the classroom (Rehak & McKinney, 2014). Thomas and colleagues (2013) describe how the peer review process of teaching can be used for formative assessment, and to understand the dynamics and social context of teaching. Another example of a course evaluation that explores teaching methodology and the classroom experience is the Individual Development Educational Assessment (IDEA) Diagnostic Form. This instrument, developed by IDEA, a nonprofit organization associated with Kansas University (Hoyt & Lee, 2002), is an evaluation tool that includes questions about students learning progress, effort, and motivation. The IDEA form also includes a set of items that comprise five scales measuring the constructs of stimulating student interest, fostering student collaboration, establishing rapport, encouraging student involvement, and structuring classroom experiences. According to Patrick et al. (2001) student ratings of teacher behaviors have been found to be consistent with ratings from external observers and is usually considered a reliable measure of teacher behaviors.

While course evaluation offers promise in understanding the implementation of successful pedagogy, it is also critical to recruit, develop and hire the best faculty for developmental education (Roueche & Roueche, 1999). Faculty teaching developmental education students must be genuine in their desire to teach developmental education students. They must also be motivated, in order to motivate students usually lacking in motivation. Unfortunately, most faculty instructing developmental education are part-time and many have other significant commitments. Research by Boylan, Bohham, Jackson, and Saxon (1994) found that 72% of developmental education instructors were part-time. When trying to understand the effectiveness of the implementation and potential sustainability of developmental education pedagogy, it is important to also consider faculty attitudes and other characteristics.

Theoretical Framework

The two theoretical frameworks, Goal Theory Model of Achievement Motivation and Transformational Leadership, detailed below, were used to understand and describe instructor attitudes and leadership behaviors in a community college developmental math education classroom. These frameworks were also used to understand and describe how instructor attitudes and leadership behaviors compared to student attitudes of the community college developmental math education classroom experiences.

Goal Theory Model of Achievement Motivation

Goal Theory. A goal theory model of achievement motivation (Anderman & Maehr, 1994; Anderman & Midgley, 1997; Kaplan & Maehr, 2002) was used in this study to provide a primary framework for understanding the interaction between instructors, students and the classroom environment. This model provides a possible explanation of how the goal structure of an environment might affect students' motivation, cognitive engagement, and achievement within that setting (Ames & Archer, 1988). According to Friedel, Cortina, Turner and Midgley (2010) it is critical to understand the goal structure of an environment because students' efficacy beliefs are directly related to personal achievement goals and personal achievement goals may be directly affected by context (Mesa, 2012). Academic self-efficacy, describes the confidence levels students' have in their ability to master new skills and tasks such as mathematics (Midgley, Kaplan, Middleton, Maehr, Urdan, Anderman, Anderman & Roeser, 1998). Using a goal structure provided a framework for interpreting the impact of developmental education instructional practices and the learning environment on student success (Wolters, 2004).

Understanding the goal orientation of students and faculty can also provide insight into the why and how they do what they do and think what they think (Anderman & Maehr, 1994). There are extensive research findings that have identified relationships between different goal orientations and different levels of student engagement and emotional experiences in education (Ames, 1992a; Dweck & Leggett, 1988). In addition, there is evidence that students' goals and beliefs about their learning experience mediates learning motivation (Pintrich & DeGroot, 1990). These findings are clearly relevant to student success and completion goals of the developmental math students because it is these beliefs, values or pursuits of goals aimed towards learning behaviors that keep a student academically motivated. These are known as achievement goals or goal orientations (Elliot, 2006). There is also a wealth of educational research demonstrating that achievement goals can predict key outcome variables such as performance (Elliot & Church, 1997; Elliot & McGregor, 1999; Harackiewicz & Elliot, 1993) use of learning strategies (Berzegar, 2012; Wolters, Yu, & Pintrick, 1996), knowledge retention (Bell & Kozlowski, 2002) and help-seeking behaviors (Middleton & Midgley, 1997).

Achievement goal theory is situated within a social-cognitive framework. According to Urdan and Schoenfelder (2006) beliefs about academic ability, expectations about task completion and associated goals for the task may be influenced by socio-contextual factors. Examples of these socio-contextual factors include messages from the instructor in regards to the difficulty of the task, perceived abilities of other students and other key classroom factors. Students then interpret and react to events based on their goal framework. Consequently, achievement motivation is situational and may vary based on situations students find themselves in and their current goal orientations.

Historically, researchers have differed in describing the number and the definition of goal orientations an individual may adopt in achievement situations (Pintrich, 2000). What emerges from the literature are two main orientations that relate differently to adaptive and maladaptive engagement and can be used to describe student and faculty attitudes and developmental math classroom factors. These orientations are known as mastery and performance goal orientations. While there are disagreement among researchers about the adequacy of the terms and the use of terms (Brophy, 2013); mastery and performance goal orientations will be used in this research.

Mastery Goal Orientation. Individuals with a mastery goal orientation strive to develop competence and extend mastery and understanding (Ames, 1992a; Friedel et al., 2010). They focus on mastering information, learning, understanding and developing skills. An individual with a mastery goal orientation typically is oriented towards personal development and growth. This supports achievement-related behavior and task-engagement. This orientation is associated with self-efficacy, persistence preference for challenge, self-regulated learning, and positive affect and well-being in the literature (Ames, 1992a; Dweck & Leggett, 1988; Elliot, 1999; Kaplan, Middleton, Urdan, & Midgley, 2002; Midgley, 2002; Pintrich, 2000; Urdan, 1997). Those with a mastery goal orientation typically hold a perspective that ability is malleable and define success as meeting either task-based criteria or self-defined criteria (Dweck, 1986 & Elliot). These individuals experience a high resistance to failure and focus on the efforts made for result (Ames, 1992a & Meece, Blumenfeld & Hoyle, 1988). A study conducted on students in community college math courses found that students who “endorsed a mastery goal orientation were more likely to engage in adaptive help seeking behaviors” and “self-efficacy in math also was found to influence students' help seeking behaviors" (Meuschke, 2005; p. 87). Unfortunately, the same study found that "students who perceived their ability to be low, those who need help the most, were more likely to avoid seeking help" (p.21).

Performance Goal Orientation. Individuals with a performance goal orientation are more interested in demonstrating competence compared to the mastery goal orientation of developing competence (Ames, 1992b; Dweck, 1986). The performance goal orientation is more interested in managing the impression others have of their abilities. They want others to have a high opinion of their ability and will avoid situations resulting in others having a low opinion of their ability (Dweck, 1986; Muis, Winne & Edwards, 2009). It is very important to the individual with a performance goal orientation to compare their performance against others and be able to demonstrate equal levels of performance. They are most interested in the bottom line as opposed to the process itself that intrigues the mastery goal oriented individual (Dweck & Leggett, 1988; Elliot & Dweck, 1988). Lack of success for those with performance goals may be attributed to low ability rather than lack of effort. As a result, they may avoid challenging tasks due to fear of failure and continuous failures may result in learned helplessness (Ames, 1992a; Ames & Archer, 1988).

Achievement Goals in Classrooms. There is a substantial body of research that has demonstrated how a classroom context can affect student's learning and influence students' views and purpose of learning. In a classic study, students' perceptions of classroom climate was found linked to the adoption of individual goal orientations and use of learning strategies by Ames and Archer (1988). More recently these findings were supported by Friedel et al. (2010) when they found that students "are sensitive to the emphasis teachers place on different types of achievement goals as expressed through instructional practice and the ways in which teachers respond to students, accomplishments or shortcomings" (p. 103).

Students are able to differentiate between a competitive classroom and a cooperative classroom and are also able to distinguish when instructors focus on individual improvement rather than on ability relative to others. Students will even go as far as to espouse beliefs that have been strongly shaped by instructors (Ames, 1992a; Anderman & Midgley, 1997; Church, Elliot, & Gable, 2001; Meece, 1991; Middleton, Kaplan, & Midgley, 2004; Patrick, Anderman, Ryan, Edelin, & Midgley, 2001; Turner, Thorpe, & Meyer, 1998; Urdan & Schoenfelder, 2006).

It is vital to begin to understand how instructors perceive the developmental math classroom. It is also important to understand how a student conceptualizes achievement goals, either as mental dispositions or as perceived environmental influences because these influences have potential to directly impact students' learning behaviors and student success (Duda, 2005). Unfortunately, while there is a significant amount of literature supporting all of these findings, they have been primarily based on middle or high school students. There is a gap in understanding goal orientations of faculty, students and the developmental math classroom context in a community college setting. Mesa (2012) found a common theme during the interviews with instructors. Many believed that the students in remedial courses were reluctant to appear incapable due to prior failures. According to Mesa (2012) more research is needed to understand how community college instructors promote performance or mastery achievement goals during instruction.

Transformational Leadership

From a broader perspective, a transformational leadership conceptual model will be used to understand and describe the classroom experience at a classroom level. Recent research has started to examine teacher leadership in the classroom (Harvey, Royal, & Stout, 2003; Pounder, 2006, 2008a, 2008b; Walumbwa, Wu, & Ojode, 2004). This type of leadership is of particular interest in the developmental math classroom, because when transformational leadership is employed, it has the potential to inspire, intellectually stimulate individuals to do their best and to motivate and engage the follower (Bass, 1985). This theory is directly in alignment with a goal theory model of achievement motivation and in direct alignment with effective pedagogical practices for developmental math education.

Filan and Seagren (2003) describe transformational leadership as an ability of leaders to prioritize the success of the organization over personal gain. Leaders have the ability to motivate others to excel and exceed beyond what is expected (Bass & Riggio, 2006). They demonstrate charisma, Meeting Students' Individual Needs and strive to intellectually stimulate others. The needs and values of those they lead are considered and understood. Those they lead are pushed to reach their potential by rethinking old ways of doing things (Bass, 1985). According to Holtz and Harold (2008) transformational leaders enjoy a higher degree of trust from their subordinates than other types of leaders.

The study of transformational leadership in the classroom has recently started emerging in the literature (Baba & Ace, 1989; Treslan, 2006). Historically, most research regarding this type of leadership has been centered on business settings. Chory and MCroskey (1999) conceptualized the classroom as an organization operating in similar ways to a workplace environment. More recently, research on transformational leadership in the classroom has been associated with higher levels of student effort, student perceptions of more effective instruction, and higher levels of satisfaction with instructors (Pounder, 2008a; Walumbwa et al., 2004).

Many studies have recommended transformational leadership in the classroom because of its significant relationship to improved student learning outcomes and personal mastery goal orientation (Bolkan & Goodboy, 2009; Goodboy & Myers, 2008; Griffith, 2004; Harvey et al., 2003; Hoehl, 2008; Goodboy, Martin, & Bolkan, 2009; Politis, 2004; Pounder, 2008; Walumbwa et al., 2004). According to Bolkan and Goodboy (2009), while much is now known about the beneficial relationship between transformational leadership and improved student learning outcomes, there is a gap in the literature in regards to the types of behaviors teachers employ to communicate transformational leadership in a classroom

Summary of Chapter II

This review has identified a strong body of literature detailing an in-depth understanding of developmental math in the community college. Students entering developmental education enter at various levels of college readiness in cognitive skills and non-cognitive skills such as motivation to succeed and self-regulation skills. There currently exists, a large body of research, detailing proven pedagogical practices, known to close college readiness gaps between developmental education students and those entering college ready. Given the significant body of research surrounding this population, it is surprising that developmental math continues to be a tremendous financial and academically crippling hurdle for so many students.

Next literature surrounding student attitudes and learning behaviors were reviewed and revealed that students' beliefs, self-concept, study habits and interest in learning have all been connected to student success in mathematics. Much is also known about the connection between community college characteristics such as age, prior achievement, ethnicity and patterns of course taking on retention and success. However, relatively little is known about the interaction between instructors and students and how mathematics instruction is related to retention and success in community colleges.

A review of research surrounding the pedagogical context of a developmental math classroom followed. Instructors and the classroom context play a key role in the success of students in developmental education students. The classroom learning environment may be the most critical factor in student growth and there are growing reports and studies to indicate that a cultural shift in the classroom experience may be needed. Fortunately, there is considerable research identifying successful pedagogy. It is apparent, however, that there is a gap in understanding the actual implementation of developmental education pedagogy, and the context surrounding the implementation.

The literature surrounding course evaluation was reviewed next. This routine assessment process is conducted regularly throughout the system of higher education, yet is often used only for summative purposes. This process offers hope in understanding the classroom learning environment and has potential to support targeted improvement plans in classroom environments. Course evaluation is a routine process that is typically required of all federally funded and accredited institutions. Research has demonstrated that course evaluation can be effectively used to improve courses.

The literature review concludes with a review of the theoretical and conceptual frameworks that support the understanding and interpretation of the study findings. There are extensive research findings validating the use of a goal theory model of achievement motivation to understand the interaction between instructors, students and the classroom environment. The relationship between individual goal orientations and the environment context established through goal orientations may have a direct impact on student goal orientations and student success. Yet, there exists gaps in the literature in understanding the developmental math classroom environment.

In addition, there are significant gaps in the literature understanding what leadership behaviors are exhibited by developmental math faculty and how these are perceived by students and how they are related to student success. The literature review concluded with a review of transformational leadership. This style of leadership has been proven to have a significant relationship to positive student outcomes and higher levels of student effort in the classroom. Given the fact the developmental math instructor is instrumental in establishing the environmental context, it is important to understand what leadership behaviors are associated with achievement goal orientations.

The use of a course evaluation assessment process provides some promise to understanding the implementation of pedagogy in the developmental classroom; yet critical understanding of faculty attitudes and practices and the relationship between attitudes and practices and student success are missing in the process. This study attempts to contribute to the literature by providing a greater understanding about the relationship between students and faculty perceptions of a developmental math classroom.

Chapter III

Methodology

The methodology for this study is detailed in this chapter. The goal of this study was to provide a better understanding of how student and faculty perceptions of the developmental math classroom experience impact students' ability to successfully complete these courses. This clarity will provide key information to support implementation and sustainability of future developmental math education initiatives. It is particularly important to also understand if there are differences in perceptions between student and faculty. Three research questions were proposed to guide this study:

1. What is the relationship between students' attitudes and perceptions of their developmental math classroom experience and their likelihood for successful course completion?
2. To what extent are student and faculty attitudes and perceptions of the developmental math classroom learning environment congruent?
3. What are the pedagogical strategies and classroom leadership behaviors exhibited by developmental math faculty who do, and do not, have high student pass rates in these courses?

The research context and design used for this empirical inquiry is described in this chapter, as well as the data collection and analysis methods, for the research questions. The research protocol regarding the use of human subjects is addressed.

Case Study Site and Context

The study site and context for this study is a community college located in Texas. Community colleges are comprehensive public institutions that provide open access to all students. Most community college missions guide the development of programs that are responsive to the community and may include academic, transfer and vocational. According to Thelin (2004) a high school or equivalency degree may or may not be required for admission to a community college. In an effort to meet the diverse needs associated with community college students, typically flexible scheduling, lower tuition, increased financial aid and extensive student support services are offered (Phillippe & Sullivan, 2005).

According to the Texas Education Code Title 3 Subtitle G Chapter 130 Subchapter A

> Texas public junior colleges shall be two-year institutions primarily serving their local taxing districts and service areas in Texas and offering vocational, technical, and academic courses for certification or associate degrees. Continuing education, remedial and compensatory education consistent with open-admission policies, and programs of counseling and guidance shall be provided.

Texas Rural Community College (TRCC), a medium-sized rural Texas community college, was selected for this case study and meets all the conditions set forth in the Texas Education Code Title 3 Subtitle G chapter 130 Subchapter A. The college has a long standing tradition of excellence and has received a variety of recognitions nationally. The college maintains regional accreditation by the Southern Association of Colleges and Schools Commission on Colleges. In addition, several programs offered by the college maintain national and state level accreditations.

The current population of the TRCC service area is nearly 179,000 and is approximately 33% Hispanic, 5% African-American, 3% Asian and other, and 59%

Caucasian. Educational attainment levels for the area are low, with only 14.5% of the population over the age of 25 having earned either an associate's or bachelor's degree. Poverty rates in the region have been traditionally high with recent U.S. Census Bureau data indicating that 16.4% of the total population in these eight counties lives below the poverty line.

TRCC offers an Associate of Arts and an Associate of Science degree, Associate of Applied Science degrees and certificates in a variety of allied health, career, and technical programs. Programs of study range from foundational general studies courses designed to transfer to a four-year university to a range of allied health, business, technology, industrial trades, and public service programs. Courses, programs, certificates, and degrees are provided in learning environments that include face-to-face instruction, interactive television (ITV), and online education.

In the fall of 2013, the semester of this study, the college enrolled approximately 4,400 students in credit courses. There was an unduplicated annual enrollment of 5,629 for 2013-2014. There were 4,102 workforce and continuing education students enrolled in 2013-2014. The student body is comprised of approximately 50% minority students. In fall 2013, 66% of the student body was female and 15% of enrolling females were first time in college students. Males comprised only 34% of the fall 2013 enrollment and of those males enrolling, 11% were first time in college students.

Developmental Math Education Students

TRCC developmental math education students who had been identified as both requiring developmental math instruction and were enrolled in a developmental math course in the fall 2013 semester were participants in this study. This does not include all students at TRCC who were identified as needing math developmental education. It is stipulated in the college developmental education policy that students enroll in at least one developmental class each semester they attend. Many students placement test results require that they take more than one developmental (reading, writing, math) course and many choose not to take math first. There were 686 students (15.6% of total TRCC students enrolled) who had not satisfied the math criteria for college readiness in the fall 2013 (see Table 1 below for a more detailed description of college readiness at TRCC and Table 2 for actual enrollments in college readiness courses).

Table 1

Status of College Readiness-Fall 2013

TSI status	Math	Reading	Writing
Not Satisfied	686 (15.6%)	344 (8%)	302 (6.9%)
Satisfied	3716 (84.4%)	4058 (92%)	4100 (93.1%)
Total	4402	4402	4402

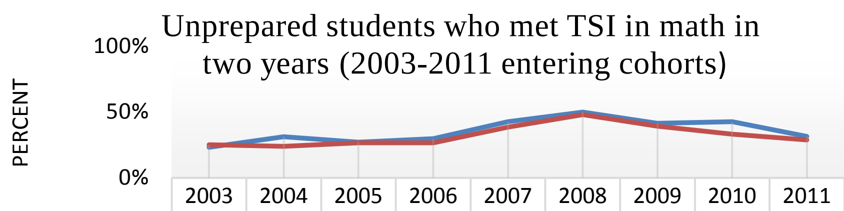
Table 2

Unduplicated Enrollment in College Readiness Courses-Fall 2013

	Math	Reading/Writing*
Total Enrolled	435	243
Total Referred	686	Reading 344
		Writing 302**

Note. *Reading and writing became integrated.
**May contain duplicates of students referred for reading.

Students enrolling at TRCC unprepared in math have attained college readiness in math within two years at slightly higher rates than state levels for the last six years (see Figure 1 below for more detailed information).



	2003	2004	2005	2006	2007	2008	2009	2010	2011
TRCC	23.20%	31.20%	27.10%	29.70%	42.60%	50.00%	41.50%	42.5%	31.5%
Texas Totals	25.10%	24.00%	26.60%	26.50%	38.40%	47.90%	39.20%	33.2%	28.8%

Figure 1. Persistence to TSI status. Percentages of unprepared students who met TSI in math in two years (2003-2011 entering cohorts).

Developmental Math Education Faculty

The total faculty of TRCC have an average tenure of 14 years, 62% are between the ages of 41-65+ and 80% are white. Fifty-six percent have a master's degree. In the fall 2012, full time faculty taught 68% and part time taught 32% of contact hours. However, for developmental math sections, full time faculty taught only 36% and part time taught 64% of contact hours (see Table 3 for a breakdown of developmental math faculty demographics).

The following sections of this chapter review each proposed research question. Samples, data collection procedures and methods and/or techniques used to analyze the data in order to answer the research questions are addressed.

Research Design

Due to the complicated context surrounding developmental math education and continued lack of student success at national, state, and local levels, an institutional case study using a mixed methods approach was used. Case studies provide a unique opportunity to understand complex real world social phenomena in depth (Yin, 2014). The implementation and sustainability problems associated with developmental education initiatives support the need for a more in-depth analysis of what is happening in the developmental math classroom. Yet, it is also important to quantify student success in order to identify successful practices.

Table 3

Fall 2013 Developmental Math Faculty Demographics

Gender		Full/Part Time	Highest Credential	Age	Ethnicity
Female	11	2 Full-time	6 Bachelor’s	Average age-49	Hispanic 1
		9 Part-time	5 Master’s	Median age-50	Unknown 1
					White 9
Male	7	2 Full-time	3 Bachelor’s	Average age-60	Hispanic 1
		5 Part-time	4 Master’s	Median age-64	Unknown 1
					White 5
Total	18	4 Full-time	9 Bachelor’s	Average age-53	Hispanic 2
		14 Part-time	9 Master’s	Median age-61	Unknown 2
					White 14

Yin (2014) explains that using mixed methods allows researchers to address more complicated and complex research questions and collect rich and strong evidence. Using both quantitative and qualitative methods combines the strengths of both approaches. Quantitative data analysis can provide data measurement from many individuals. Qualitative analysis provides detailed information directly from the participants and can be contextualized directly in the stetting. The combination of approaches yields a much better understanding of research problems (Creswell, 2008).

The literature surrounding developmental math education clearly establishes an extensive quantitative research base identifying effective developmental math pedagogical experiences; yet, many would argue that developmental math education continues to be a monumental failure in practice. A holistic and real-world perspective is needed that identifies successful implementation of research into practice and provides for sustainability of implementation. Yin (2014) explains that case studies have potential to accomplish this. The use of mixed methods research within this case study begins to bridge this gap. Mixed methods is formally defined by Johnson and Onwuengbuzie (2004) as “the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study” (p. 17) .

According to Johnson and Onwuengbuzie (2004) mixed methods provides an opportunity to bridge the schism between quantitative and qualitative research. They postulate that research today is increasingly interdisciplinary, complex, and dynamic. Because of this, multiple methods can facilitate communication and promote collaboration among scholars. In addition the mixed methods provide a unique opportunity to answer specific research questions unable to be answered by qualitative or quantitative research alone.

Written permission to use the data in the research and to interview developmental education faculty was obtained from the Vice President of Instruction at TRCC. Careful attention was taken at all times to adhere to all ethical principles regarding the use of human subjects in research. Steps were taken to protect the privacy of participants in this study. Once the study was approved by the dissertation committee, it was submitted to the Institutional Review Board at the University of Houston for review and received approval. Participants interviewed received an informed consent document prior to beginning the interview. They were provided information about their rights as voluntary participant in this study, including the ability to withdraw their participation at any time, along with an overview of the purpose of the study. Caution was taken to protect the privacy of participants through the removal of any items in the interview responses or institutional data that contain personal identifiable information. The interview protocol instrument was carefully designed to ensure that participants could not be identified through responses.

The application of the mixed methods used for this study are outlined below. Each research question and the methods implored are described in turn. Data and sample collection methods, variables, and analysis are described. The summary of this chapter follows the third question.

Research Question One

The first research question for this study was: What is the relationship between students' attitudes and perceptions of their developmental math classroom experience and their likelihood for successful course completion? This research question is answered through quantitative correlational analysis. Quantitative analysis is important to answer this question because one of the major characteristics of quantitative research is prediction (Johnson & Onwuegbuzie, 2004; Yin, 2014).

Sample and Data Collection Procedures. Secondary student success data from the fall 2013 TRCC developmental math courses was retrieved from the college information management system database and course evaluation data compiled by IDEA (the course evaluation company used by the college to evaluate courses) was used for the quantitative analysis in this mixed method study. The total sample includes 435 students in developmental math. This sample represents 68% of the total number of students referred to developmental math coursework. Not all students referred to developmental math enroll in the coursework. There are an additional 226 students included in the study who are enrolled in Math 0303. These students have TSI status, but do not meet the requirements to take college algebra.

Three sections of students, each with less than five students, were excluded from the analysis. These sections are all taught by the same instructor. Given the fact that these are the only students taught by the instructor, the instructor was excluded from the analysis. A total of 432 students enrolled in math 0300 and math 0301 and 226 students enrolled in Math 0303 comprised the sample in the study.

Student success data for all fall 2013 students enrolled in developmental math was collected; however, course evaluation data are administered on a certain day and not every single student is present on that day. Therefore not every single student participated in the evaluation. Course evaluation data was collected at the section level and evaluated with the section as the unit of analysis. There are 18 developmental math instructors instructing a total of 39 sections. Four of these instructors are full-time instructors and 14 are part-time instructors. One part-time instructor had class sizes less than 5 and these sections and the instructor were excluded from the analysis. All other sections were used in the analysis. These data were used to understand the success of the developmental math student and student perspective of a developmental math course by instructor. Identifying student information and faculty information were removed from the data for use in the analysis.

Variables

IDEA Scales. The primary measures of interest in this study are derived from the Individual Development Educational Assessment (IDEA) Diagnostic Form. The IDEA diagnostic form developed by IDEA, a nonprofit organization (Hoyt & Lee, 2002) is an evaluation tool that includes a teaching method component comprised of 20 items. The IDEA diagnostic form teaching method component is comprised of five teaching approach scales: stimulating student interest, fostering student collaboration, establishing rapport, encouraging student involvement, and structuring classroom experiences. Each of the scales includes related teaching method items (see Appendix A). Students were asked to evaluate the items using a five-point Likert type scale ranging from the lowest score of 1, hardly ever, to the highest score of 5, almost always.

These scales were used as primary measures in this study to understand the relationship between the classroom environment, as described by the teaching method items on the IDEA rating form and the dependent variables of course completion rates. High scores on the stimulating student interest scale indicate that the instructor has worked to develop a classroom environment that stimulates students' interest and curiosity, behaviors associated with student motivation and higher levels of self-efficacy. High scores on the fostering student collaboration scale indicate that a collaborative or engaged learning environment may be present and thus be fostering the deep learning experiences described by Kuh (2008). High scores on the establishing rapport scale, encouraging student, involvement and structuring classroom experiences scales demonstrate that instructors have created an atmosphere that encourages student effort and provides critical feedback opportunities that research has shown developmental students are often lacking.

Student and Faculty Demographics. Student demographic determinants of successful higher education outcomes have been identified in the literature and were explored as variables in this study. These include gender, race/ethnicity, age, and cohort differences (Choy, 2002; Pascarella & Terenzini, 2005). Faculty demographic determinants related to successful student outcomes have been identified in the literature. These include status of employment (part-time vs. full-time) and level of credential. These variables were also explored.

Course Completion Rate. Course completion rate is the primary variable for this study. Students completing a course with a grade of A, B, C in a course was considered successful in the course. This aligns with local, state and national practices and meets the definition of student success described previously in this paper.

Data Analysis

Descriptive data analysis was used to describe the student demographics by the course the instructor taught and then in each of the sections taught by the instructor. Table 4 displays the student demographics for the entire population of students enrolled in the three fall 2014 developmental mathematics courses. Table 4 also details what percentage of the faculty instructing the courses are full time and what percentage of the faculty are part time.

Table 4:

Descriptive Statistics for Students Enrolled in Developmental Education Fall 2013

	Math 0300	Math0301	Math0303
N (total students)	154	356	230
Sections	7	18	14
Faculty (part-time/fulltime)	85.71% (PT) 14.29% (FT)	61.11% (PT) 38.89% (FT)	64.29% (PT) 35.71% (FT)
Gender	28.85% (M)71.15% (F)	32.87% (M)67.13 % (F)	40% (M) 60% (F)
Age: Median years	24.4	24.5	23.8
Ethnicity	25% (White) 12.8% (African American) 60.3% (Hispanic) 2% (other)	27.8% (White) 12.9%(African American) 57.3% (Hispanic) 2% (other)	37% (White) 7.4% (African American) 53.5% (Hispanic) 2.1% (other)
Course Success Rates	75% (ABC) 17.3% (DF) 7.7% (W)	50.6% (ABC) 36.8% (DF) 12.6% (W)	51.3% (ABC) 33.5% (DF) 15.2% (W)

Next, descriptive statistics were used to compile the A, B, C success rates and course completion rates for each instructor and for each of the sections taught by each of the instructors. (See Table 5). See appendix D for a complete details of success rates and course completion rates for each instructor and for each of the sections taught.

An internal consistency reliability test was and principal components exploratory factor analysis with a Varimax rotation were conducted on the IDEA items to determine the reliability and components measured by the IDEA evaluation. Prior to running the principal components analysis with SPSS, the IDEA course evaluation data were screened by examining descriptive statistics on each item, inter item correlations, and possible univariate and multivariate assumption violations. From this initial assessment, all variables of the course evaluation data were found to be interval-like and all cases were independent of one another. The Kaiser-Meyer-Olkin measure of sampling adequacy for the fall 2013 developmental math students collectively was .958, indicating that the data were suitable for principal components analysis (Dziuban & Shirkey, 1974). Similarly, Bartlett's test of sphericity was significant (P<.001) for all analysis, indicating sufficient correlation between the variables to proceed with the analysis (Gorsuch, 1973).

Table 5

Instructor Student Success Rates

	Total Students	ABC Rates	Completion Rates
Tim (FT)	73	63.00%	93.20%
Bob (PT)	57	57.90%	91.20%
Rhonda (PT)	27	44.40%	88.90%
Jenna (PT)	22	81.80%	95.50%
John (FT)	118	56.80%	89.00%
Julie (PT)	15	53.30%	86.70%
Mary (PT)	26	34.60%	73.10%
Instructor Eight (PT)	47	27.70%	80.85%
Instructor Nine (PT)	45	53.30%	82.20%
Instructor Ten (FT)	125	58.40%	88.80%
Instructor Eleven (PT)	22	54.60%	72.70%
Instructor Twelve(PT)	43	67.40%	81.40%
Instructor Thirteen (PT)	42	59.50%	83.30%
Instructor Fourteen (PT)	8	37.50%	87.50%
Instructor Fifteen (PT)	30	76.70%	96.70%
Instructor Sixteen (PT)	14	50.00%	92.90%
Instructor Seventeen (PT)	19	31.60%	94.70%
Grand Total 0300	156	75.00%	91.70%
Grand Total 0301	356	50.60%	87.40%
Grand Total 0303	230	51.30%	84.80%
Grand Total All DM	742	55.90%	87.50%

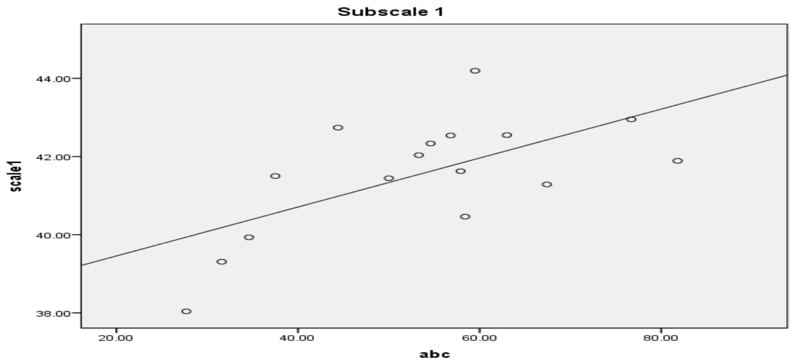
A bivariate correlational analysis was then conducted to understand if a relationship existed between students' attitudes and perceptions of their developmental math classroom experience, as determined by the IDEA course evaluation scales, and their likelihood for successful course completion using course success data (ABC rates). The following hypotheses were used for this analysis:

H_0: There is no statistically significant relationship between students' attitudes and perceptions of their developmental math classroom experience and successful course completion.

H_1: There is a statistically significant relationship between students' attitudes and perceptions of their developmental math classroom experience and successful course completion.

A Pearson product-moment r correlation was then conducted to measure the strength of the relationship between the IDEA scale scores and the course completion rates (percentages of ABCs per section and completion percentages) and the effect size. Prior to conducting the Pearson product-moment correlation coefficient; the continuous data were screened and relevant assumptions of this statistical analysis were tested.

The data were then screened for normality and outliers. The Shapiro-Wilk test was used to test for normality. This test is recommended by Stevens (2002) and Meyers, Gamst and Guarino (2006). All variables indicated normality with p values greater than .05. Two outliers were identified in the data set for subscale 1 and one outlier was identified in the data set for Subscale 2. The outlier (case number 10) identified in subscale 2 was removed from the dataset. This case was also identified at the top of the range in subscale 1. When the data was checked again for outliers, one outlier remained in subscale 1 and no outliers remained in the second subscale. Smaller samples have potential to increase the estimate of measurement error (Meyers et al., 2006). A decision was made to keep the remaining outlier in the data set so as to not further reduce the modest sample. Scatterplots indicated positive linear relationships (see Figure 2 below).



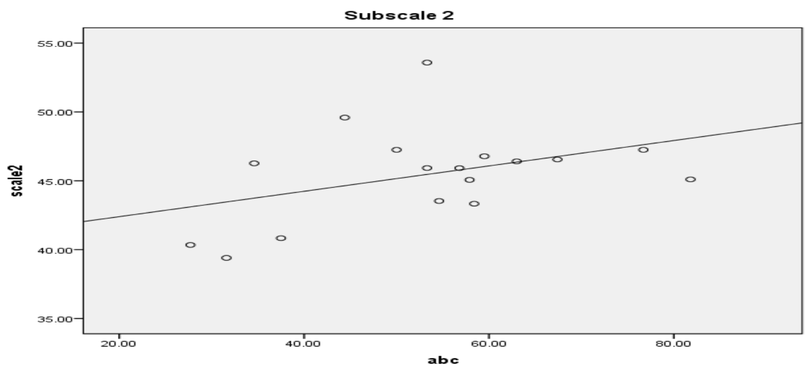


Figure 2. IDEA Subscale Scatter Plots

The correlation first conducted was between each of the instructors total success rates and the IDEA scale scores; and then between each of the sections success rates and the IDEA scale scores for each of the sections. The Pearson r correlation (product-moment correlation) is a bivariate measure of association (strength) of the relationship between two variables. Given that all the variables are continuous (interval/ratio data) and the hypotheses seek to assess the relationships, or how the distribution of the z scores vary, Pearson r correlations are the appropriate bivariate statistic. Cohen's standard was used to evaluate the correlations coefficient, where 0.2 represents a weak association between the two variables, .5 represents a moderate association, and 0.8 represents a strong association. The results of the descriptive and correlational analysis were then analyzed to determine if the null hypothesis should be rejected.

Research Question Two

The second research question is: To what extent are student and faculty attitudes and perceptions of the developmental math classroom learning environment congruent? This question was answered through qualitative research methods. Qualitative research methods were used to answer this question due the limited research on developmental math faculty attitudes and leadership behaviors and continued dismal lack of student success in regards to the phenomena of developmental math education (Creswell, 2008; Yin, 2014). Patton (2002) indicates that studying issues in depth and detail are facilitated by qualitative research. Merriam (2002) indicates that "meaning is socially constructed by individuals in interaction with their worlds" (p.3). It is important to understand how faculty members construct the ideas behind their classroom practices that are associated with student success. This provides insight into the leadership styles exhibited in a developmental math classroom.

Sample and Data Collection Procedures. In order to address this question, 17 faculty teaching in the fall 2013 were initially included in the sample (see table 3 above for sample demographics). Consent to use the secondary student data and to interview the faculty was obtained from the college administration. One approval was given from the Institutional Review Board to conduct this study, all participants were given a description of the research and a consent form (see Appendix H) that they signed prior to the interview. Interviews of faculty were conducted at the convenience of the participant in terms of time and location. The interviews were recorded to provide for a more accurate rendition of the interview and lasted from fifteen minutes to approximately an hour. According to Yin (2014) recordings should not occur if the interviewee is uncomfortable with the process. Interviews were asked first for permission to record prior to recording and then their permission to record was captured in the informed consent.

Each participant was asked specific guided, yet open-ended questions in order to understand the individual perspectives and views. According to Kvale and Brickmann (2009) when an interview is structured, the analysis will more likely be straightforward. The development of the questions that were used to interview the faculty was guided by goal theory (Midgley, et al., 1998; Pajares & Miller, 1997; Schunk, 1995) and transformational leadership literature (Bolkan & Goodboy, 2011) along with alignment with the IDEA course evaluation items (Hoyt & Lee, 2002). The alignment of the interview questions with the literature surrounding goal theory and transformational leadership was designed to support construct validity. These interviews were essential to understanding the faculty perspective of a developmental math classroom experience

Seventeen faculty (three full time and 14 part time) instructing during the fall 2013 semester were recruited via email using a recruitment letter (see Appendix B). One part time faculty member declined and one part time faculty member had relocated from the area. One full time and five part time members failed to agree to participate. Two did indicate that they would consider it, but never followed through when attempts were made to set up an appointment. Multiple email attempts were made and one phone attempt was made to recruit these faculty. Two full time (67% of full time) and five (36% of part time) part time members agreed to participate in the interviews. This is a response of 41% of the faculty instructing developmental math. These seven faculty taught 46% of the students in developmental math education at TRCC. Participants were representative of faculty instructing developmental education (see Table 6 for demographic information on participating faculty).

Each interview followed the same proposed research protocol outlined in Appendix B. Interviews lasted from fifteen minutes to approximately an hour. Each interview was recorded and transcribed prior to coding procedures. Care was taken to first code each recording and each transcription with a unique identifier associated with the student success data and course evaluation data.

Data Analysis. The responses to the interview questions were first transcribed using transcription software to ensure accuracy. The interviewee was asked to verify the accuracy of the transcribed interviews. Member-checking is important to establish the validity of the qualitative data and the inferences that will be drawn from the interviews (Creswell & Miller, 2000; Lincoln & Guba, 1985). Data were then coded and the outputs from the analysis studied to determine if any meaningful patterns are emerging.

In addition, the transcribed interview data were organized by thematic data analysis using a deductive process (Creswell, 2008) where themes and coding structure are based on literature about goal theory model of achievement motivation and transformational leadership behaviors. A matrix of categories related to the theoretical frameworks was used to guide this process (see Appendix C). These categories were drawn from the literature. Text that aligned with the category descriptors were placed within the category (Miles & Huberman, 1994) for future analysis. According to Rogowski (2010) the use of even a few observations in a case study, are relevant when linked to preexisting theories.

Table 6

Interviewed Faculty Demographics (n-7)

Name	Gender	Age Range	Status	Ethnicity
Tim	Male	30-40	Full time	White
Bob	Male	60-70	Part time	White
Rhonda	Female	50-60	Part time	White
Jenna	Female	50-60	Part time	White
John	Male	60-70	Full time	White
Julie	Female	20-30	Part time	White
Mary	Female	60-70	Part time	White

Pattern matching logic was used to match the predicted patterns to the empirical research regarding goal theory, and transformational leadership and student success, identified in the literature (Trochim, 1989). The final analysis included the systematic process of matching any shared patterns, behaviors, and ways of thinking drawn on the interviewees' descriptions of instructional pedagogy and leadership behaviors in the developmental math classroom with the student perception data. This process was used to help determine the internal validity of the study (Yin, 2014). Based on the theoretical framework, the following outcomes were hypothesized as occurring for this analysis:

1. Faculty transcripts reflecting mastery goal orientations will be matched with higher scores on the IDEA scales.

2. Faculty transcripts reflecting performance goal orientations will be matched with lower scores on the IDEA scales.

3. Faculty transcripts reflecting transformational leadership behaviors will be matched with higher scores on the IDEA scales.

Research Question 3

The third research question proposed is: What are the pedagogical strategies and classroom leadership behaviors exhibited by developmental math faculty who do, and do not, have high student pass rates in these courses?

Sample and Data Collection Procedures. Findings from the quantitative analysis were used along with the thematic data identified through the qualitative analysis to answer this question. Pedagogical strategies from instructors' course evaluations, along with the themes identified through the analysis of the instructor interviews, were compiled and described for each of the instructors using a pattern matching logic (Yin, 2014). A congruence method was used to determine and describe the level of congruence between the two sets of data in regards to pedagogical strategies and classroom leadership behaviors.

Data Analysis. Findings from the literature regarding the developmental math classroom learning environment, goal theory model of achievement motivation and transformational leadership were used in the pattern matching logic process to determine and describe the pedagogical strategies and leadership behaviors. Based on the literature regarding the developmental classroom learning environment and the theoretical framework, the following outcomes were hypothesized as occurring for this analysis:

1. There will be higher levels of congruence, in regards to pedagogical strategies, between faculty transcripts reflecting mastery goal orientations and pedagogical strategies identified on higher scores on IDEA scales.

2. There will be lower levels of congruence, in regards to pedagogical strategies, between faculty transcripts reflecting performance goal orientations and pedagogical strategies identified on higher scores on IDEA scales.

3. There will be higher levels of congruence, in regards to transformational leadership behaviors, between faculty transcripts reflecting mastery goal orientations and pedagogical strategies identified on higher scores on IDEA scales.

4. There will be lower levels of congruence, in regards to transformational leadership behaviors, between faculty transcripts reflecting performance goal orientations and pedagogical strategies identified on higher scores on IDEA scales.

Limitations

The findings of this mixed method study make a valuable and timely contribution to the field of higher education in community colleges. However, it is important when considering the findings, to understand the limitations of this work and how it impacts future research. Limitations related to the selected methodologies of this work, as well as this type of work in general, are addressed first.

The context of this study was limited to a medium sized rural community college and the sample included only faculty and students from one semester of an academic year. It is important to understand that the sample was neither fully representative of all faculty instructing developmental math at the college, nor did it include all students requiring developmental math. Part time faculty not scheduled to instruct the selected semester were not included. In the semester of study, students required to take developmental math were not required to take it if there were other developmental deficiencies such as reading and/or writing. They may elect to take those courses first and therefore, the sample is not representative of all students identified for developmental math and should not be generalized beyond populations of similar context and nature.

There are also two important limitations to consider when reviewing the findings and analysis of the quantitative data. First, and of most importance, is that there are issues of independence regarding the student course evaluation and success data. The data was collected at the individual student level; however, it was aggregated to an instructor level. The reason for this is that course evaluation data is aggregated up from student to section level and does not include any identifiable student demographic information. Thus, the inability to connect the individual student evaluation data to the individual student success data created limitations that should be considered in future research studies of this nature. In addition, instructors may teach up to three different types of courses in any given semester due to the multiple levels of developmental education. Data for this analysis was only entered into the Pearson product-moment r correlation analysis at the instructor level, not at a student level, due to the anonymity of the student evaluation data.

Second, while the sample did reflect only one semester of data, there are students who may have been continuously enrolled in developmental education from prior semesters. The inability to connect course evaluation data to individual student created problems of independence. No controls were established in this simple analysis to control for effects from prior instructors or prior instructional experiences. Research with a multi-level statistical analysis methodology would provide a more rigorous study of the relationship. Therefore, this quantitative analysis can only provide a limited understanding of students' attitudes and perceptions of their developmental math classroom experience and their likelihood for successful course completion.

While the mixed method case study analysis provides a richer context in which to understand the findings of the quantitative analysis, it is important to realize that findings from a case study are limited in generalizability (Creswell, 2008). The number of faculty interviewed did not represent the full population of faculty instructing during the semester. However, this study does begin to contribute to addressing the gaps in the literature in regards to understanding the developmental math classroom experience. It can inform practice and move community college faculty and administrators, as well as others involved with developmental education initiatives, forward as they work to address the critical lack of progress in developmental education.

An additional limitation concerns that of the issue of social desirability of conducting interviews with the staff member responsible for developing the institutional effectiveness processes at the institution under study. The institution under study has recently joined a state level initiative with a lot of attention and focus on developmental math. Given that developmental math and the problems associated with it are currently in focus at the institution, faculty may have responded in ways that did not accurately reflect their practice. This may also have impacted the response rate of the study. Care was taken to develop protocol to insure the confidentiality of the participants and to inform the participants of the protocol prior to their participation in the study.

Summary of Chapter III

This chapter detailed the research design used in this study, including the participants, instrumentation and statistical procedures used in the analyses. The methodology and limitations associated with the study were detailed in Chapter 3. Descriptive data analysis was used to describe the student demographics and success rates. Chapter 4 presents the findings of the study.

Chapter IV

Findings

The goal of this study was to provide a better understanding of how students and faculty perceive the developmental math classroom experience, and how these perceptions potentially impact students' ability to successfully complete these courses. It also evaluated levels of congruency between student and faculty attitudes and perceptions of the developmental math classroom learning environment. Finally, pedagogical strategies and classroom leadership behaviors exhibited by developmental math faculty who do, and do not, have high student pass rates were identified. The findings of the study, organized by research questions, are presented in this chapter.

Research Question One

The findings for the first research question are detailed in this section. The first research question asked: "What is the relationship between students' attitudes and perceptions of their developmental math classroom experience and their likelihood for successful course completion?" Quantitative methods were used to answer this question. First, findings from the principal components factor analysis conducted on the IDEA course evaluation data are described. Next, findings from the Pearson product-moment r correlation conducted to measure the strength of the relationship between the IDEA scale scores and the course completion rates (percentages of ABCs per section and completion percentages) are described.

Principal Components Analysis. A principal components exploratory factor analysis with a Varimax rotation and an internal consistency reliability test were conducted on the IDEA course evaluation items for the fall 2013 semester developmental education data to determine the reliability and components measured by the IDEA evaluation. Using the Kaiser-Guttman retention criterion of eigenvalues greater than 1.0, a two-factor solution provided the clearest extraction of the data collectively. Two factors accounted for 61.55% of the total variance. Table 7 presents the extracted components, items and factor loadings. Communalities were adequate for each of the 20 items, with a range of .50-.76.

The first factor extracted in the full math course evaluation data set (N=449) had a rotated eigenvalue of 6.28 and accounted for 31.42% of the variance. Nine items were included in this factor. The second factor extracted had a rotated eigenvalue of 6.03 and accounted for 30.13% of the variance. Eleven items were included in the second factor. Corrected item-total correlation for the entire dataset ranged from .55-.79 and Cronbach's coefficient alpha ranged from .94 to .95. Corrected item-total correlation for the first factor extracted ranged from .60-.76 and Cronbach's coefficient alpha ranged from .88-.89. Corrected item-total correlation for the second factor extracted ranged from .65-.79 and Cronbach's coefficient alpha ranged from .92-.93.

Recommendations by Comrey and Lee (1992) and Rummel (1970) provided rationale and guidance in the decision to name the factors. Sorted factor weights in excess of .65 were used to label and interpret each factor along with research literature from IDEA. Six items fell below the .65 threshold. Research conducted by IDEA was used to guide the interpretation of these items (Hoyt & Lee, 2002). Several of the items falling below the .65 threshold demonstrated cross loadings. For example, teaching method 8 with loadings of .57 and .56. A decision was made to defer to prior reliability and validity studies conducted by Hoyt and Lee (2002). The IDEA Diagnostic Form is a reputable and widely used instrument with extensive reliability and validity studies. For this reason, items with cross loadings were placed in the scales established by Hoyt and Lee (2002).

A decision was made to keep all of the items as they fell only slightly below the threshold and were approved during the content validity and reliability testing conducted by researchers associated with the IDEA Center. However, reliability studies by IDEA, indicate that the 20 teaching method items should extract five components (see chart in appendix). Only two components emerged in these analyses. The two-factor model was chosen as the best solution because of its conceptual and theoretical clarity, ease of interpretability and alignment with previous research findings from IDEA.

The first factor contained items from the Structuring Classroom Experiences and Establishing Rapport IDEA scales. High scores on these scales demonstrate that instructors have created an atmosphere that encourages student effort and provides critical feedback opportunities that research has shown developmental students are often lacking. The second factor extracted contained items from the Encouraging Student Involvement, Stimulating Student Interest and Fostering Student Collaboration IDEA scales. High scores on these scales indicate that the instructor has worked to develop a classroom environment that stimulates students' interest and curiosity, behaviors associated with student motivation and higher levels of self-efficacy. Specifically, high scores on the fostering student collaboration scale indicate that a collaborative or engaged learning environment may be present and thus be fostering the deep learning experiences described by Kuh (2008).

Table 7

IDEA Course Evaluation Items and Factor Loadings for the Principal Component Analysis with Varimax rotation (N=449

Content	Factor Loadings	
Structuring Classroom Experiences and Establishing Rapport (α=.90)		
TM 1: Displayed a personal interest in students and their learning.	.80	.19
TM 2: Found ways to help students answer their own questions.	.76	.30
TM 3: Scheduled course work (class activities, tests, projects) in ways which encouraged students to stay up-to-date in their work.	.63	.32
TM 4: Demonstrated the importance and significance of the subject matter.	.70	.35
TM 6: Made it clear how each topic fit into the course.	.68	.40
TM 9: Encouraged students to use multiple resources (e.g., data banks, library holdings, outside experts) to improve understanding.	.60	.47
TM 10: Explained course material clearly and concisely.	.79	.29
TM 12: Gave tests, projects etc. that covered the most important points of the course.	.70	.16
TM 17: Provided timely and frequent feedback on tests, reports, projects, etc. to help students improve.	.71	.30
Encouraging Student Involvement, Stimulating Student Interest and Fostering Student Collaboration (α=.93)		
TM 5: Formed "teams" or "discussion groups" to facilitate learning.	.74	.18
TM 7: Explained the reasons for criticisms of students' academic performance.	.65	.37
TM 8: Stimulated students to intellectual effort beyond that required by most courses.	.57	.56
TM 11: Related course material to real life situations.	.61	.44
TM 13: Introduced stimulating ideas about the subject.	.61	.55
TM 14: Involved students in "hands on" projects such as research, case studies, or "real life" activities.	.85	.20
TM 15: Inspired students to set and achieve goals which really challenged them.	.65	.54
TM 16: Asked students to share ideas and experiences with others whose backgrounds and viewpoints differ from their own.	.85	.20
TM 18: Asked students to help each other understand ideas or concepts.	.69	.41
TM 19: Gave projects, tests, or assignments that required original or creative thinking.	.70	.31
TM 20: Encouraged student-faculty interaction outside of class (office visits, phone calls, e-mail, etc.).	.53	.48

The first factor contained items from the Structuring Classroom Experiences and Establishing Rapport IDEA scales. High scores on these scales demonstrate that instructors have created an atmosphere that encourages student effort and provides critical feedback opportunities that research has shown developmental students are often lacking. The second factor extracted contained items from the Encouraging Student Involvement, Stimulating Student Interest and Fostering Student Collaboration IDEA scales. High scores on these scales indicate that the instructor has worked to develop a classroom environment that stimulates students' interest and curiosity, behaviors associated with student motivation and higher levels of self-efficacy. Specifically, high scores on the fostering student collaboration scale indicate that a collaborative or engaged learning environment may be present and thus be fostering the deep learning experiences described by Kuh (2008).

Pearson Product Moment r Correlation. Results of the Pearson product-moment r correlation indicated a moderate positive correlation between Scale 1- Structuring Classroom Experiences and Establishing Rapport and student A, B, C success rates, $r(14) = .64$, $p<.01$ (see Table 7). Results of the Pearson product-moment r correlation also indicated a positive moderate correlation between Scale 2- Encouraging Student Involvement, Stimulating Student Interest and Fostering Student Collaboration and student A, B, C success rates, $r(14) = .51$, $p=.04$ (see table 4).

The null hypothesis "There is no statistically significant relationship between students' attitudes and perceptions of their developmental math classroom experience and successful course completion" was rejected in this study. Findings from the quantitative analysis demonstrated that there is a significant relationship between students' attitudes and perceptions of their developmental math classroom experience and successful course completion.

Table 8

Bivariate Correlations Among Structuring Classroom Experiences and Establishing Rapport and Student A, B, C Success Rates.

Scale and/or item	M	SD	S1	S2	Successful course completion
Scale 1-Structuring Classroom Experiences and Establishing Rapport	41.55	1.52	--	.68**	.64**
Scale 2-Encouraging Student Involvement, Stimulating Student Interest and Fostering Student Collaboration	49.49	2.80	--	--	.51*
Successful course completion	53.45	15.4	--	--	--

Note: Correlations marked with an asterisk (*) were significant at p<.05. Correlations marked with asterisks (**) were significant at p<.01.
Note: Successful course completion indicates completion of course with a C or higher.

Research Question Two Findings

The findings for the second research question are detailed in this section. Pseudonyms have been used in place of the real names of faculty. The second research question asked: “To what extent are student and faculty attitudes and perceptions of the developmental math classroom learning environment congruent?” Primary themes emerging from the interviews included: Meeting Students’ Individual Needs, Facilitating Student Learning and Acquisition of Skills, and Motivating and Inspiring Students. The extent of congruency between faculty attitudes and perceptions, as identified in the themes revealed through the analysis of the interview data, and student attitudes and perceptions, as determined by course evaluation data is described below. Faculty attitudes and perception findings are detailed first followed by student perceptions for each theme. A brief summary is then provided following the attitudes and perception findings detailing the extent of the congruence between faculty and student attitudes and perceptions.

Meeting Students' Individual Needs

Faculty Attitudes and Perception. It was very evident, in all seven interviews, that faculty considered it a priority to identify, consider and find ways to meet individual student needs. All seven faculty interviewed explained leadership skills focused around students' individual needs. They believed that most students lacked academic self-efficacy and addressed ways to tackle this. All worked to establish a rapport with students in order to understand and meet students' individual needs. Faculty providing richer examples of this theme more frequently described the atmosphere in the classroom, with a deeper appreciation of individual differences and needs of students.

Rhonda, Julie, John and Tim most frequently expressed a desire to personalize interactions, acquire trust and provide supports for learning. All articulated strategies used to this purpose. While Jenna, Bob and Mary, each did describe at least one situation, in which they considered individual student needs, they did not elaborate extensively on data related to this theme. Rhonda, Julie, John and Tim believed it central to student success to acquire trust and understand the individual student in a developmental math classroom.

Each of these faculty identified practices they use to build rapport and trust with students. For example when Rhonda as asked how she established rapport in the classroom she replied: "I try to tell them and make them understand that everybody is good at something." Later, when asked to describe the climate or atmosphere in the classroom she said: "When they see that you care and they see that you're real, you don't present that air that you're smarter than they are, and that's real important, it becomes a nurturing group effort to learn it."

Julie also provided evidence that she considered a responsive environment to be a priority in the developmental classroom. When asked how she established rapport, she replied: "Well the very first day of class is nothing, we don't even really truly talk about the syllabus. It is an introduction of them to understand who I am, and me to understand each of them." Julie continued later with: "I know which students in my class have kids, which ones have kids in high school, middle school, what their kids names are. So I make that personal connection."

For Julie, it was also important to simply listen to their conversations with other students. This "listening strategy" was also mentioned in several other transcripts. John, also with many reflections on this theme, takes advantage of small group time to visit with the groups. It is during this time that he "listens to what they're saying, and then they'll be talking to each other differently than they would talk to me." Julie also meets with students on Sundays at a local coffee shop because for many that is the only day they have off. She also provides students with all different ways of contacting her including giving her cell phone number out to students.

Tim also described how he works to push students forward, adjusting for individual needs, yet is careful to maintain a rigor that prepares them for the next course, whether it be developmental or credit. He shares with his students some of his own personal struggles. I relate that struggle to their struggle in math." These behaviors describe the ways faculty personalize interactions and acquire trust, all behaviors associated with transformational leadership.

Student Attitudes and Perception. Faculty perception data is generally congruent with the student perception data regarding this theme. Faculty sharing how they meet individual student needs in greater depth, received higher student ratings. This was especially evident when students were asked to what extent instructors displayed a personal interest in students and their learning (TM 16). Student data were also congruent with the instructor data when asked to what extent did the instructor encourage students to use multiple resources (e.g., data banks, library holdings, outside experts) to improve understanding (TM 9). It was evident that faculty believed that a variety of external resources were needed to meet individual student needs. Faculty and students perceptions were also congruent in regards to understanding faculty-student interaction outside of class. Student perception was that all faculty encouraged student-faculty interaction outside of class (TM 20) and ratings on this item were consistently high. Julie, Rhonda, Tim and John were rated higher on items from the IDEA course evaluation data associated with meeting students' individual needs on several of these items, than were Jenna, Bob and Mary.

Summary of Meeting Students' Individual Needs Findings. It was the perception of faculty interviewed that meeting students' individual needs was a priority and essential to student success. Faculty provided rich descriptions of actual behaviors used to develop trust and build rapport in the classroom and how they worked to build meaningful relationships. Student data also revealed that they recognized and acknowledged that faculty do display a personal interest and interact with faculty inside as well as outside of the classroom.

Facilitating Student Learning and Skill Acquisition

Faculty Attitudes and Perception. A second theme identified from the data, and associated with the first extracted factor, was facilitating learning and skill acquisition. Faculty expressed a desire for students to acquire skills, develop mastery goal orientations and develop and progress in their abilities. All interviewed believed that college readiness was a significant contributing factor to the low performance outcomes. Once again, Julie, Rhonda, Tim and John responded more frequently with data centering on this theme, than did Jenna, Bob and Mary. However, this theme was observed much less frequently in all interviews, than the other two themes.

Faculty perception on importance of acquiring and mastering skills was observed when faculty were asked what they consider to be two important goals for students. Rhonda replied: “To master the skills to be successful.” Rhonda also shared that she likes to watch students work in groups at the board. She said this way: “I know whether you’re getting it or not.” Later when asked why she believes students struggle with developmental math she replied:

> I think our error in our way is elementary and then junior high and then high school. We try to put too much into elementary. We need to be teaching kids, reading, writing, and arithmetic, and make sure they master it. If they fall behind in elementary, they never catch up.

When Julie was asked what goals she considered important, she also identified a personal desire for students to acquire and master skills. She replied to this question: “For them to have that light bulb moment of ‘Oh, I get it’.” Later she continued to explain how she wants to reach “as many of those students as I can, to have that moment of light bulb.”

Tim, like Rhonda, believes that students struggle in math today because of a lack of prior learning and problems with the timing of when math is introduced and how it is introduced in elementary and secondary school. He even went as far as to propose a “Montessori-type environment” and a return to “old school rules”. When questioned about old school rules, Tim expressed that he did not believe that the developmental cognitive capabilities of students were being considered in the planning and progression of an elementary and secondary math curriculum today. He suggested that he likes to say that “I’d like to bulldoze everything down and start over again.” Tim attributed a lack of progress towards reaching goals in math directly to the lack of timely progressive skill acquisition through elementary and secondary education. Tim was not the only instructor demonstrating practices of a reflective practitioner.

Faculty expressed a variety of ways to facilitate learning they either provided or facilitated. For John, it was particularly important to ensure that students knew about and used external supports. He mentioned on several occasions how he would encourage the students to take advantage of the tutoring center. When asked what strategies he used to help students from falling behind or to be successful he replied: “I encourage them to meet with me or the tutoring center each time they’re behind, or meet with their group members with the buddy system that we use. We use a buddy system.” John also shared how he provides students with information regarding what research shows for successful students. Julie revealed additional resources, in addition to tutoring, such as Purplemath.com and YouTube that take students through step by step.

Student learning and skill acquisition was important to the faculty interviewed. When John was asked how important it is to cover everything in the book he replied:

> What's more important is to have understanding of what we actually go through. If we get through 80% of it, that's fine as long as they understand it. We get through 60% and that's as far as I can stretch them, that's a lot better than they were when they came in.

Moreover, he mentions how he assesses readiness of the students throughout the semester to determine if they are ready for the next level of skill assignments. All faculty interviewed acknowledge in some fashion, the importance of student learning and skill acquisition. However, this theme was overshadowed in the interviews, by what appeared to be a greater vested interest in developing rapport, building trust and motivating students.

Student Attitudes and Perception. It is important to note that there was not a considerable amount of variation in the interviewed faculty scores on student perception items related to this theme. Students generally rated all faculty higher on items related to this theme. The student perception data indicated that students believed that most faculty demonstrated the importance and significance of the subject matter (TM 4) and made it clear how each topic fit into the course (TM 6). The perception was that faculty explained course material clearly and concisely (TM 10) and gave tests, projects etc. that covered the most important points of the course (TM 12). Both faculty and students recognized that instructors related course material to real life situations (TM 11) and higher scores were seen on the related item for most faculty. On a similar item asking to what extent did the instructor involve students in hands on projects such as research, case studies, or real life activities (TM 14), students rated faculty lower. This may be a situation where faculty are providing real life examples for students, but not providing opportunities for students to personally engage with real life experiences. For example Julie explained why relating course material to real-life situations doesn't always work for these students. She believed that:

> It's important so they understand where it's coming from, but they're still not always going to see how it's going to relate to what they're doing. They don't see that like, so trying to get them to see that link when they don't think mathematically, it just doesn't work. They've got that drawbridge up in their mind that says, "I can't go there."

Reflections from the interviewed faculty, regarding this theme, are mostly congruent with how their students perceive the classroom experience on these items with higher scoring faculty providing more detailed responses in regards to mastery, skill acquisition, progress and development of ability. Just as in the first theme, Julie, Rhonda, Tim and John were rated higher on the associated teaching method items. Mary continued to have the lowest scores on these items as well.

Summary of Facilitating Student Learning and Skill Acquisition. There was congruence between faculty and student perception in regards to facilitating student learning and skill acquisition. Student success was important to faculty interviewed and they provided classroom structure designed to facilitate student learning experiences. An important finding in this theme is that while students rated most of the items associated with this theme higher than other items, faculty descriptions of behaviors used were not as developed as in other themes. This could indicate that faculty do facilitate student learning and skill acquisition; however, they place greater importance on behaviors associated with the other themes that were described in much greater detail.

Motivating and Inspiring Students

Faculty Attitudes and Perception. The third major theme identified is Motivating and Inspiring Students. Data from the interviews revealed how faculty exhibit leadership behaviors designed to motivate and inspire students. Most faculty described their roles as coaches and mentors and shared how they strive to be a role model for their students. Several believed they needed to be a central force for moving the group forward and gave examples of times they placed the needs of the students over their own personal needs. They work to provide meaning and challenge to the course and display enthusiasm and optimism. All faculty interviewed explained that the use of teamwork and collaboration strategies were a daily occurrence and all considered these strategies important learning support and intimately related to student success. These behaviors are observed in transformational leaders.

It was obvious that Tim considered motivation to be a key factor in moving the developmental math class forward. When asked if there are any strategies he uses to help students from falling behind he replied “You don’t have enough paper.” He went on to describe many examples and during the course of the conversation made the statement “One of my major beliefs is motivation.” Along with this he believed that students needed to “be ready to learn math”. He also expressed a belief that “the lower the level, the more important motivation can definitely be.”

Tim also believed that students in his developmental math courses were at risk of adopting a performance based goal orientation in regards to failure. For example, in his discussion about what to do when you find you are behind schedule, he replied: “It’s okay to spend more time on a topic because if you test them, they’re going to fail, and if they fail, they’re going to be unmotivated. If they’re unmotivated, you’re going to get the drops and everything else.” Tim also described how we works to foster effort instead. He regularly gives quizzes and uses them to support the homework. He shared how he asks: “did you give me an effort? If you got stuck tell me why you got stuck.”

Tim was emphatic in describing his role of coach or mentor of sorts for the students. At times he appeared to believe his role was not unlike that of a combat leader. For example, he addressed how he believes students arrive in his classroom with considerable barriers. He elaborated on the steps he takes to combat these barriers. In fact, he likened the developmental classroom to a “war zone sometimes”. A war zone “until everybody understands everybody else’s purpose.” When asked how he established rapport with students he replied:

> With developmental, there’s such a need that arises from anxiety, fear, and other things that cause a lot of toughness on the student’s part that I find that they approach me easier if I just first start off with Tim.

Later, he went on to say: “I want to be a tool for their educational goals.” His perception of how they perceive of him as in instructor also demonstrated the continued desire be a leader of some type. When asked how students perceive him he replied that students would say: “He is the one that is leading the ship, driving the bus, and had a master game plan. In the end it worked. He was the last one to give up on me.” This theme was less frequently observed in the interview with Jenna, and almost missing from the interviews with Bob and Mary.

John, on the other hand, did not believe that everyone needed to be motivated, he believed that some were already motivated when they entered the classroom. When asked what his perspective was on student work habits, he replied:

> I think some of them have very good work habits. As far as they have jobs, some of them have families that they're raising. Some of them have more than one job, and they're full time doing that and full time being a parent, full time keeping a home, and trying to still be a full time students.

John also indicated that he has quite a few students trying to balance a lifestyle like this and demonstrating motivational behaviors. He would also later indicate that he found it very important to relate course material to real life situations, such as finance and societal issues. John believed that making it real enhanced engagement in the classroom "because they can relate to this stuff more than they thought." It seemed like he may have believed that the success problem was not totally motivational, but more with an inability to understand the relevance of the material.

While he believed that many had a desire to complete the education, he also believed they may be less motivated to complete the coursework. This could explain his efforts to inspire students by providing meaning and challenge to the coursework. Jenna also believed it to be important provide meaning and challenge in the classroom through finding "things in their own jobs that they could help the other students relate."

Mary seemed to focus quite a bit on this theme. It became very apparent early on that she related on many levels with these students. Her educational pathway was a nontraditional pathway and she believed that many of the students were very much like her and could relate to her struggles. She believed that she was an inspiration for them. She described on multiple occasions how she would work to make it real. On one occasion she said: “I’ve tried to teach them that a lot of the stuff that I’m teaching in class is actually something that they did in real life.” Later she would share that it “encourages them” and “if I can relate it to everyday work, something that they do every day then it makes more sense to them.”

Mary expressed the most concern about the adversities students faced and attributed much of the students’ failures in math to a failed educational system. For example, she explained: “Some of this is for rote, they needed it and they never got it.” However, later she would indicate that many students also lacked effort. She went on to say “they have no clue what I’m talking about.” When she was asked about the students’ study habits, she replied:

> Students that are putting themselves through the college and it’s their money? They get tutoring. They ask for help. They do all the work. The ones that mom and daddy are paying? They haven’t had to really work? They don’t put out the effort.

Later she would go on to say that high school failed these students. “That somewhere along the line people just kind of pushed them off to the side.” Mary believed that many of these students may have “trouble makers” or had “learning disabilities”.

Whereas Julie and Rhonda were quite expressive about Meeting Students’ Individual Needs and facilitating student learning and acquisition of skills in the prior themes, they were less vocal when it came to inspiring and motivating students. It was very apparent that Tim, John, Jenna and Mary all believed motivation to be a critical component to successful instruction in a developmental classroom. This theme was not observed at all in Bob's data.

Student Attitudes and Perception. This theme showed congruence with student data. Unfortunately, there was only one item on the IDEA course evaluation directly related to this theme. Faculty provided rich detail about strategies they deployed to motivate and inspire students. Students rated instructors high on course evaluation data asking to what extent the instructor inspired them to set and achieve goals which really challenged them (TM 15).

Summary for Motivating and Inspiring Students. This theme provided the richest detailed faculty data. Behaviors described by faculty are descriptive of transformational leadership. Faculty believed that many students arrived in the developmental classroom lacking motivation. They believed that this was due to a variety of prior learning experiences. A significant amount of time in and outside of the classroom was dedicated to mentoring and supporting students. It was not possible to determine levels of congruence with this theme, due to a lack of related student perception data. Students did rate teachers higher on the one item asking students if their teacher inspired them to set and achieve goals. Future research studies should consider additional ways to capture student perception in regards to this theme.

Overall Summary for Research Question Two. The overall findings for this research question seem to support the anticipated outcomes for the analysis. Faculty transcripts reflecting mastery goal orientations, such as what was observed with the facilitating student learning and acquisition of skills theme were matched with higher scores on the IDEA scales. However, faculty transcripts reflecting performance goal orientations such as what was identified with the failure attribution theme were unable to be matched with lower scores on the IDEA scales due to a lack of related student perception data. The final outcome proposed for this research question was observed in the analysis. Faculty transcripts reflecting transformational leadership behaviors such as Meeting Students' Individual Needs and Motivating and Inspiring Students were matched with higher scores on the IDEA scales.

Research Question Three Findings

The findings for the third research question are detailed in this section. The third research question asked: What are the pedagogical strategies and classroom leadership behaviors exhibited by developmental math faculty who do, and do not, have high student pass rates in these courses?

Pedagogical Strategies. It is important to first mention that pass rates for these faculty, as well as for all developmental math faculty, were very low. Only Jenna, Tim, Bob, John and Julie had pass rates above the 50 percentile. Most of the strategies mentioned by faculty were directly related to motivating and providing educational supports for students. The use of computer-assisted strategies, curriculum alignment, student-faculty collaboration, frequent assessment/quizzes and student-faculty contact were identified as primary strategies used by the higher scoring faculty; however lower scoring faculty also indicated that they use these strategies. Given the minimal variation concerning pass rates, it is not possible to clearly differentiate between high scoring and low scoring faculty. What follows is a brief description of strategies that were identified in the interviews.

Computer-assisted strategies are used by all faculty. Jenna among the higher scoring faculty, described how she would “go over in detail the computer software program” students used for practice. This is a homework software that all developmental math students are required to use. She particularly liked the live chat that was available twenty-four seven for students. This was also mentioned by all other faculty as an important strategy designed to support student learning.

Alignment of curriculum with the next level course was important to a few faculty. At least it seemed to be important to cover the foundational learning outcomes necessary to bridge students to the next course. Jenna explained how she is careful to select and align her instruction by hitting the high points. The ones that “would help them learn to the next level.” While other faculty were not very articulate in describing curriculum alignment, several did indicate a desire to prepare them so that they would be successful in the subsequent class. For example, Tim said:

> The goal is give them a surviving and fighting chance, and they still got to duke it out because there’s no way that college algebra is anywhere related to the developmental math class, but if they do well in the class, I hope that is a good indicator of doing well in college algebra.

All faculty described using student work groups, student study groups and student support groups. Even faculty with the lowest student success rates. What was more evident in the higher scoring faculty was a more detailed understanding of how the students could provide alternate viewpoints to assist in student learning. For example, Jenna explained that student involvement is critical:

> Because what one person can explain, another person might explain better. It’s all about connecting. Maybe you, as the instructor, don’t connect that particular topic, but the one next to him can. Everybody has to feel comfortable with interrupting, interjecting.

Frequent formative assessment and quizzes were used by several of the faculty. Bob, also with higher course pass rates, described how he uses a classroom response system for formative assessment. Tim described the use of regular ongoing quizzes and assessments to help him understand “why they got stuck”.

All faculty explained how they work to develop opportunities for student-faculty contact. One arranged for after hours in a coffee shop. Another would arrange to meet students in the tutoring lab. Others made arrangements to meet back in offices or before or after class. All shared examples of engaging with the students during class through whole group or small group discussion. While they all described trying to create those opportunities for student-faculty contact, many did indicate that it was often difficult to make contact outside the class. Thus, it became important to make critical contact with students during class.

In the fall 2014, the college under study began implementing the Mathways curriculum. Only a few of the faculty interviewed were instructing in both the fall 2013 and the fall 2014. All participants were asked as a concluding question, if they were familiar with the Mathways Project and if they were implementing any new practices associated with it. Only three of the faculty interviewed are currently instructing a Mathways course.

All three described the project to be in the early stages and were hesitant to describe any significant advantages associated with the change in curriculum at this time. According to Bob:

> I think it's too early to tell. You see a full range of people that are able to grasp what they're trying to do and others that... Part of the problem to be quite honest, the program is pretty much in its infancy. It's got a lot of bugs in it. It's very peculiar about how you enter the answer and it's got some questions that I'll scratch my head and say, "I can't figure this out." We'll try every possible answer and none of them are right. There's something wrong with that when the instructor can't figure out what they're asking.

A similar response was noted from Julie:

> I can see it as being successful once we get all the kinks out. We're struggling a lot with the homework portal that we're using, I have 5 of my 22 students who are doing their homework. Because the quest portal that they're using is so difficult, I can't even use it half the time. So, having them, with students who struggle already, having them getting on to do their math homework when they have the correct answer, but the computer is telling them, no it's wrong, because it wants it in a certain format, that's kicking them down.

Julie continue to describe how it limited her ability to personalize her instruction. However she did end with acknowledging that "Once we get through all of our kinks and getting all of that worked out, I think it will be okay in the long run. It's just going to take, I think it's going to take several years before we're going to get there."

John was the final faculty teaching a Mathways course. John indicated that he is fully implementing the Mathways curriculum. He responded with the following when asked if he found the practices to be more successful:

> For those at my end, it is. Some of them that haven't really made that conscious decision to keep coming, maybe not as much, but the ones that buy in, yes. The ones that struggle and do the perseverance, all the things that it's based upon, they make it okay.

Classroom Leadership Behaviors. It was also difficult to distinguish differences regarding classroom leadership behaviors and successful course rates. It is still important to be mindful that only five of the faculty interviewed had scores above the 50 percentile and only two of those were above the 60 percentile.

Faculty with course pass rates among the highest, demonstrated more often and with greater detail Meeting Students’ Individual Needs for students, Motivating and Inspiring Students and idealized influence. These are all behaviors associated with transformational leadership. Faculty demonstrating Meeting Students’ Individual Needs often appeared to act as a coach or mentor, and worked hard to acquire trust, and build relationships with students. Bob, one of the top three highest course pass rates, expressed that he wanted the student “to take the initiative” to start using resources. One of his goals was to “teach them to be self-learners.

Motivating and Inspiring Students strategies were used to motivate and inspire students. Faculty worked to provide meaning and real life scenarios for students. Most faculty also worked to be a role model for students and many considered the needs of students above their own. While some believed they were a central force for moving the group forward, others felt a bit helpless, due to the lack of readiness and motivation they believed students bring to the class. These transformational leadership behaviors were not observed as frequently in the faculty with lower pass course rates and were often not observed at all.

Summary of Chapter IV

This chapter presented the findings related to the three research questions. Findings from the factor analysis and the Pearson product-moment r correlation demonstrated a positive relationship between students' attitudes and perceptions of their developmental math classroom experience and their likelihood for successful course completion. The correlation between the first factor extracted in the factor analysis and the A, B, C success rates was $r(14) = .64$, $p<.01$. The correlation between the second factor extracted in the factor analysis and the A, B, C success rates was $r(14) = .51$, $p=.04$. No significance was determined between their perception and completion rates or between the success rates and completion rates.

Findings from the qualitative analysis of the transcribed and coded interview data determined congruency between the student and faculty attitudes and perceptions of the developmental math classroom learning environment. It was particularly evident in regards to Meeting Students' Individual Needs, Motivating and Inspiring Students and facilitating student learning and acquisition of skills. It was difficult to determine congruence in regards to evaluation of criterion, failure attribution, and idealized influence. These were themes that appeared, but were not as prevalent. What appeared to be missing almost completely from the faculty data, was any mention of behaviors faculty may use to stimulate or challenge students intellectually. It appeared that the focus of these faculty was primarily centered on student readiness and struggles to motivate and support the learning process and skill acquisition.

Finally, pedagogical strategies and classroom leadership behaviors exhibited by developmental math faculty with higher student pass rates and higher scores on the IDEA course evaluation scale were identified. The pedagogical strategies identified by faculty are in direct alignment with research presented in Chapter 2. Unfortunately, due to the minimal variance in successful course rates and strategies presented, it was difficult to ascertain any significant differences between high scoring and low scoring faculty. What was noticeable is that very little mention was given to pedagogical strategies designed to help students become independent learners. Only Bob, one of the higher scoring faculty made mention that he wanted “teach them to be self-learners”. Most other faculty believed it more important for them to work together. Bob is the only faculty who mentioned the importance of communicating high expectations.

Three of the seven faculty interviewed are currently implementing Mathways. Two of the three faculty working with the project believe that it is still in a developmental state and that there are issues that still need to be addressed. One of the faculty attributed any lack of success with the curriculum to the students’ lack of buy-in. He believed that students with the perseverance to continue through the course, did well.

The developmental math faculty interviewed appeared to use behaviors associated with transformational leadership. These included idealized influence, Motivating and Inspiring Students and Meeting Students’ Individual Needs. However, what was not observed frequently were behaviors association with intellectual stimulation. There was infrequent mention of stimulating students to be creative or innovative. Emphasis seemed to focus more on remediation and college readiness issues. There was effort made to create situations where students could relate to course material, but little acknowledgement of a how they intellectually challenge or stimulate the student.

Chapter V addresses the findings from this mixed method study and their relationship to the literature surrounding developmental math education. The chapter concludes with implications of the findings to practice and policy along with recommendations for future research.

Chapter V

Discussion and Conclusion

The purpose of this study was to provide a better understanding of how student and faculty perceive the developmental math classroom experience and the potential impact on students' ability to successfully complete these courses. This chapter provides an interpretation of the findings presented in Chapter IV toward this purpose. In addition, resulting implications for developmental math education practice and policy at the course level, institutional level, and state level are discussed. This chapter closes with a general summarization of the study and concludes with recommendations for future research.

Classroom Environment

Student and Faculty Attitudes. The IDEA course evaluation survey provided a valid and reliable picture of the developmental math student experience in the classroom at TRCC. The survey is a reputable survey validated externally by the IDEA Center (Hoyt & Lee, 2002) and has undergone external reliability analysis. Student success rates at a course level provide a strong indicator of student success and are accepted measures nationally in understanding student success. Findings from the Pearson product-moment r correlation conducted in this study did establish a correlation between the two factors extracted from the IDEA course evaluation data and student success rates. This current study found that course evaluation instruments can provide insights into the student-teacher relationship and the student experience within the classroom as proposed by Rehak and McKinney (2014).

Furthermore, findings from the qualitative and quantitative analysis demonstrated congruence between faculty and student attitudes regarding the classroom experience at

TRCC. This was particularly evident in the following themes: Meeting Students' Individual Needs, Facilitating Student Learning and Acquisition of Skills, and Motivating and Inspiring Students. Faculty, in congruence with students, described transformational leadership behaviors where individual student needs were considered and supports for learning were provided. According to Bass (1985) these types of behaviors have potential to inspire, intellectually stimulate individuals to do their best, and motivate and engage the student. Perhaps of greater significance was the identification of achievement goal theory behaviors, described in the theme facilitating student learning and acquisition of skills. This is an important contribution from this study because success in developmental math is directly related to the students' ability to acquire skills, develop mastery goal orientations and develop and progress in their abilities (Meuschke, 2005).

However, what was missing from interviews of faculty was any significant description of transformational leadership behaviors to potentially intellectually stimulate students. While most faculty acknowledged the need to create situations through which students could relate to the mathematical content, they appeared to be more concerned with readiness issues. There appeared to be a greater effort made to gain the trust of the student, individualize the instruction, provide supports, and motivate the student over efforts made to intellectually stimulate and challenge the student. This is an important finding because students may adopt beliefs that have been strongly shaped by instructors (Ames, 1992a; Anderman & Midgley, 1997; Church, Elliot, & Gable, 2001; Meece, 1991; Middleton, Kaplan, & Midgley, 2004; Patrick, Anderman, Ryan, Edelin, & Midgley, 2001; Turner, Thorpe, & Meyer, 1998; Urdan & Schoenfelder, 2006). If faculty place greater importance on the fact that students in developmental math lack college readiness, they may be inadvertently conveying this to the student, and thus compromising the ability of the student to set higher level achievement goals that are critical for advancing to more rigorous college level courses.

This finding begins to extend research regarding measuring teacher quality in secondary schools with student surveys conducted by the Measure of Effective Teaching (MET) Project of the Bill & Melinda Gates Foundation to community colleges (Kane & Cantrell, 2010). The MET Project established that well-crafted student surveys have potential to inform professional development programs and can be used, along with other relevant data, to evaluate teacher effectiveness.

The MET Project used the Tripod Survey, an instrument developed by Ron Ferguson, a Harvard researcher. It was used in the project to assess the extent “to which students experience the classroom environment as engaging, demanding, and supportive of their intellectual growth” (Babriel & Allington, 2012, p. 47). Like the IDEA course evaluation survey, the Tripod Survey also are asked to give feedback on specific aspects of a teacher’s practice. The MET Project established that “student perceptions of a given teacher’s strengths and weaknesses are consistent across the different groups they teach” (Gabriel & Allington, 2012, p.47). Most importantly, this project established that “teachers have larger effects on math achievement than on achievement in reading or English language arts, at least as measured on state assessments” (Gabriel & Allington, 2012, p. 47).

Mesa (2012) found that teachers have been found to indicate a more negative perspective of the students achievement goal for students enrolled in their classes than the students themselves held. However, findings from this study only minimally support the findings. Perin (2002) found that faculty perceptions may vary based on where developmental education is situated in the college. Faculty perceptions of student achievement in a college where developmental education is centralized tend to be kinder as opposed to a college where the developmental education is integrated into the department. Therefore, it is important to note, that developmental education in the current study is centralized in one division of the college and credit math is centralized in another division of the college. This may have had some influence on the current findings.

Most faculty interviewed in the current study believed that students enrolled in developmental education experienced significant issues of motivation and needed continual supports to be successful. However, motivational levels of students were not explored in this study. No faculty interviewed ever expressed any indication of displeasure with engaging with the students in the developmental education classes. A more recent study by Ellerbe (2015) using qualitative inquiry and grounded theory techniques found that faculty participants in a community college viewed their roles as a professional challenge, rather than a burden.

Findings from the current study found that faculty interviewed were supportive of students. They provided the classroom experiences essential to student success and established rapport with students. The faculty also encouraged student involvement and fostered student collaboration. Faculty attitudes and perceptions were congruent with student perception, determined by the IDEA course evaluation instrument, and student perception correlated with student success rates. This provides great potential for understanding opportunities for professional development. However, faculty professional development is not often aligned with the results of faculty evaluation or links to class practices (Darling-Hammond, 1998; Sandholz & Scribner, 2006; Wilson & Berne, 1999).

Researchers from the Community College Research Center recently determined that most reform efforts in developmental education fail because there are not "mechanisms to identify and counteract implementation weaknesses" (Edgecombe, Cormier, Bickerstaff, & Barragan, 2013, p.1). Yet student surveys have potential to inform professional development programs and can be used, along with other relevant data, to evaluate teacher effectiveness and understand the effectiveness of developmental math reform efforts. According to Edgecombe, et al. (2013) the use of assessment data, including qualitative assessments collected through surveys or focus groups helps to understand the success of the reform efforts in an ongoing and systematic way. It can support the cultural change needed to sustain developmental education reform.

Pedagogical Strategies. This research study also begins to document what behaviors faculty used to deploy pedagogical strategies that correlate with higher levels of student success. Supplementing with computer-based instruction and curriculum alignment have been identified in the literature as successful pedagogical strategies (Casazza & Silverman, 1996; Maxwell, 1997). All faculty interviewed in this study referred to using these strategies. Computer-based instruction was deployed in the form of homework. Curriculum alignment was demonstrated by the focus of the faculty to understand the current individual level of learning for each student, careful scaffolding of learning experiences to reach what was needed for the student to succeed in the next math class. Encouraging student-faculty contact and promoting cooperation among students have also been identified as successful pedagogical strategies for developmental math students (Chickering& Gamson ,1987; Chickering & Reisser, 1993). Faculty described many examples of how they engaged with students in and out of the classroom.

These strategies also align with similar strategies identified in the MET Project. For example, the MET project identified seven constructs that are referred to as the Seven Cs. The seven Cs are: Care, Control, Clarify, Challenge, Captivate, Confer and Consolidate. The items on the seven C's were highly correlated with student success in the secondary schools. The two constructs most related to student achievement at the secondary level were Control and Challenge. Items on the Control construct reflect the ability of the faculty to impose a behavioral structure to the class that provides for the intellectual stimulation of students (Kane & Cantrell, 2010). Juxtaposed with findings from the MET project, the lack of student achievement in developmental math education at TRCC, along with the absence of notable pedagogical behaviors designed to challenge students, could explain the lower performances of students in the current study.

This has important implications for developmental education reform. Jaggars, Hodara, Cho and Xu (2015) identified potential mechanisms impacting the success of acceleration initiatives in developmental math education. Acceleration initiatives are strategies used in developmental education reform to accelerate the developmental math sequence. For example, students may take two eight week courses in a 16 week semester, rather than two courses in two sixteen week long semesters. They speculated that there were three factors associated with more successful acceleration initiatives. These were a rigorous curriculum, faculty support and supports for students (Jaggars, et. al, 2015). According to Barragan and Scott-Cormier (2013) increasing rigor in acceleration strategies can be explained as aligning the course curriculum with college-level expectations. It will also include stimulating students to problem solve and think critically.

Leadership Behaviors. This study also extends earlier research examining the impact of transformational leadership in the classroom on student effort, student perceptions of effective instruction, and satisfaction with instructors (Pounder, 2008a; Walumbwa et al., 2004). Transformational leadership behaviors observed by students and described by faculty were congruent and correlated with student success. The findings from this study support and add to other studies recommending transformational leadership due to its relationship to improved student learning outcomes and personal mastery goal orientation (Bolkan & Goodboy, 2009; Goodboy & Myers, 2008; Griffith, 2004; Harvey et al., 2003; Hoehl, 2008; Goodboy, Martin, & Bolkan, 2009; Politis, 2004; Pounder, 2008; Walumbwa et al., 2004).

Faculty demonstrating transformational leadership behaviors described classroom behaviors used that were not unlike those a coach or mentor would exhibit. They would create opportunities to personalize instruction and worked hard to acquire trust and build relationships with students, often meeting students outside of class. Those with higher success rates described how they personally believed they were a central force in moving the students forward. The findings from this study begin to address the gap in the literature in regards to understanding the types of behaviors faculty employ to communicate transformation leadership in the classroom.

According to Burns (1978) transformational leadership has potential to raise students to higher levels of motivation. Faculty interviewed expressed an opinion that many students entered the developmental classroom, lacking motivation. However, faculty also expressed an opinion that many students entered the developmental classroom highly motivated. This is an important finding. Focusing too narrowly on transformational leadership behaviors designed to increase levels of motivation, may be boring or alienating students who already have higher levels of motivation. Faculty should ensure that they are clearly providing opportunities for motivated students to be intellectually stimulated and challenged.

Achievement Goal Orientations. This current study also extends the work of Patrick et al. (2001) regarding teachers' communication of goal orientations in four fifth-grade classrooms to the community college context. Faculty in the Patrick et al (2008) study were perceived as having a high mastery focus when they spoke about learning as an active process. This was also evidenced in the practices Patrick et al. (2008) describe; student involvement was required and effort was emphasized as well as student interaction. These faculty also provided social and affective support for students. They demonstrated a concern about students learning and progress.

The findings from the current study demonstrated similar practices. Further these practices aligned with higher student success rates. What was most evident in the current study was that faculty emphasized how they support a mastery goal orientation. They provided supports in the form of tutoring, office hours, collaborative group work, and 24 hour online tutoring to ensure that students had resources needed to develop their deficit in ability. While most faculty expressed a generalized belief that students entered into higher education with a lack of ability, they believed that this was not necessarily directly due to the student's lack of effort. They believed that somehow the system of education had failed the student.

It is important that faculty realized that developmental students may be entering developmental education with low self-confidence and may need additional supports to deal with affective factors associated with prior learning experiences. Yet, it is even more important for faculty to understand that they must empower students to realize that adversity is an integral part of learning (Barragan & Scott-Cormier, 2013 & Hern & Snell, 2010). Findings from a study designed to explore student experiences with math assessment and placement identified that students have a deep lack of math confidence (Fay, Bickerstaff, & Hodara, 2013). According to Fay et al. (2013) many also have misunderstandings about how to even prepare for placement tests. Helping students develop behaviors associated with mastery achievement goal orientations offers great potential to dealing with many of the affective factors influencing the success of students in developmental math education. Many of the developmental math faculty at TRCC observed that developmental math students at TRCC lacked math confidence and sometimes lacked self-confidence. TRCC faculty explained ways in which they provided student support for the lack of self-confidence. What TRCC faculty did not expound on were ways they empower students to deal with adversity.

Implications for Community Colleges

College Readiness. Faculty interviewed, described college readiness to be largest barrier students entering developmental math education face. They described a significant lack of readiness in regards to skills and college going behaviors for most students entering developmental math education. These findings in regards to college readiness, align with the research of Strong American Schools (2008) that indicates that students entering into community colleges today are unable to demonstrate academic preparedness. College readiness is a significant problem that must be addressed first if developmental education reforms are to be successful at any significant levels. What this means is that community colleges must work rigorously hand in hand with primary, middle schools and secondary schools to build strong pathways and college going behaviors.

According to Smittle (2003) students entering developmental education often have unique challenges associated with providing effective instruction in developmental education. They not only lack the essential skills necessary to succeed, they also often have additional adult responsibilities that impact their time and other resources. Most TRCC faculty interviewed believed that this was a significant factor for many of the students in their classes. Community colleges should consider partnering with local business and industry to develop pathways for students that merge the adult responsibilities with their college pathways. An example of a collaboration between Kentucky-based business, government and postsecondary institutions resulted in the development of a Metropolitan College. Students entering college through the partnership work as a part-time UPS overnight employee while attending school. They are provided 100% undergraduate tuition, book reimbursement, academic and graduation bonuses, health insurance, time off and student support at work and at school (The Aspen Institute, 2015).

Indiana University (Indiana University, 2015) provides another example of a P-16 partnership. The university has established a P-16 Center. The center has multiple purposes. It is focused on improving college access and success, especially in underrepresented populations. Pre-college preparation and transitions to college are strengthened. Faculty and staff work to develop school-university partnerships and bring together business and industry along with educational partners to improve education.

Given the continued dismal success in developmental math education and the growing need to staff a skilled workforce, it is important to also include stakeholders from the workforce segment in the critical work of college readiness. Chory and MCroskey (1999) conceptualized the classroom as an organization operating in similar ways to a workplace environment. Yet, many times, education remains isolated from the workplace environment.

Professional Development. Effective pedagogical practices and leadership behaviors leading to successful developmental math outcomes have been identified in the literature. This study along with the MET Project found that course evaluation, routinely administered, provides critical feedback to understanding these pedagogical practices and leadership behaviors. This provides a rich opportunity for community college administrators and faculty to begin the hard work of better using course evaluation data to "assess the effectiveness of interventions at a course level and provides opportunities to develop and implement targeted improvement plans" (Rehak & McKinney, 2014, p.6). This type of formative evaluation has been linked to successful developmental education outcomes (Boylan, Bliss, & Bonham, 1997; McCabe, 2000). This may require that administrators and faculty receive professional development first focused on assessment in order to interpret course evaluation data meaningfully, understand what pedagogy and leadership behaviors are needed, and subsequently understand how to develop targeted improvement plans.

While faculty implementing the new Mathways Project, a project designed to accelerate students to complete a college-level math course more quickly, acknowledged that the project has potential to support student success, they recognized that there were problems associated with implementing new pedagogical practices and that time was needed to fully understand the changes. The Mathways Project facilitator, The Charles A. Dana Center, recently released a report acknowledging that they are now moving towards what they call the second and third prong of implementation. These prongs are designed to “provide implementation guides, data tools and advising materials to assist colleges in scaling up multiple math pathways” (p.4). In addition, they are focusing on cross-institutional reform designed to ensure that they pathways created in the community colleges are aligned with university pathways (Rutschow & Diamond, 2015). The Dana Center has also recently added additional professional development opportunities.

Initiatives such as the College Readiness Assignments for Texas (CRAfT) provides great curriculum redesign opportunities and should be supported and promoted widely as a professional development tool (CRAfT, 2015). CRAfT is a collaborative effort supported by The University of Texas at Austin and sustained through a grant from the Texas Higher Education Coordinating Board. Secondary school instructors and higher education professors collaborated to develop College Readiness Assignments. These assignments are directly in alignment with the Texas College and Career Readiness Assignments.

Faculty at TRCC implementing the new Mathways curriculum described a bit of confusion and frustration with some of the assignments and believed that it would take some time to work out the kinks in the implementation. Community colleges should spend considerable time on professional development regarding change initiatives before full implementation. It is critical that faculty understand curriculum changes and what behaviors are needed to fully implement the practices successfully. Assessment supports are also needed to understand the effectiveness of the changes at the course level and institutional level. It is very important that assessment and evaluation be an integral part of any developmental education reform effort in order to refine and then scale the change. It is equally important to help faculty and administrators interpret data and understand how to develop responsive action plans (Edgecombe, et al., 2013). According to Rehak and McKinney (2014) community college institutional researchers are well-positioned to support faculty in interpreting and analyzing student success data along with course evaluation data.

Developmental Math Reform

It is evident that developmental math reform is not a localized problem and therefore, is impossible to handle at a local level. Community colleges and universities will not likely be able to reform developmental education by themselves. Initiatives such as the Mathways Project, instituted by the Dana Center, are not likely to succeed long term without a platform of associated reform efforts. Students will continue to enter postsecondary education lacking college readiness skills and behaviors unless major reform efforts are implemented and sustained throughout the entire educational pipeline.

Vertical reform efforts, such as the Academic Vertical Alignment Training and Renewal (AVATAR) initiative, currently funded by the Texas Higher Education Coordinating Board and implemented under the leadership of the North Texas Regional P-16 Council and the University of North Texas, have potential to reduce college readiness issues such as described by the developmental education faculty at TRCC. The AVATAR model, as implemented in Texas, provides a model for creating sustained networks of vertical and horizontal alignment. The networks of secondary and postsecondary institutions help support college readiness and completion for students preparing for higher education and career. TRCC developmental education faculty described a significant disconnect between secondary and post-secondary education curriculum. Vertical alignment of curriculum between secondary and post-secondary institutions has potential to reconnect the pathways.

Advancement Via Individual Determination (AVID) is a strategy that was initially implemented in secondary education, and is another example of a curriculum reform effort that has potential to cross boundaries (Watt, Butcher & Ramirez, 2013). This strategy emphasizes rigor, while providing opportunity to scaffold learning. It is associated with constructivist learning theory. Recently, it has started emerging in higher education. According to Cuseo (2010) AVID in higher education includes extensive professional development for instructors, academic and social supports, collaborative tutoring and teams from across the campus working together. The Texas Higher Education Coordinating Board has also supported this effort, in partnership with the AVID Center. The purpose of their collaboration between community colleges and universities was to improved student success in first-generation, college-going students.

While reform efforts occurring only in higher education institutions have provided only minimal results in making any significant impact on student success at this time, there have been some successes. The Community College Research Center's Scaling Innovation project (Edgecombe, et al., 2013) identified examples of current developmental education reforms. All of the reform efforts have merit and potential to address the problems identified in this current study. Reforms most frequently noted in their scan included compression, learning communities or linked courses and modularization. Compression is a type of acceleration that allows students to complete multiple courses in a developmental education sequence in a single semester. Learning communities or linked courses require cohorts of students to travel through a sequence of courses together. Modularization is a more individualized remediation that may use an adaptive software that allows students to progress based on their skill acquisition.

Other types of reform efforts include boot camps that prepare students to take or retake a placement exam, contextualization which integrates the developmental skills into discipline or career specific content and curricular redesign where course content is aligned with college-level expectations. Two others that appear to be gaining in momentum include mainstreaming and skip and jump. Mainstreaming places students directly into college-level courses and provides additional supports such as extra lab hours and companion courses. Skip and jump is akin to competency based education where students are allowed to skip some developmental course requirements if they demonstrate that they have mastered the learning objectives for the skipped course and/or content.

Edgecombe, et al. (2013) discovered that while the different reform efforts provide opportunities for colleges and universities to select and tailor the reform to identified need, there were still many challenges that affected the actual implementation. A major obstacle noted in their research is that some colleges were unable to clearly identify what was impeding student performance and persistence due to limited analytic capacity. A second concern noted by Edgecombe, et al. (2013) is that many of the reform efforts were directly in response to cost efficiency or financial concerns. Care should be taken to ensure that important cost intensive services related to the developmental reform efforts are not cut when the reforms are implemented.

Many states have recently started legislating policies driving developmental reform. For example, Florida enacted Senate Bill 1720 which allows students to decide if they want to enroll in developmental education. Early studies by the Center for Postsecondary Success (Park, 2015) explored enrollment patterns and choice factors students use to make course enrollment decisions when allowed to opt out of the developmental education sequence. Preliminary findings indicate that 42% of students who were advised to take developmental math education enrolled in a developmental education course compared to 31.4% enrolling in a writing course and only 7.9% enrolled in a reading course. What may be even more revealing is that when students were advised that they needed to take a developmental math course, 35.6% of the students did not enroll in any math intensive course. Only 22.4% of the students who were advised to enroll in a developmental math course actually enrolled in a college-level math course. Delaying entering a math course could be just as significant a barrier for the student as attempting to make it through the developmental math course sequence. The current study similarly revealed that many students were delaying enrollment in developmental math coursework.

Edgecombe, et al. (2013) found cost efficiency or financial concerns, legislative mandates and a desire to respond to grant opportunities as the primary catalyst driving most developmental education reforms. What was even more alarming is that reform efforts appeared to be most often implemented with very little real assessment and evaluation to determine the real underlying obstacles to student success. Developmental education faculty at TRCC all talked about using standardized test and standardized curriculum with the new Mathways project implementation. There were at times concern that the curriculum and associated strategies, did not always allow faculty to differentiate instruction as they had in the past.

Academic preparedness and student motivation were described by Edgecombe et al. (2013) as primary factors by many of the participants in the study, yet, there were no measures used to understand these constructs. Others used indicators such as overall pass rates or graduation rates to understand successes in developmental education. Colleges and universities should work carefully to refine assessment and evaluation processes to ensure that the most appropriate types of reform efforts are implemented.

Recommendations emerging from the Edgecombe et al. (2013) study include a set of processes designed to steer reform efforts and strengthen organizational capacity. This framework includes a robust diagnostic and selection process. Preparation processes include activities that are inclusive and broadly extended. During an adaptation state assessment, refinement and scaling occurs. This framework has great potential to affect the type of change needed in higher education developmental math education.

Finally, if developmental math education reform is to be successful, it will require a legislative commitment to fund, support and sustain reform efforts. It will require a shift in culture from silos of education to collaborative and linked pathways. The problems associated with the completion agenda are not unique to higher education. Clearly, this current study and a supporting body of literature has demonstrated that this a community problem that must involve all stakeholders with a vested interest in education.

Future Research

The findings of this mixed method study make a valuable and timely contribution to the field of higher education in community colleges and to the completion agenda. This section provides a general discussion of recommendations for future research, for practitioners and administrators in higher education, and for all stakeholders with a vested interest in student success.

First, given the limitations of the quantitative analysis and the fact that a moderate correlation was identified between student perceptions of a developmental math course, the first recommendation is that ways be identified to collect student course evaluation data at the individual student level. According to the Kane and Cantrell (2010), one of the three fundamental principles of the MET Project is to require additional components of an evaluation, such as student perception data be related to student achievement. Using student perception data to help clearly diagnose the underlying variables impacting student success in developmental math education was also recommended by Edgecombe, et al. (2013). However, it is important to understand the student demographics along with student perception data. More research is needed to completely understand the relationship between student and faculty attitudes.

Second, course evaluations are routinely administered and have potential to add to the understanding of the quality of instruction and the effectiveness of developmental math education reform interventions. They also have great potential to provide formative assessment feedback. The primary purpose of course evaluations are to inform professional development. The second recommendation concerns the need for practices and policies to include valid and reliable course evaluation instruments, based on proven effective leadership and pedagogical practices, in evaluation procedures. These evaluation procedures should inform professional development and staffing decisions at an institution, but should not be used exclusively to understand the context or effectiveness of a developmental math classroom.

The third recommendation concerns professional development. Findings from this study demonstrated that student success rates increased when faculty demonstrated behaviors associated with transformational leadership and a mastery goal orientation. Embedding a faculty leadership component into professional development for developmental math faculty, drawn from transformational leadership theory and achievement goal theory, has potential to improve student success. More research is needed to understand the full impact of transformational leadership in the developmental math classroom.

A fourth recommendation is for continued research in community colleges in higher education in regards to the impact of individual faculty on student success in developmental math education. There is a gap in the literature in regards to individual differences in faculty practices, faculty leadership and faculty perception in regards to the developmental math classroom. Faculty are at the heart of change initiatives and have potential to have the greatest impact on students and more must be known.

Conclusion

It is well documented that significant numbers of students are entering college unprepared, with financial challenges and are not succeeding for a variety of reasons.

Developmental mathematics, specifically, has become a primary barrier for many students wishing to complete a post-secondary degree (Achieving the Dream, 2006; Bailey, 2009 and Stigler, Givvin, Thompson, 2010).This present study adds to existing literature demonstrating that teacher behaviors inside the classroom play an important role in shaping students' learning in mathematics (Gabriel & Allington, 2012). Transformative leadership in the classroom has the potential to empower, motivate and help students navigate through the war zone many students lacking essential college readiness skills face.

A completion agenda is primed for failure if the extent and depth of the problems associated with developmental math education are not recognized and responsive reform efforts immediately identified, implemented and sustained. The nation is at risk of an imminent significant impact to the economy. More research is needed to understand how to effectively select and implement reform efforts such as those employed by the Dana Center Mathways Project, AVID, AVATAR, CRAfT and the Indiana P-16 partnership. These efforts have potential to inform and shape a cultural shift in educational pathways. However, there is even a greater gap in understanding how to sustain effective change. Studies such as the Community College Research Center's Scaling Innovation project (Edgecombe, et al., 2013) provide great insight into how community colleges and universities can maximize and sustain the impact of developmental math education reform.

Given the decades of dismal success in developmental math education, increasing financial student debt and marginal completion rates, it is critical that legislators, community members, administrators and faculty band together and begin the hard work to reform educational pathways to completion. This study contributes vital information and processes stakeholders can use to assist in the rigorous reform work needed to help students in developmental math education persist to completion.

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Appendix A

IDEA Teaching Approaches and Teaching Methods

IDEA Teaching Approaches and Teaching Methods

According to Hoyt and Lee (2002, p. 1):

"Stimulating Student Interest. Those who score high on this scale spend time and effort enlisting student interest and curiosity. They seek to establish an atmosphere that gets students excited about the subject matter.

4. Demonstrated the importance and significance of the subject matter
8. Stimulated students to intellectual effort beyond that required by most courses
13. Introduced stimulating ideas about the subject
15. Inspired students to set and achieve goals which really challenged them

Fostering Student Collaboration. Faculty scoring high on this scale find ways for students to learn from each other. They establish an atmosphere that capitalizes on the adage that "the best way to learn something is to teach it."

5. Formed "teams" or "discussion groups" to facilitate learning
16. Asked students to share ideas and experiences with others whose backgrounds and viewpoints differ from their own
18. Asked students to help each other understand ideas or concepts

Establishing Rapport. Those scoring high on this scale communicate caring through the relationships they establish with their students. By displaying their concern for how well students are learning, such instructors create an atmosphere that encourages student effort and commitment.

1. Displayed a personal interest in students and their learning
2. Found ways to help students answer their own questions
7. Explained the reasons for criticisms of students' academic performance
20. Encouraged student-faculty interaction outside of class (office visits, phone calls, e-mail, etc.)

Encouraging Student Involvement. High scores indicate that the faculty member encourages students to become personally involved/identified with the subject matter. The classroom atmosphere they establish places more emphasis on problem solving than on acquiring information.

9. Encouraged students to use multiple resources (e.g., data banks, library holdings, outside experts) to improve understanding
11. Related course material to real life situations
14. Involved students in "hands on" projects such as research, case studies, or "real life" activities
19. Gave projects, tests, or assignments that required original or creative thinking

Structuring Classroom Experiences. High scores are characteristic of teachers who organize and plan their classes in ways that facilitate student learning. The atmosphere reflects the instructor's commitment to clear communication of both subject matter and his/her expectations.

3. Scheduled course work (class activities, tests, projects) in ways which encouraged students to stay up-to-date in their work
6. Made it clear how each topic fit into the course
10. Explained course material clearly and concisely
12. Gave tests, projects, etc. that covered the most important points of the course
17. Provided timely and frequent feedback on tests, reports, projects, etc. to help students improve."

Appendix B

Interview Protocol for the Math Developmental Education Faculty

Dear Colleague,
I would like to inform you about a Doctoral Dissertation study being conducted by as part of the program in the Department of Educational Psychology at the University of Houston, Main Campus. This study has been reviewed by the University of Houston Committee for the Protection of Human Subjects; for information contact (713) 743-9204.

The goal of this study is to develop an integrated understanding of the faculty and student experience in a developmental math classroom. The study has also been approved by CTMSCC administration. All faculty who taught a developmental math course in the fall 2013 academic semester, is requested to participate in an interview for this study. Your contribution to this study would be immeasurable to our understanding of the developmental math classroom context.

A poll has been created for scheduling and may accessed from this location: Interviews will last approximately 45 minutes to one-hour and will take place at a location and time of your convenience. Information obtained from the interviews will not use either your name or the names of anyone you mention. I will attempt to provide as near to anonymity as possible. The goal of the interview is to gather a collection of themes in the experiences of developmental education faculty and students and not to look at individual faculty.

Interviews are expected to be completed by ___________.

What is of most interest to this study is the types of pedagogical strategies and instructional behaviors engaged in by faculty in the classroom. Participation in any portion of this study is strictly voluntarily and there is no penalty for not participating in this study. You will be asked to sign informed consent forms prior to the start of the interview.

Please confirm a date and time that fits your schedule by accessing this link___________.

Sincerely,
Patricia A. Rehak
Doctoral Candidate, EPSYID - Higher Education
University of Houston

Interview Protocal
Understanding Differences Between Faculty and Students in a Community College Developmental Education Classroom: A Case Study of Student Experiences and Success at a Texas Community College.

Pre-Interview Questions:

Thank you so much for taking time out of your busy schedule to work with me. A quick reminder that the purpose of this study is to understand differences between faculty and student experiences in a developmental math classroom.

Background Questions

1. Are you a full time or part time faculty member? How long have you been teaching for Victoria College?

2. What developmental math courses in higher education have you instructed?

3. Have you ever instructed any other courses in higher education?

4. Have you ever taught math in a secondary or elementary school?

Establishing Rapport & Structuring Classroom Experiences (IDEA)/Charisma & Meeting Students' Individual Needs (Transformational Leadership)

5. How do you go about establishing rapport with students in your developmental education classroom?

6. Are there any practices you use to help you get to know your students?

7. What is your perspective on student work habits?

8. Do you use any strategies to help students from falling behind or to be successful?

9. How do you encourage independent learning?

10. How important is it to you to cover everything in the book? What do you if you find you are falling behind schedule?

11. What are the two most important goals you have for your students?

Fostering Student Collaboration, Encouraging Student Involvement (IDEA)/Intellectual Stimulation (Transformational Leadership)

12. How do you encourage student involvement in the classroom? Do you believe that this is important to the learning process?

13. What strategies, if any, do you use to encourage student involvement out of the classroom?

14. Can you describe the types of assignments and tests you use in your course? If you instruct more than one type of developmental math course can you explain any differences between them in regards to assignments and tests?

15. How often would you say students work collaboratively or in teams in your classroom?

16. How important do you believe it is to relate course material to real life situations?

Concluding Questions:

17. How would you describe the climate or atmosphere within your developmental math classrooms?

18. How do you think students perceive you as an instructor? Can you offer some examples to support your view?

19. Currently, the nation is struggling with success rates in developmental math classes. What do you think are the primary reasons why many students don’t succeed in Dev Math?

20. Are you familiar with the Mathways Project? If so, are you implementing any new practices associated with it? In your opinion, are you finding these practices to be more successful?

Appendix C

Theoretical Framework Patterns

Goal Theory Components:

Characteristics	Mastery goal	Performance goal
Failure attribution	Lack of effort	Lack of ability
Challengeable task	Pursues challenges	Avoids challenges
Reason for engagement	Intrinsic motivation and mastery desired	Demonstrating comparable competence
Evaluation criterion	Evaluation of progress towards reaching goals; sets individual goals	Normative and social comparison
Facilitating student learning and acquisition of skills	Mastery, creativity, innovation, skill acquisition, progress, development of ability	Competence; High achievement

Transformation Leadership Components:

Component	Description
Idealized Influence	Behavior leads them to be a role model for followers. They consider the needs of others over their personal needs. High standards and central force for moving group forward.
Motivating and Inspiring Students	Motivate and inspire those around them. Provide meaning and challenge to followers. Display enthusiasm and optimism.
Intellectual Stimulation	Stimulate followers' efforts to be creative and innovate. Question assumptions and reframe problems. Open to change. Tries to get followers to think and stimulates discussions.
Meeting Students' Individual Needs	Consideration given to individual needs and often acts as a coach or mentor. Provides supports for learning. Communicates effectively and personalizes interactions. Acquires trust.

Appendix D

TRCC Developmental Math Education Student Success and Completion Rates at TRCC

Sections Taught	Total Students	ABC Rates	Completion Rates
Instructor One (PT):	47 Total	27.7%	80.85%
Section 1(0301):	26	27%	80.8%
Section 2(0303):	21	28.6%	81%
Instructor Two(PT):	45 Total	53.3%	82.2%
Section 1(0301):	28	42.9%	75%
Section 2(0303):	17	70.6%	94.1%
Instructor Three(FT):	73 Total	63%	93.2%
Section 1(0303):	35	65.7%	88.6%
Section 2(0303):	6	66.7%	100%
Section 3(0301):	32	59.4%	96.9%
Instructor Four(FT):	125 Total	58.4%	88.8%
Section 1(0301):	37	54.1%	86.5%
Section 2(0303):	28	50%	89.3%
Section 3(0303):	32	59.4%	87.5%
Section 4(0301):	11	81.8%	90.9%
Section 5(0301):	17	64.7%	94.1%
Instructor Five (PT):	57 Total	57.9%	91.2%
Section 1(0300):	28	78.6%	89.3%
Section 2(0301):	29	37.9%	93.1%
Instructor Six(PT):	27 Total	44.4%	88.9%
Section 1(0300):	11	81.9%	100%
Section 2(0301):	16	18.8%	81.3%
Instructor Seven:	22 Total	81.8%	95.5%
Section 1(0300):	22	81.8%	95.5%
Instructor Eight(FT):	118 Total	56.8%	89%
Section 1(0301):	22	63.6%	90.9%
Section 2(0300):	33	75.8%	100%
Section 3(0303):	25	44%	76%
Section 4(0301):	26	46.2%	80.1%
Section 5(0301):	12	41.7%	100%
Instructor Nine (PT):	22 Total	54.6%	72.7%
Section 1(0300):	22	54.6%	72.7%
Instructor Ten (PT):	15 Total	53.3%	86.7%
Section 1(0301):	15	53.3%	86.7%
Instructor Eleven(PT):	43 Total	67.4%	81.4%
Section 1(0300):	18	83.3%	88.9%
Section 2(0301):	25	56%	76%
Instructor Twelve (PT):	42 Total	59.5%	83.3%
Section 1(0301):	25	60%	88%
Section 2(0303):	17	58.8%	76.5%
Instructor Thirteen(PT):	8 Total	37.5%	87.5%
Section 1(0303):	8	37.5%	87.5%
Instructor Fourteen (PT):	30	76.7%	96.7%
Section 1(0300):	22	72.7%	95.5%
Section 2(0301):	8	87.5%	100%
Instructor Fifteen (PT):	14 Total	50%	92.9%
Section 1(0301):	14	50%	92.9%
Instructor Sixteen(PT):	19 Total	31.6%	94.7%
Section 1(0301):	10	30%	90%
Section 2(0303):	9	33.3%	100%
Instructor Seventeen(PT):	26 Total	34.6%	73.1%
Section 1(0303):	15	33.3%	80%
Section 2(0303):	11	36.4%	63.6%
Grand Total 0300:	156	75%	91.7%
Grand Total 0301:	356	50.6%	87.4%
Grand Total 0303:	230	51.3%	84.8%
Grand Total All DM:	742	55.9%	87.5%

Appendix E

Individual Faculty IDEA Results

Instructor	Overall IDEA	Scale 1	Scale 2	ABC Mean	Completion Mean
Tim	89.0	42.6	46.4	63.0	93.2
Bob	87.4	41.6	45.1	57.9	91.2
Rhonda	92.5	42.7	49.6	44.4	88.9
Jenna	87.8	41.9	45.1	81.8	95.5
John	88.4	42.5	45.9	56.8	89.0
Julie	97.3	43.7	53.6	53.3	86.7
Mary	85.3	39.9	46.3	34.6	73.1
8	78.0	38.0	40.3	27.7	80.9
9	88.3	42.0	45.9	53.3	82.2
10	83.8	40.5	43.3	58.4	88.8
11	87.9	42.3	43.5	54.6	72.7
12	87.9	41.3	46.6	67.4	81.4
13	92.0	44.2	46.8	59.5	83.3
14	82.3	41.5	40.8	37.5	87.5
15	90.2	43.0	47.3	76.7	96.7
16	85.2	41.4	47.3	50.0	92.9
17	78.9	39.3	39.4	31.6	94.7

Factor 1:

Instructor	Overall IDEA	Scale 1	TM1 (A)	TM2 (B)	TM3 (C)	TM4 (D)	TM6 (F)	TM9 (I)	TM10 (J)	TM12 (L)	TM17 (Q)
Tim	89.0	42.6	4.9	4.7	4.7	4.8	4.5	4.6	4.8	4.8	4.8
Bob	87.4	41.6	4.8	4.7	4.5	4.6	4.6	4.3	4.8	4.7	4.7
Rhonda	92.5	42.7	4.9	4.7	4.6	4.9	4.8	4.6	4.9	4.9	4.8
Jenna	87.8	41.9	4.7	4.9	4.2	4.7	4.8	4.3	4.9	4.7	4.8
John	88.4	42.5	4.9	4.8	4.6	4.7	4.7	4.5	4.8	4.9	4.7
Julie	97.3	43.7	4.9	4.9	4.9	4.8	4.8	4.8	4.8	4.8	4.9
Mary	85.3	39.9	4.6	4.4	4.7	4.7	4.3	4.0	4.4	4.6	4.4
8	78.0	38.0	4.4	4.4	4.4	4.2	4.2	3.7	4.0	4.5	4.2
9	88.3	42.0	4.7	4.7	4.5	4.7	4.5	4.5	4.7	4.7	4.6
10	83.8	40.5	4.5	4.6	4.6	4.6	4.4	4.2	4.5	4.7	4.5
11	87.9	42.3	4.8	4.7	4.3	4.7	4.9	4.6	4.8	4.8	4.7
12	87.9	41.3	4.8	4.6	4.6	4.7	4.7	4.2	4.7	4.6	4.6
13	92.0	44.2	4.9	4.9	4.9	4.9	4.9	4.8	5.0	4.9	4.9
14	82.3	41.5	4.7	4.7	5.0	4.3	4.3	4.8	5.0	5.0	4.5
15	90.2	43.0	5.0	4.7	4.9	4.8	4.8	4.3	5.0	4.8	4.9
16	85.2	41.4	4.3	4.7	4.7	4.8	4.3	4.7	4.6	4.8	4.7
17	78.9	39.3	4.7	4.4	4.4	4.4	3.9	4.4	4.0	4.5	4.8

Factor 2:

Instructor	Overall IDEA	Scale 2	TM 5 (E)	TM 7 (G)	TM 8 (H)	TM 11 (K)	TM 13 (M)	TM 14 (N)	TM 15 (O)	TM 16 (P)	TM 18 (R)	TM 19 (S)	TM 20 (T)
Tim	89.0	46.4	3.6	4.5	4.5	4.7	4.6	3.4	4.4	3.6	4.4	4.3	4.6
Bob	87.4	45.1	3.6	4.1	4.6	4.2	4.5	4.0	4.3	3.9	4.3	4.1	4.4
Rhonda	92.5	49.6	4.4	4.6	4.7	4.7	4.6	4.2	4.6	4.5	4.7	4.1	4.6
Jenna	87.8	45.1	3.6	4.2	4.0	4.7	4.2	3.6	4.2	4.3	4.2	4.2	4.7
John	88.4	45.9	3.5	4.2	4.5	4.4	4.6	3.5	4.4	4.0	4.3	4.1	4.4
Julie	97.3	53.6	4.8	4.8	4.8	4.8	4.9	4.9	4.9	4.9	4.8	4.9	4.8
Mary	85.3	46.3	4.6	4.3	4.4	4.4	3.7	3.7	4.1	3.7	4.3	3.7	4.1
8	78.0	40.3	2.9	4.1	4.1	3.4	4.0	3.2	3.7	3.5	3.7	3.5	4.1
9	88.3	45.9	4.0	4.2	4.6	4.3	4.4	3.7	4.2	4.1	4.6	4.2	4.5
10	83.8	43.3	3.2	3.9	4.3	4.0	4.2	3.5	4.2	3.6	4.1	4.0	4.3
11	87.9	43.5	3.2	4.6	5.6	4.9	4.5	3.5	4.4	4.0	4.3	4.3	4.3
12	87.9	46.6	3.8	4.5	4.2	4.3	4.4	4.1	4.1	4.1	4.6	4.5	4.3
13	92.0	46.8	3.7	4.5	4.7	4.3	4.7	3.8	4.6	3.8	4.3	4.5	4.9
14	82.3	40.8	2.5	3.7	4.5	3.7	4.5	3.2	4.0	3.2	4.0	3.2	4.5
15	90.2	47.3	4.1	4.4	4.6	4.4	4.6	4.0	4.6	3.9	4.2	4.7	4.0
16	85.2	47.3	3.3	3.9	4.3	4.2	4.7	3.2	4.3	3.6	3.8	3.9	4.6
17	78.9	39.4	3.6	3.6	3.6	3.6	3.6	3.1	3.7	3.1	3.6	3.4	4.5

Appendix F

A Pearson product-moment r correlation SPSS output

Pearson Correlation Output:

		scale2	abc	completion
scale2	Pearson Correlation	1	.510*	.063
	Sig. (2-tailed)		.044	.817
	Sum of Squares and Cross-products	117.454	329.941	19.630
	Covariance	7.830	21.996	1.309
	N	16	16	16
abc	Pearson Correlation	.510*	1	.378
	Sig. (2-tailed)	.044		.149
	Sum of Squares and Cross-products	329.941	3567.580	650.388
	Covariance	21.996	237.839	43.359
	N	16	16	16
completion	Pearson Correlation	.063	.378	1
	Sig. (2-tailed)	.817	.149	
	Sum of Squares and Cross-products	19.630	650.388	831.232
	Covariance	1.309	43.359	55.415
	N	16	16	16
tm1	Pearson Correlation	.390	.470	.105
	Sig. (2-tailed)	.135	.066	.699
	Sum of Squares and Cross-products	3.024	20.085	2.164
	Covariance	.202	1.339	.144
	N	16	16	16
tm2	Pearson Correlation	.513*	.717**	.240
	Sig. (2-tailed)	.042	.002	.370
	Sum of Squares and Cross-products	3.418	26.343	4.261
	Covariance	.228	1.756	.284
	N	16	16	16
tm3	Pearson Correlation	.258	-.028	.074
	Sig. (2-tailed)	.334	.918	.786
	Sum of Squares and Cross-products	2.280	-1.360	1.732
	Covariance	.152	-.091	.115
	N	16	16	16
tm4	Pearson Correlation	.907**	.554*	.052
	Sig. (2-tailed)	.000	.026	.848
	Sum of Squares and Cross-products	7.671	25.808	1.176
	Covariance	.511	1.721	.078
	N	16	16	16
tm5	Pearson Correlation	.685**	.182	-.065
	Sig. (2-tailed)	.003	.501	.811
	Sum of Squares and Cross-products	14.918	21.796	-3.759
	Covariance	.995	1.453	-.251
	N	16	16	16
tm6	Pearson Correlation	.651**	.721**	-.072
	Sig. (2-tailed)	.006	.002	.790
	Sum of Squares and Cross-products	7.895	48.177	-2.328
	Covariance	.526	3.212	-.155
	N	16	16	16
tm7	Pearson Correlation	.702**	.433	-.340
	Sig. (2-tailed)	.002	.094	.197
	Sum of Squares and Cross-products	9.137	31.023	-11.783
	Covariance	.609	2.068	-.786

	N	16	16	16
tm8	Pearson Correlation	.338	.149	-.499*
	Sig. (2-tailed)	.200	.582	.049
	Sum of Squares and Cross-products	5.982	14.530	-23.500
	Covariance	.399	.969	-1.567
	N	16	16	16
tm9	Pearson Correlation	.213	.150	.203
	Sig. (2-tailed)	.427	.579	.452
	Sum of Squares and Cross-products	2.674	10.359	6.754
	Covariance	.178	.691	.450
	N	16	16	16
tm10	Pearson Correlation	.570*	.640**	.151
	Sig. (2-tailed)	.021	.008	.577
	Sum of Squares and Cross-products	7.176	44.389	5.055
	Covariance	.478	2.959	.337
	N	16	16	16
tm11	Pearson Correlation	.737**	.596*	-.107
	Sig. (2-tailed)	.001	.015	.693
	Sum of Squares and Cross-products	13.114	58.408	-5.074
	Covariance	.874	3.894	-.338
	N	16	16	16
tm12	Pearson Correlation	.335	.218	.142
	Sig. (2-tailed)	.204	.417	.601
	Sum of Squares and Cross-products	1.996	7.159	2.244
	Covariance	.133	.477	.150
	N	16	16	16
tm13	Pearson Correlation	.583*	.498*	.184
	Sig. (2-tailed)	.018	.050	.496
	Sum of Squares and Cross-products	8.194	38.587	6.864
	Covariance	.546	2.572	.458
	N	16	16	16
tm14	Pearson Correlation	.744**	.450	-.097
	Sig. (2-tailed)	.001	.080	.721
	Sum of Squares and Cross-products	10.753	35.861	-3.730
	Covariance	.717	2.391	-.249
	N	16	16	16
tm15	Pearson Correlation	.811**	.602*	.081
	Sig. (2-tailed)	.000	.014	.766
	Sum of Squares and Cross-products	9.210	37.685	2.441
	Covariance	.614	2.512	.163
	N	16	16	16
tm16	Pearson Correlation	.712**	.535*	-.109
	Sig. (2-tailed)	.002	.033	.687
	Sum of Squares and Cross-products	11.323	46.896	-4.622
	Covariance	.755	3.126	-.308
	N	16	16	16
tm17	Pearson Correlation	.473	.585*	.507*
	Sig. (2-tailed)	.064	.017	.045
	Sum of Squares and Cross-products	3.825	26.058	10.895
	Covariance	.255	1.737	.726

	N	16	16	16
tm18	Pearson Correlation	.728**	.462	-.222
	Sig. (2-tailed)	.001	.071	.409
	Sum of Squares and Cross-products	9.541	33.382	-7.730
	Covariance	.636	2.225	-.515
	N	16	16	16
tm19	Pearson Correlation	.710**	.835**	.068
	Sig. (2-tailed)	.002	.000	.804
	Sum of Squares and Cross-products	12.253	79.397	3.101
	Covariance	.817	5.293	.207
	N	16	16	16
tm20	Pearson Correlation	.143	.111	.255
	Sig. (2-tailed)	.597	.683	.340
	Sum of Squares and Cross-products	1.421	6.067	6.748
	Covariance	.095	.404	.450
	N	16	16	16
scale1	Pearson Correlation	.679**	.636**	.175
	Sig. (2-tailed)	.004	.008	.518
	Sum of Squares and Cross-products	43.223	223.405	29.584
	Covariance	2.882	14.894	1.972
	N	16	16	16
*. Correlation is significant at the 0.05 level (2-tailed).				
**. Correlation is significant at the 0.01 level (2-tailed).				

Appendix F

University of Houston Institutional Review Board Consent

UNIVERSITY of HOUSTON
DIVISION OF RESEARCH

February 6, 2015

Patricia Rehak
Educational Psychology

Dear Patricia Rehak,

The University of Houston's Institutional Review Board, Committee for the Protection of Human Subjects(1) reviewed your research proposal entitled ""Inside the Community College Developmental Math Classroom: Understanding the Differences Between Faculty and Students' Attitudes and Experiences," on December 19, 2014, according to federal regulations and institutional policies and procedures.

At that time, your project was granted approval contingent upon your agreement to modify your protocol as stipulated by the Committee. The changes you have made adequately fulfill the requested contingencies, and your project is now **APPROVED**.

- **Approval Date: February 6, 2015**
- **Expiration Date: February 5, 2016**

As required by federal regulations governing research in human subjects, research procedures (including recruitment, informed consent, intervention, data collection or data analysis) may not be conducted after the expiration date.

To ensure that no lapse in approval or ongoing research occurs, please ensure that your protocol is resubmitted in RAMP for renewal by the **deadline for the January, 2016** CPHS meeting. Deadlines for submission are located on the CPHS website.

During the course of the research, the following must also be submitted to the CPHS:

- Any proposed changes to the approved protocol, prior to initiation; AND
- Any unanticipated events (including adverse events, injuries, or outcomes) involving possible risk to subjects or others, within 10 working days.

If you have any questions, please contact Samoya Copeland at (713) 743-9534.

Sincerely yours,

Daniel O'Connor

Dr. Daniel O'Connor, Chair
Committee for the Protection of Human Subjects (1)

PLEASE NOTE: All subjects must receive a copy of the informed consent document, if one is approved for use. All research data, including signed consent documents, must be retained according to the University of Houston Data Retention Policy (found on the CPHS website) as well as requirements of the FDA and external sponsor(s), if applicable. Faculty sponsors are responsible for retaining data for student projects on the UH campus for the required period of record retention.

Protocol Number: 15218-01 Full Review: X Expedited Review: __

316 E. Cullen Building Houston, TX 77204-2015 (713) 743-9204 Fax: (713) 743-9577

COMMITTEES FOR THE PROTECTION OF HUMAN SUBJECTS.

Appendix G

Consent Form

UNIVERSITY OF HOUSTON CONSENT TO PARTICIPATE IN RESEARCH

PROJECT TITLE: "**INSIDE THE COMMUNITY COLLEGE DEVELOPMENTAL MATH CLASSROOM: UNDERSTANDING DIFFERENCES BETWEEN FACULTY AND STUDENTS' ATTITUDES AND EXPERIENCES"**

You are being invited to participate in a research project conducted by Patricia A. Rehak, a graduate student at the University of Houston. The project is a dissertation requirement and is being conducted under the supervision of Dr. Lyle McKinney.

NON-PARTICIPATION STATEMENT

Your participation is voluntary and you may refuse to participate or withdraw at any time without penalty or loss of benefits to which you are otherwise entitled. You may also refuse to answer any question. Your participation or lack of participation will be kept confidential.

PURPOSE OF THE STUDY

The purpose of this study is to provide a better understanding of how student and faculty perceive the developmental math classroom experience and the potential impact on students' ability to successfully complete these courses. The study is expected to conclude within 6 months.

PROCEDURES

A total of 18 developmental math faculty members at 1 location will be asked to participate in this project. You will be one of approximately 18 subjects asked to participate at this location. The procedure includes an approximately one hour long interview. In addition, you will be asked to check a transcript of the interview to verify the accuracy of the transcript after transcription has occurred. This should take approximately 15 minutes.

CONFIDENTIALITY

Your participation or lack of participation in this project will be kept confidential. Please do not write your name on any of the research materials to be returned to the principal investigator.

RISKS/DISCOMFORTS

There are no foreseeable risks associated with this study.

BENEFITS

While you will not directly benefit from participation, your participation may help investigators better understand the developmental math classroom and provide opportunities for formative assessment and improvement.

AGREEMENT FOR THE USE OF AUDIO TAPES

If you consent to take part in this study, please indicate whether you agree to be audio taped during the study by checking the appropriate box below. If you agree, please also indicate whether the audio tapes can be used for publication/presentations. If you do not agree to be audiotaped, you may still take part in the research.

- ☐ I agree to be audio taped during the interview.
  - ☐ I agree that the audio tape(s) can be used in publication/presentations.
  - ☐ I do not agree that the audio tape(s) can be used in publication/presentations.
- ☐ I do not agree to be audio taped during the interview.

ALTERNATIVES

Participation in this project is voluntary and the only alternative to this project is non-participation.

PUBLICATION STATEMENT

The results of this study may be published in professional and/or scientific journals. It may also be used for educational purposes or for professional presentations. However, no individual subject will be identified.

If you have any questions, you may contact Patricia. A Rehak 361-485-6843. You may also contact Dr. Lyle McKinney, faculty sponsor, at 713-743-1784.

SUBJECT RIGHTS

1. I understand that informed consent is required of all persons participating in this project.
2. I have been told that I may refuse to participate or to stop my participation in this project at any time before or during the project. I may also refuse to answer any question.
3. Any risks and/or discomforts have been explained to me, as have any potential benefits.
4. I understand the protections in place to safeguard any personally identifiable information related to my participation.
5. I understand that, if I have any questions, I may contact Patricia A. Rehak at 361-485-6843. I may also contact Dr. Lyle McKinney, faculty sponsor, at 713-743-1784.
6. **Any questions regarding my rights as a research subject may be addressed to the University of Houston Committee for the Protection of Human Subjects (713-743-9204). All research projects that are carried out by Investigators at the University of Houston are governed be requirements of the University and the federal government**.

SIGNATURES

I have read (or have had read to me) the contents of this consent form and have been encouraged to ask questions. I have received answers to my questions to my satisfaction. I give my consent to participate in this study, and have been provided with a copy of this form for my records and in case I have questions as the research progresses.

Study Subject (print name): ______________________________

Signature of Study Subject: ______________________________

Date: ______________________________

I have read this form to the subject and/or the subject has read this form. An explanation of the research was provided and questions from the subject were solicited and answered to the subject's satisfaction. In my judgment, the subject has demonstrated comprehension of the information.

Principal Investigator (print name and title): ______________________________

Signature of Principal Investigator: ______________________________

Date: ______________________________