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Community College Students' Perceptions of Developmental Mathematics and Influences on Persistence

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Walden University
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Doctoral Study Submitted in Partial Fulfillment

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Abstract

The increase in the dropout rates associated with developmental mathematics classes in 1 Texas community college provoked the need for this study. The purpose of this case study was to explore students' reasons for dropping out of developmental mathematics and what might have helped them be successful. Tinto's model of student attrition, which is characterized by students' social and academic integration affecting their retention in the college, provided the conceptual framework for the study. The research questions addressed the students' perceptions of both why they dropped out of developmental mathematics courses and what might have helped them to successfully complete those courses. A purposeful sampling process was used to select 7 developmental mathematics students who did not complete the course. Data were collected through semistructured interviews from 7 developmental mathematics students. Emergent themes were identified through open coding, and the findings were developed and reviewed for trustworthiness through member checking, rich descriptions, and a code-recode process. Findings revealed that students needed help in acquiring a better understanding of the subject, in adapting to different teaching methods, and in finding available resources. A professional development training for mathematics instructors was created to share the why students drop out of developmental mathematics and to provide suggestions for improved teaching practices. Results from this study may lead to the positive social change by providing teachers with successful developmental mathematics strategies to improve student performance.

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Dedication

I would like to dedicate this study to my beloved parents, mentors and guides. I could not have done this without you. Thank you for your endless love, support and encouragement along the way.

Acknowledgments

I thank my parents for their love and support throughout my life. I also acknowledge my husband, my children, and my sister for giving me the strength to reach for the stars and chase my dreams. You all deserve my wholehearted thanks.

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To all my friends, thank you for understanding and encouraging me throughout. Your friendship makes my life a wonderful experience.

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Section 1: The Problem

The Local Problem

Community colleges provide the first two years of undergraduate education as well as continuing and adult education. Graduating students earn diplomas, associate degrees, and certificates. Community colleges appeal to many different student populations, in part because they are a fraction of the cost of attending four-year colleges (Hoxby & Turner, 2013). In addition, community colleges have open admission policies, meaning the admission is noncompetitive, and the only criterion for enrollment is a high school diploma or a General Education Development (GED) (Scherer & Anson, 2014). While the low tuition has opened the doors to many students, both student persistence and completion have become issues at the community college (Terriquez, 2015). Also, Pruett (2015) pointed out that student persistence and completion rates in developmental mathematics need to be addressed to improve college success rates. In fact, researchers from the Institute of Higher Education and California State University, Sacramento, identified that only a third of the students enrolled in mathematics classes from California community colleges over six years earned an associate degree or a vocational certificate (Mejia, Rodriguez, & Johnson, 2016). Further, for those students who are not prepared for college-level mathematics, developmental mathematics classes are required to earn a degree Schargel and Smink, (2014) and Tella (2014) noted that the increase in the number of required math courses to earn a degree is linked to higher dropout rates.

In this technological age, knowledge of advanced levels of mathematics is often needed. In order to maintain its competitive position in the global economy, the United States has renewed its interest in STEM (Science, Technology, Engineering, and Mathematics) education, especially mathematics (Drew, 2015). Mathematics is generally considered a difficult subject when compared to other curriculum subjects (Rotgans & Schmidt, 2014). Developmental mathematics is one of the core prerequisites for postsecondary education and completing the needed developmental mathematics courses means that students can then advance to college-level mathematics courses (Edwards et al., 2015; Harwell, Moreno, & Post, 2016). According to labor market statistics, a high school diploma is not sufficient to hold a job with a decent wage and between the years 2010 and 2018, 63% of the jobs will require at least some postsecondary education (Albright & Weissberg, 2010). Thus, it is imperative that students complete their degree or their certification, in order to avoid living in poverty (Gándara, 2015). When students drop out of developmental mathematics classes, their graduation is postponed, and this in turn affects the graduation rates of the college.

Over the past few years, many community colleges have adopted President Obama's challenge, the *college completion agenda of 2020,* to significantly increase the postsecondary education attainment goal (Kilgore & Wilson, 2017). In 2012, the state of Texas trailed California and Florida in terms of graduation rates (Texas Higher Education Coordinating Board, 2014). In fall 2012, the enrollment of students in Texas community colleges was more than the enrollment in Texas universities, and 41.5% of the community college students were not college ready for mathematics (Texas Higher

Education Coordinating Board, 2014). Texas community colleges are apt avenues for the completion agenda because many students prefer completion of some college instead of obtaining college degrees (Monaghan & Attewell, 2015).To work towards the college completion agenda, students need to complete their developmental education, especially in mathematics (Stanley, Hamilton, Allgyer, Ramsey & Pippin, 2012).

Over the past 40 years and over a series of mathematical reforms to improve developmental mathematics learning, many students have dropped out from developmental mathematics classes (Edwards, Sandoval, & McNamara, 2015). Although many educators and policy makers have developed various strategies to improve mathematical learning, it is unclear as to why some students drop out of these classes while others succeed (Bol, Campbell, Perez, & Yen, 2016).

In Texas, where my study was conducted, the Texas Higher Education Coordinating Board (2014) reported that math poses a major barrier in Texas community colleges, with 41% of freshmen underprepared in mathematics. Only one out of three students graduating from high school is ready for college, which is why two-thirds of the students need to take developmental classes (Klasik, & Strayhorn, 2018). Additionally, research conducted by McClenney (2013), with 38,000 students from various community colleges in Texas, showed that even after enrolling in classes 94% of students took a break from their enrollment, with only 72% re-enrolling. McClenney (2013) argued that research is required to track the causes for the dropouts with a major focus on developmental mathematics. The dropout rate in developmental mathematics classes is a

significant issue in community colleges and has proportionally reduced the graduation rate (Hsu & Gehring, 2016).

This was an opportune time to research the students dropping out of developmental mathematics because of the attention this issue is receiving nationally and locally. For example, nationally, the dropout issue is referred to as *the silent epidemic* (Harada, Kirio & Yamamoto, 2015). Also, according to McKinney and Hagedorn (2017) and Weiss, Visher, Weissman, and Wathington (2015), Texas community college students' success rates remain low. Dropouts from developmental mathematics classes cost students loss of potential earnings, and they also result in lower economic returns for the nation and create a large demand for welfare assistance.

The mission of the local community college, where the study was conducted, is to provide high quality, affordable education, preparation for lifelong learning in diverse communities, and work in a global and technological society. According to an internal report from the local community college, the college provides open admissions with an increase in enrollment each year, and a 25.3% increase for developmental mathematics classes. However, during department meetings, faculty expressed concern about retention in developmental mathematics classes because only 17-20% of students who had been required to complete developmental mathematics graduated within two years. Furthermore, there has been a marked increase in dropout rates associated with developmental math classes in the recent past, leaving a gap between the goals of developmental mathematics courses and student outcomes in those courses (Osborne,

Rimmer & Houston, 2015). This gap has provoked the need to study the reasons leading to dropouts in one Texas community college.

Rationale

According to the Texas Higher Education Coordinating Board, mathematics poses a major barrier to students in Texas community colleges, with 41% of freshmen underprepared in mathematics (Abraham, Slate, Saxon, & Barnes, 2014). Klasik and Strayhorn (2018) pointed out that nationally only one out of three students graduating from high school is ready for college, which is why two-thirds of the students need to take developmental mathematics classes. Also, according to Daloz (2012), adult learners returning to school also face the challenge of being underprepared, especially in mathematics. In fact, as Daloz noted, when adult learners take a break from the regular practice of mathematics, they often forget what they learned in the past. Moreover, the complexity of mathematics adds to the frustrations faced by all students at the developmental level. Mathematics is abstract and needs logical thinking, and the ability to learn mathematics may vary from person to person. In addition, it has been noted that 6 to 7% of the student population in the state of Texas has some disability in learning mathematics (Texas Higher Education Coordinating Board, 2014).

The community college site for this study has a mission to provide high-quality education and lifelong learning. As an open admission public institution, the college awards associate degrees and certificates in more than 70 fields of work within 17 campuses. With no on-campus housing, the students commute to and from campus. This community college provides education to all learners coming from various educational

backgrounds with or without high school diplomas. Initially, they are enrolled in appropriate classes after taking placement tests and can also enroll into various workforce or career developmental programs if they satisfy the minimum requirement of developmental mathematics.

According to the Texas Association of Community Colleges, the enrollment of students for the local community college from fall 2008 to fall 2014 increased by 23.1%. Despite the increase in the enrollment, however, data from the college of study, indicate that for the fall of 2013, only 14.8% of students who enrolled in the developmental mathematics classes completed them within a two-year time period. Compared to other subjects, the developmental mathematics sequence had a completion rate of only 22.9%, which was the lowest completion rate of all the subjects. The institutional data do not offer reasons for the low completion rate in developmental mathematics. As a result of this lack of research at the college to explore why some students drop out and others succeed in the subject of developmental mathematics, the department chair and the associate chairs of mathematics are concerned about the low completion rate and support this study. In fact, the department chair of developmental mathematics extended her offer to help (S.F., personal communication, 2015). Moreover, the president of the college is interested in the results of the study (Z.H., personal communication, 2015).

While the low tuition in community colleges has opened the doors to many students, student persistence and completion are now important concerns (Terriquez, 2015). Research from the Institute of Higher Education and California State University, Sacramento, underscores the need for this focus as findings noted that only a third of the

California Community College students enrolled in mathematics classes over six years earned an associate degree or a vocational certificate (Mejia et al., 2016). For those students who are not prepared for college-level mathematics, developmental mathematics classes are required to earn a degree (Schargel & Smink, 2014). Based on students' performance on COMPASS and ACT scores, they are placed into three levels of developmental mathematics courses. With the lower-level remedial mathematics class being basic mathematics, students move on to beginning and intermediate algebra courses before they enter the college level. These courses do not count towards transfer credit. Tella (2014) noted that the increase in the number of required math courses to earn a degree is linked to higher dropout rates.

Fulcher (2015) feared that the changing policies in mathematics could affect the decline of student success rates. Also, Weiss et al. (2015) mentioned that the mathematics curriculum has changed due to advancements in technology. The use of calculators (or other devices) in classes has brought a fear that it will affect the students' potential. Also, the handling of high proficiency calculators in the college placement tests can affect student results and cannot be relied upon to measure their true mathematical knowledge (Scott-Clayton, Crosta, & Belfield, 2014). The use of technology may serve as a tool to help with the calculations, but the awareness of the concepts is what it means to learn mathematics (Moore & Thompson, 2015). He examined 10 teachers from middle school through interviews and concluded that it is fun to use calculators, but they are not necessary to learn mathematics.

According to Riconscente (2014), Hispanic students' success rate in mathematics is below average, and the author argued that the underachievement of these students is due to the lack of understanding of English. The students understood the mathematical process and were able to participate in classroom activities when a considerable amount of Spanish was used in the classroom. Planas and Civil (2015) pointed out, however, that the students' poor performance on exams was due to the lack of understanding of the language of mathematics. Essential factors for any successful mathematics learning are to effectively communicate the ideas of mathematics to students. Language is the mediator in the classroom, helping to better understand word problems and their applications as well as playing a key role in the thinking and reasoning skills of a student (Planas & Civil, 2015).

The review of the literature showed a gap in understanding of why some students drop out of developmental mathematics classes while others succeed. The purpose of this study was to identify students' perceptions about why they dropped out of developmental mathematics and what could have helped them to complete their course of developmental mathematics classes.

Definition of Terms

COMPASS: Computer-adaptive Placement Assessment and Support System, developed to address the need for accurate course placement in order to support student services (ACT, 2007).

Community college: A public, two-year institution offering a broad array of educational programs to meet the needs of a community (Callan, 2017).

Developmental mathematics: Supplemental aid in mathematics curriculum that starts with elements of arithmetic and progresses into beginning and intermediate algebra (Ariovich & Walker, 2014).

Dropouts: Students who stop attending school or college before finishing the course (Schargel & Smink, 2014).

Underprepared students: High school graduates not ready for college-level courses (Bernstein, Edmunds, & Fesler, 2014).

Significance of the Study

Dropping out of developmental mathematics classes can lead to students' loss of potential earnings and to the nation's lower economic returns (Weiss et al., 2015). Reducing and eventually preventing dropouts is critical for the students and is a national goal (Schargel & Smink, 2014). In addition, examining the dropout data has shown that just by moving one student from a dropout status to a graduate status can lower government expenditures and yield higher tax revenues (DePaoli et al., 2015). The significance of this study is that the results may help the educators at one community college better understand those reasons that contribute to students' failure to complete developmental mathematics courses and what could lead to students becoming more successful in these courses.

Research Questions

The purpose of this study was to identify students' perceptions about why they dropped out of developmental mathematics and what could have helped them to complete their course of developmental mathematics classes in a Texas community college.

Researchers (Bailey & Jaggars, 2016; Reilly, 2015) suggested that there were still unexplored concerns regarding why students drop out of developmental mathematics. Also, institutional data do not offer reasons for the successful completion of developmental mathematics. Furthermore, a review of literature revealed gaps in understanding why some students drop out of developmental mathematics classes while others succeed. This study was guided by the following research questions:

1. In one community college in Texas, what are students' perceptions of their reasons for dropping out of developmental mathematics courses?

2. In one community college in Texas, what are students' perceptions of supports that might have contributed to their completion of developmental mathematics courses?

Review of the Literature

To better understand the problem of dropping out of developmental classes, I reviewed the literature using Google scholar and Walden University's Thoreau multidatabase search and scholar works for dissertations. The key words used for the scholarly search were: *developmental mathematics, drop outs from mathematics, community colleges* and *basic skills.* The review of literature expanded my horizons and revealed significant ideas, ideal for my study. Some of the findings that emerged were Tinto's model of student attrition, evolution of community colleges, early preparation, retention, and persistence.

I first explored the conceptual framework of Tinto's model of student attrition using Google scholar search engine that provides broad searches for scholarly literature. Then, the evolution of community colleges, how developmental classes started, and the

involvement of retention and persistence in developmental classes were reviewed using Thoreau multi-database search and scholar works for dissertations from Walden University. Saturation of literature review was reached through a systematic search of research related to developmental mathematics in higher education.

Conceptual Framework

Tinto (1975) formulated a theoretical model of student attrition and retention based on Spady's sociological model (1971), which is comprised of five variables namely, academic capacity, normative congruence, intellectual development, grades, and friendship support. This sociological model focused on social and academic integration as factors that played a key role in the decision to drop out of college. Based on Spady's sociological model, Tinto then proposed his model of institutional departure, built on three major sources: academic difficulties, incorporated social life of the institution, and unresolved educational and occupational goals. According to Tinto, when students faced academic difficulties such as grade performance, lack of enthusiasm for the subject, lack of interest in studying the subject, and lack of responsibility as a student, they were likely to drop out of the class. Also, institutional departure happened when students did not get involved in social life like peer to peer interactions, faculty student interactions, and enjoyment of student life. Academic difficulty and a lack of social life lead to unresolved goals and the loss of the persistence needed for graduation (Tinto, 1975).

With this theory, Tinto (1975) suggested that students' retention depended on their social and academic integration into the college. He also mentioned that the more students understand their academic and social realms of college, the more likely it is that

they complete their degree (Tinto, 1975, 1987). Continuing to explore retention and persistence, Tinto (1987) established the "paradox of institutional commitment" (p.11). According to the paradox, students' retention in college is related to students' academic and social involvement in college. Tinto's theory can give insights into why students drop out of developmental mathematics.

Review of the Broader Problem

Community Colleges Past to Present

Even though the roots of two-year institutions were proposed during the 1800s, most community college historians (Brubacher & Willis, 2017; Callan, 2017; Harbour, 2015) point to Joliet Junior College, which was founded in Joliet, Illinois, in 1901 as the first community college. In earlier days, colleges focused mainly on liberal arts studies (Brubacher & Willis, 2017). Beach (2012) noted that the concept of junior colleges began to be well accepted during the Great Depression of the 1930s when job training was in demand due to unemployment. National leaders realized that the key to economic growth was a skilled workforce. Consequently, after World War II ended, the military industries were converted to consumer goods, which created new jobs. These jobs needed technical and skilled employees. To address the widespread unemployment and to meet the local labor demands, community colleges began offering technical programs. Also, many high school graduates who were reluctant to leave home and eager to study in postsecondary institutions enrolled in nearby community colleges. The G.I. Bill of Rights, signed by President Roosevelt in 1944, helped veterans returning from World War II to enter postsecondary education. By the end of 1956, about 2 million veterans had made use of

the G.I. Bill to attend colleges or universities and about 5 million used it for training purposes (Kowalski, 2016).

The Truman commission report in 1947 marked the first use of the term *community college* (Sullivan, 2017). There were various reasons for the evolution of the community college, but the most important one was the Civil Rights Movement in the 1960s, an era that marked the implementation of developmental education. With the Civil Rights Act of 1964, educational programs extended opportunities to all students including women and minorities (Dreiband, Swearingen, & Day, 2015). Dreiband et al. noted that students felt displaced and could not meet their expectations in universities, whereas in community colleges, students were able to adjust because of the smaller class size and low tuition. Additionally, developmental education was established in 1973 at the University of Missouri, Kansas, to address the disparities in academic readiness among the diverse student population.

Community colleges serve as a medium for exiting high school students to pursue their education. Community colleges strive to provide equal educational opportunities with affordable tuitions. Most community colleges are open access, meaning all applicants are accepted (Brubacher & Willis, 2017). In addition to associate degrees, they offer a variety of certificate programs and technical programs with credentials that lead to the workforce. Educational programs were extended to all students to provide them with an enriched learning environment, despite their previous level of academic performance (Rhoads & Valadez, 2016). According to Taylor (2015), the number of students underprepared for college has increased in the past 20 years. Although all

students face some challenges during their higher education, underprepared students confront more. Community colleges have evolved and created developmental education for underprepared students.

The purpose of developmental education is to provide students with the skills needed to succeed in college (Weiss et al., 2015), yet at the study site, students were not always successfully completing these prerequisite courses. Because community colleges evolved from offering very limited programs to offering a wide range of programs open to all students, issues that affect student success were critical to the community college's continued growth and development. The concern for those students who dropped out of developmental classes made the topic of this doctoral study critical for both the future success of the increasing number of underprepared students at community colleges and for community colleges in general.

Significance of Early Preparation

The quality of education students receive and the experiences they have in high school affect the success of their postsecondary education. In fact, students who do well in high school are better prepared and better positioned in college than students who are underprepared and placed into developmental courses in community colleges (Bryk, Gomez, Grunow, & LeMahieu, 2015). Similarly, research conducted by Bryant (2015) linked the underprepared college students to their high school preparation. Tinto (1987) pointed out that three-fourths of the underprepared students drop out during their first year of college. As a matter of fact, when a student enters a community college with various levels of preparation and a family background which includes aspirations to

complete college, their retention depends on their academic involvement (Tinto, 2012). However, Wood (2014) argued that social, psychological, and environmental factors and not just academic integration impact the persistence of nontraditional students. Findings of Bahr et al. (2017) in the California community college system illustrated that mathematics remediation programs helped in student success. Bahr et al. used an analytical method to develop six clusters defining the behavior of the community college students. Using the noncognitive variables in the study, Bahr et al. concluded that not all students who enter the mathematics remediation program complete it. Primarily, students enrolled in developmental mathematics classes were less likely to graduate (Reilly, 2015).

Community colleges have grown considerably in the last decade, along with providing students with developmental education, but the problem of students not completing their mathematics courses has become acute (Reilly, 2015). However, the Virginia Community College System conducted a study in 2011 on the students who placed into developmental mathematics courses and found out that there were no significant relationships between underprepared students and students' success. Similar results were found by Miller (2015) when the research was conducted with Australian students entering community colleges. The differences in the above mentioned studies strengthens the need for community college specific research on finding the reasons influencing students to drop out of developmental mathematics classes in local community colleges.

Retention

For all higher education institutions, retention is a concern as some students choose to continue with their classes while others decide to drop out (Wurtz, 2015). Once students are enrolled into the developmental classes, retention is often the next challenge. A number of dropouts leave their courses before completing their developmental requirements and then may never return to school. In the years 2000-2010, community colleges focused on student retention. They have implemented faculty advising and learning communities to help with student retention. For example, Johnson et al. (2016) conducted research with faculty members and students and found that thematic programs helped with student retention. Their research showed that when students joined career focused programs (technical education), their retention was better than that of students who did not join the career focused programs. Similar results were found by Fontaine (2014) when a correlational analysis between demographic variables and degree completion and between student intervention programs and degree completion was conducted. Fontaine concluded that the career focused retention programs resulted in a statistically significant improvement in retention.

Retention has also been supported by outreach programs. Bawa (2016) found that outreach programs in the online environment such as emailing students, calling students, and advising them helped to keep students participating and positively impacted their success. In addition, in a qualitative research at a community college, Gaytan (2015) revealed that faculty who reached out to their students by making themselves available to them and referring them to student support services contributed to higher student

retention compared to the faculty who did not advise their students in using these services. Boatman and Long (2018) examined the low student retention rate problem in the United States. They found that colleges placed too many students into their remedial courses and that the longer they took to finish these remedial courses, the more likely they were to drop them. This appeared to hinder students' academic retention. Overall Boatman and Long emphasized that academic advising, mentoring, and tutoring could improve students' academic retention.

In Orlando, Valencia Community college implemented academic advising, goal setting, and planning to increase retention success rates. Three years into the implementation of these practices, their graduation rate increased from 39% to 51% (Foote, Kranzow, & Hinkle, 2015; Nichols & Larson, 2016). In 2004 the Center for Community College Student Engagement (CCCSE) suggested that every community college in Florida participate in the community college survey of student engagement. The survey examined the relationship between student engagement and a variety of student outcomes. The findings of the survey revealed that if the students were actively engaged, they were likely to continue with their academic goals (Kimbark, Peters, & Richardson, 2017). Then, as documented by Nichols and Larson (2016), the CCCSE listed the practices needed for educational institutions to help student retention. The list prescribed that community colleges needed to provide students with clear academic plans, good support systems, sufficient academic foundations, and student engagement for underprepared students.

Persistence

At the community colleges, students enrolled in the developmental classes seemed to have significant issues with persistence. For example, students taking developmental English and mathematics classes from three community colleges in three different states were examined for the outcome trajectories of students enrolled in developmental courses during their first term of college (Stewart, Lim, & Kim, 2015). It was found that several factors helped the students persist into their second term. However, the main factors affecting persistence were financial aid and tutoring (Stewart, Lim, & Kim, 2015). Norman (2017) also reported that Carnegie University had developed a new program called *Pathways to Improvement* which showed that a psychological strategy (changing students' mindset towards mathematics) needed to be developed to help students persist in developmental mathematics classes.

Many underprepared students placed in developmental classes find it challenging to remain persistent and focused on completing their courses. However, when students are involved in a learning community, it helps them succeed, which in turn leads to persistence (Weiss et al., 2015). In addition, active learning in developmental classes and membership in learning communities has been shown to promote persistence in STEM programs (Wang, Sun, Lee, & Wagner, 2015). In fact, Dwyer's (2017) study on the role of active learning in college persistence showed that faculty use of active learning played a major role in persistence and retention of students. Dwyer also found that with increases in the use of technology and in class size, student engagement and interaction (active learning) became highly important in increasing student persistence. Moreover,

active learning helped to facilitate cooperative learning, which in turn increased students' sense of responsibility and resulted in the actual learning of the subject. Students used the skills and knowledge gained to help them stay on track (Dwyer, 2017).

Tracking student difficulties before they drop out can help improve persistence (Gaytan, 2015). Gaytan examined the factors associated with the ability of the students to persist in their online classes. He found that motivation, learning communities, and increased communication played key roles in persistence. If these factors were not present, students were likely to drop out from their courses. Additionally, when students fall into their daily routine in class, their focus and attention on the subject becomes a challenge. Stimulating student motivation by encouraging them and building different strategies to learn can help students with their persistence (Wlodkowski & Ginsberg, 2017). Furthermore, Cho and Karp (2013) examined the data from the Virginia Community College System. They found that if students enrolled in a student success course during their first year, then they are likely to persist to the second year.

Conclusion

In spite of student retention and persistence programs created for the needs of the students to retain them in their courses, some students still tend to drop out of their developmental classes while others successfully complete these courses and move on to the next level. This study helped to find out why certain students dropped out of developmental mathematics and what could have helped them to complete their course of developmental mathematics classes.

Implications

This study was conducted in a local community college in Texas, and the results may prove significant to the community college as a means of better understanding why students drop out of developmental math classes. Because no similar study has been conducted in the Texas community college system, the results of this study could be useful for future planning. For example, sharing the results with the department of mathematics and the stakeholders, with a clear explanation of the problem statement, the research methods, and the analysis, may help provide a deeper insight into the issue. The sharing of results will be done through a professional development workshop for the developmental mathematics faculty, where the research findings would be shared. The workshop would be created as a part of my doctoral study project. This work could provide new perspectives on how effectively and efficiently the college could mitigate the drop-out issue. Therefore, it is anticipated that the results of this study could be of great interest to community colleges and could have the potential to bring positive social change to the local community.

Summary

While the low tuition in community colleges has opened the doors to many students, it is important to focus on student persistence and completion (Terriquez, 2015). Because students entering community colleges are often underprepared, the role of community colleges is to assist them in identifying and meeting their academic goals and to encourage them to be persistent. Institutions develop remedial programs to help students successfully complete their degree programs. However, they find student

retention to be a challenge. At community colleges, many studies have been conducted on student retention (Bean & Metzner, 1985; Farmer & Hope, 2015; Spady, 1971; Tinto, 1975), and these studies have shown that student retention is closely linked with degree completion concerns. Gaps, or yet unidentified reasons, exist in the current knowledge and understanding of why some students drop out of developmental mathematics classes while others succeed. Understanding these gaps more conclusively was the motivating factor for the study.

Section 1 described the problem statement, the research questions, and the literature review and explained how the results could help the local community college. In Section 2, I describe the research design and approach, sampling methods, data collection, and data analysis procedures. Section 3 and Section 4 includes an introduction to the project, an additional literature review, the project description and evaluation plan, implications, reflections, and conclusions.

Section 2: The Methodology

Introduction

The purpose of this study was to explore students' perceptions about why they dropped out of developmental mathematics and what could have helped them to complete their course of developmental mathematics classes. I used a qualitative research design. Although a variety of methods have been used to find out why students drop out of developmental mathematics, qualitative methods can help in determining the perceptions of students (Fraser, 2015). Tinto's (2012) model for college student departure was used as a conceptual framework for this case study research.

In this section, I explored the problem in-depth through a qualitative case study using semistructured interviews with students who have dropped out of developmental mathematics courses. I reviewed the process of selecting the participants, the procedures for gaining access to the participants, and the measures taken to protect their confidentiality. Next, I described the data collection instrument and its sources, the procedure for gathering and recording the data, the role of the researcher and the ethical procedures. Finally, I explained the data analysis procedures.

Research Design and Approach

Qualitative and quantitative research designs are the most used research methodologies (McCusker & Gunaydin, 2015). Quantitative designs use a large sample size to represent their target population when collecting data. Once the data are collected, researchers analyze relationships among variables and then interpret the results (Brannen, 2016). Quantitative research analyzes numerical forms using statistics to examine the

cause and effect of a relationship. In contrast, the qualitative research method, also known as field research, often focuses on the perceptions of a study's participants. Qualitative studies focus on understanding the central phenomenon and on identifying contextual factors. Thus, the information obtained in qualitative research is descriptive rather than predictive, textual and visual data rather than numeric (Brannen, 2016). Researchers use a smaller sample size and collect data through interviews and observations when investigating a problem (Malterud, Guassora, & Siersma, 2016; McCusker & Gunaydin, 2015). When using semistructured interviews in qualitative studies, researchers have a degree of flexibility as they can alter the questions or add new ones if new topics important to the study emerge (Nyberg, 2012). Collecting data through interviews gives a voice to the participants and allows their perceptions, feelings, and/or experiences to be understood. It has the added benefit of being able to elicit important insights from the participants which might not be captured using quantitative research (Lewis, 2015).

Ethnography, grounded theory, and phenomenology designs were considered and rejected since they were not suitable for this study. Ethnography examines the patterns of behavior, language, and beliefs of a cultural group and requires extended periods of observation (Merriam & Grenier, 2019). My study explored students' perceptions related to dropping out of developmental mathematics. Consequently, cultural observations of a group and ethnographic research would not be appropriate (Kemparaj & Chavan, 2013). In addition, grounded theory was not appropriate for my study since it is used to generate a theory which would explain interactions that were formed or "grounded" from the data

collected. Since my study did not involve preparing or producing a theory, grounded theory was rejected. Furthermore, phenomenological research generally uses a large number of participants to explore a phenomenon through lived experiences (Merriam & Grenier, 2019) and was not suitable for this study as no human condition was studied.

Case studies are common to qualitative research methods. They are bounded by time and activity. As the name indicates, case studies explore in-depth a single case or sometimes multiple bounded cases (Yin, 2014). Researchers use cases because they can collect multiple types of data for decision making purposes. Cases are also a good source of ideas about behavior as they allow a lot of detail to be collected. In addition, they provide opportunities for innovation because the data they collect is richer and more in-depth than that collected by quantitative research designs (Hancock & Algozzine, 2016). My research into the perceptions of students from a local community college fit a qualitative bounded case study because it explored in depth a single case focusing on students who drop out of developmental mathematics classes at the college. I used a self-designed interview protocol (see Appendix B) to gather data to answer the research questions.

Participants

This study was conducted at a local community college which has 17 campuses located around the city. Only one of these campuses was the focus of this study. I submitted an application requesting to conduct research at the campus of the local community college, and the president of the college approved it. Once the proposal was approved by Walden's IRB, and I received a letter of cooperation from the dean of

developmental mathematics department at the study site, I created and posted a recruitment flyer in the student lounge, cafeteria, and library in order to recruit prospective study participants.

I used purposeful sampling to select the participants for this study. This sampling involves the selection of participants who have the most knowledge or information related to the study (Robinson, 2014). Since purposeful sampling includes several different forms, I selected typical sampling, which involved selecting the average or typical person or site from the phenomenon being studied (Merriam & Tisdell, 2016). Typical sampling worked well for this study since I selected participants only from those who have not completed developmental mathematics courses rather than from all students enrolled in developmental mathematics. The criteria for participant selection were the following:

1. Students who dropped out of or withdrew from one or more developmental mathematics class(es).
2. Students who have never been enrolled in any of the classes I teach or had any contact with me.

Recruitment flyers were posted in the student lounge, cafeteria, and the library to recruit students who dropped out or withdrew from developmental mathematics classes. As I began to get responses from the flyer, I sent an invitation along with the consent form to the students to participate in the research. The invitation included the purpose of the research. Once I received a response from a student agreeing to participate, I asked if he/she understood the purpose of the research and was comfortable with participating.

Fifteen students responded that they would participate, and emails were sent for a mutually agreeable day, time, and location for the interview. Some qualifying students did not respond to the emails that I sent, so I contacted the next student who met the criteria for participation in the study. This process continued until I had 7 student participants. Unexpectedly, this process took about 6-8 weeks.

According to Yin (2014), the appropriate sample size for a qualitative case study is 15 students, but saturation for a smaller study can be achieved with a smaller sample size. However, the number of participants differs for each study. Some studies require only a few participants to reach data saturation, whereas other studies may require more. Guest, Bunce, and Johnson, (2006) pointed out that "a sample of six interviews may [be] sufficient to enable development of meaningful themes and useful interpretations" (p. 78).

The student participants were provided with a consent form which they were asked to read. The consent form clarified for them that the participation in this study was voluntary, that no incentive would be provided for participation, that they could withdraw from the study at any time without any consequences, and that their names would never be revealed during or after the study. The form also assured them that no harm would come to them through their participation in the study and that their privacy and dignity would be preserved at all times. Once the participants understood the conditions set forth in the consent form and agreed to them but before taking part in the study, they were asked to respond to my email with *I consent*, which served as their written agreement to

participate in the study. Also, I got their signature on the consent form before the interview.

Qualitative research largely depends on maintaining good interpersonal relationships, which facilitate the gathering of rich data (Rossetto, 2014). It is important to foster individual rapport in order to have a good relationship between the researchers and the participants. Interviews, however well-planned, can have unforeseen problems. Sometimes, the participants may not divulge information in the detail required for the study. In such cases, the entire study can be delayed. To overcome these instances, the researcher needs to have positive engagement and a thorough understanding of the participants. The development of genuine rapport by showing empathy and appreciation for the participants can assist in establishing and maintaining the positive interpersonal relationships between the researcher and the participants (Taylor, Bogdan, & DeVault, 2015)

The Researcher's Role

Because I am a member of the mathematics faculty on the campus where the students participating in this study attend classes, I made sure that students who were selected as study participants have never been and are not now in any of my developmental mathematics classes. Each student participant was assigned a numeric code to ensure confidentiality. After coding and analyzing the data, I stored the data in an electronic file, which was locked for protection and only accessible with a unique password and held for 5 years from the completion of the study. These steps minimize

ethical issues in terms of confidentiality, informed consent, and harm to the participants (Yin, 2014).

Data Collection Methods

Data collection focused on exploring the perceptions of the students who dropped out of their developmental mathematics courses. Merriam (2014) pointed out that qualitative research consists of various forms of data such as interviews, observations, and review of documents. Merriam and Tisdell (2016) indicated that interviewing is probably the most often used type of qualitative data collection. Yin (2014) and Lewis (2015) also identified interviews as the most important source of data collection for qualitative research. In addition, when more individual interviews are conducted with multiple respondents, the accuracy of the study increases since the information is from more than one individual (Yin, 2014). Interviews allow the participants to provide rich descriptions reflecting their perceptions and also help the researcher gain in-depth and widespread resources for a study (Yin, 2013). Merriam (2014) discussed three different ways of data collection during an interview, including audio recording with the participant's permission, note taking during the interview, and recording everything post-interview. The last method of recording postinterview is the least effective because the researcher may not remember all the details. The most effective is audio recording during the interview as it records the data accurately.

For this study, I collected the data by audio recording the interviews, with participant permission, along with note taking during the interviews. Interviews with the participating students were scheduled at a date, time, and location that were mutually

agreeable to the researcher and the selected students. The interviews were guided by a set of pre-established, open-ended questions aligned to the research questions (Appendix B). Furthermore, the questions were clear and understandable, and professionalism was maintained throughout the interviews (Bogdan & Biklen, 2011). The length of the interviews varied from 20–40 minutes. I recorded the interviews so that the content could be easily transcribed. Using a secured room inside the library of the campus, I conducted the interviews during noninstructional time over a span of 3 weeks. This was longer than I had expected.

To conduct the interviews, I designed an interview protocol form (Appendix B) which contained instructions for the process of the interview, the questions to be asked, and space to take notes on the responses of the interviewee (Lewis, 2015). On this form, I took short notes highlighting comments made by the interviewee. The interview protocols helped in organizing the field notes and recordings. All students were asked the same set of 5 questions. Since the same interview format was used for each interview, it was reliable, and accuracy was maintained by asking questions for clarifications. I labeled each student's interview and audio recordings and then transcribed verbatim each interview into a Word document. The participant's responses were retained with the original meaning and did not deviate from the actual response. I asked probing questions such as, "Did you go for tutoring? Did you talk to your professor about your problem?" These questions provided additional evidence or context for the study (Yin, 2017). All the data were stored in a folder system as well as in an Excel database for easy tracking.

Data Analysis

The most essential part of a research project is the data analysis (Lewis, 2015; Yin, 2014). The purpose of qualitative data analysis is to identify, examine and explicate the emerging patterns and themes to help answer the research questions (Merriam, 2014). The data analysis process for this qualitative study was iterative in nature and began simultaneously as data were collected. I repeated the steps outlined below numerous times, adding some new information each time. According to Creswell and Creswell (2017), qualitative data are analyzed through codes that lead to the development of themes, and the outlined six steps:

1. Explore the data by coding.
2. Use codes to find themes.
3. Use codes to develop an idea of the data.
4. Represent the findings through narratives.
5. Interpret the meaning of the results.
6. Conduct strategies to validate the finding.

The above process was used to code by identifying themes emerging from the interviews. The coding process involved organizing and sorting the data. It acted as a basis to link data collection and interpretation of data for developing the analysis. It served as a way to label and compile the data and was usually a word or a phrase to summarize a topic from the interview transcripts.

Using the research questions as a guide, I began by reading and analyzing the participants' transcribed interviews, my research journal, and notes taken during the

interviews. The coding process began by making notations in the margins of the transcripts near words and sentences that were pertinent to the study. Initial coding can be crucial by determining the common words used by the participants, and then a division of coded categories is done in search of repetitive words, ideas, or themes (Creswell & Creswell, 2017). According to Saldaña (2015), code-recode (repeating the process of coding) procedure on data should be conducted throughout the data analysis. Also, Lewis (2015) mentioned that code-recode helps identify themes and ideas from the collected data. Taylor, Bogdan, and DeVault (2015) wrote that word repetition allows the researcher to explore verbatim participant responses from recording the words and transcripts from the interviews and phrases used often. Once I identified a code derived from the transcribed interview, I marked it with a color. This particular color was used to mark the same code every time it appeared elsewhere in the data. As I continued, I used a different color to distinguish each distinctive code that occurred in the data. This process helped in making connections of commonalities in participants' responses that led to the emergence of themes. The codes marked with the same color then led to the formulation of the themes that emerged as the analysis progressed. The easy way to find themes and subthemes is repetition (Saldaña, 2015). The process of repetition helped in accuracy and in avoiding any missing theme. As the coding re-coding process continued, the identified themes and bridging themes were compared for their conceptual meaning (Saldaña, 2015). To keep a record of the themes, I created an Excel Spreadsheet for each interview question asked during the interview. Then, I transferred the identified themes to the spreadsheet according to the appropriate category.

Data Analysis Results

Semistructured interviews were conducted at one community college in Texas. A qualitative method was used for studying the perceptions of students regarding why they dropped out of developmental mathematics and what could have helped them to complete their course. This study was guided by the following research questions:

1. In one community college in Texas, what are students' perceptions of their reasons for dropping out of developmental mathematics courses?

2. In one community college in Texas, what are students' perceptions of supports that might have contributed to their completion of developmental mathematics courses?

After analyzing each interview, my journal, and notes from the interviews, I did an initial coding of the interviews and found 16 potential themes. Following the code-recode process by reading the transcripts multiple times, I reduced the number to 4 main themes. Then, I transferred the identified themes to the spreadsheet according to the appropriate category. Table 1 shows the list of codes and themes used in this study according to the interviews. Participants were assigned numbers 1-7, and the interview responses were labeled according to the assigned numbers.

Table 1

Themes and Codes

Themes	Codes
Lack of Subject Comprehension	Not comprehending Could have studied harder Falling behind
Factors External to the Class	Medical reasons Test anxiety Finances Mental anguish Work schedule
Resources	Tutoring You-tube videos Talk to professors Do homework
Teaching/Learning methods	Explain by breaking down Teach/learn in a different way Ensure understanding

Theme 1: Subject Comprehension

In order to better understand why students dropped out of developmental mathematics class, I asked my participants "What, if any, characteristics about the class itself led you to decide to withdraw from your developmental mathematics class?"

Participants had varied educational experiences. All the students said that how they learned the subject depended on how they were taught. While some of them managed to understand the basis of the subject, many of them agreed that they struggled with math. Of the seven students interviewed, six had retaken the class that they had dropped, and

only one out of the six had successfully completed the class at the time of the interviews. According to 85% of the students interviewed, they had trouble comprehending the subject. Student 1 described his first experience:

> Because it was from my first math course here, I did not understand it, did not click. If explained step by step I would have passed, I wanted to be explained to me step by step, it did not really click right away, so I had to really start over the whole math course.

Students agreed that they could not comprehend the subject from regular lectures in the class. About 50% of the students wanted word problems that related to real life applications and a few mentioned hands-on projects to better understand the content. Student 6 mentioned "more real-life problems." For Student 2, the problem was that the class did not have any practical application to real life:

> I tend to absorb things better when I can see, touch and do, so it's very hard for me to comprehend imaginary things on a piece of paper which has no practical application to apply them to.

With perceived negative attitudes towards the subject and fearing humiliation in front of the class, about 70% of the students did not ask questions in the class. While some students thought that they were asking basic questions, Student 3 assumed that asking questions would slow down other students. He added "the age difference in class, the kids were fresh out of high school…. I didn't adjust to it." Moreover, Student 4 said he was "shy and embarrassed and didn't know… not confident enough to ask." Participants 2

and 3 discussed how math was difficult during high school and continued to be difficult in college. Student 3 commented:

> Even in high school I had to take math over. And we are working on something else and constantly moving on, and I am still at point A and others are now at point B. It's a little bit too much.

This student continued by indicating that he did not know how to ask for help and ultimately dropped out of the class. Student 2 felt that she could overcome the problem of math comprehension on her own. She would go home and try to work on her assignments without getting help. She said, "This has always been consistently the frustration with math." Because of her lack of success, she eventually dropped out. Student 4 offered his perspective:

> It was struggling through, trying to understand. I had a very good teacher it was just very hard for me to catch on and keep going like everyone else. So I kind of fell behind and quit…. I would try to study when I get home, but it was just hard to comprehend it.

Two- thirds of the participants shared personal examples about their negative learning experiences that caused a disconnection with the subject. Student 6 noted "I neglected school…I could have studied harder" while student 7 added "the difficulty of the subject …could not comprehend." Student 5 provided this reply:

> I was not grasping the material, it was getting closer to the end of the semester, my professor at that time said I probably would save some money to drop and try it again, but still I was not prepared for it. I tried tutoring, I tried tutoring outside

> the school, but math is something that I don't grasp very well. I took algebra 3 times in high school and I finally passed it the final year. It's always been something that I haven't grasped very well.

These collective acknowledgements suggested that students had difficulty understanding the subject. This led to the formation of the theme lack of subject comprehension. This was the first major theme that students identified as their challenge. Even though participants had various personal issues, one of the top reasons for withdrawal from the developmental mathematics class was the lack of subject comprehension. As in previous studies mentioned in the review of literature, many underprepared students placed in developmental classes find it challenging to remain persistent and focus on completing their courses. According to Tinto (1975), when students faced academic difficulties, they were likely to drop out of the class. Hernandez and Henson (2017) examined the reasons why students dropped out of their classes. Based on their findings, academic performance and academic difficulties were related to retention. Moore et al. (2016) mentioned that academic challenges and dropout rates are issues of concern.

Theme 2: Factors External to the Class

Even though difficulty with the subject was one of the primary reasons why students withdrew from developmental mathematics classes, there were other significant external factors that affected their ability to complete the courses. The question I asked my participants was "Were there reasons outside of the class itself that led you to withdraw from the developmental mathematics class (classes)? If so, what were the

reasons?" Three out of the seven students felt that there were external reasons that led them to drop out of developmental mathematics. Tinto (1975) wrote that the students who drop out of classes early do so because of non-academic factors. The nonacademic factors in this study included illnesses, financial problems and bad influences. Academic challenges added to these external factors were the deciding reasons for the decision to drop out of the classes. Three student participants had to make the decision of dropping out of the developmental mathematics classes because of non-academic reasons. Student 2 felt anguish and frustration from family and medical issues that made her drop out of her class:

> Family and medical reasons. A person can handle only so much mental anguish even with all the help that you can get, you get frustrated. Is this mental frustration worth getting a piece of paper in the end?

For student 6, it was his encounter with outside bad influences that impacted his classes. He believed that his actions were inappropriate at that time and regretted that he had to drop out instead of completing his course. He missed a lot of classes and did not finish his assignments on time. He did not want to be in school and wanted to be with friends. His absences caused him to fall behind academically and ultimately dropped out of the class. He revealed that he was "doing bad things with my friends that I was not supposed to. Now I am back on track, with the help and support of my girlfriend."

Tinto's (1975) theory on departure served as the conceptual framework for this study, and the theory stated that an individual's inability to pay for college or university could likely result in students dropping out of classes. Terriquez and Gurantz (2015)

reported that students opt out of college when there is a lack of financial support. Lack of financial planning for college can lead to students' dropping out (Leijen, Lepp & Remmik, 2016). Student 5 described how his financial issues were part of what caused him drop out of his class:

> The only other reason would be paying for it. I did take a semester break to work and save money for my other classes. Now I am back to college. The main reason was I was not getting it but the other reason that influenced me to drop out was money.

The review of literature mentioned that Stewart et al. (2015) found that one of the main factors affecting persistence was financial aid. The research data I collected also included financial problems in addition to medical reasons and distractions as external factors that influenced them to drop out of developmental mathematics classes. Theme 2 described the challenges faced by the students that impacted them. Tinto (1975) suggested that there were certain variables that influenced the students to drop out and both finances and psychological issues were notably significant variables.

Theme 3: Resources

In a classroom, resources generally provide assistance or information for students. In this study, resources referred to tutoring, watching You-tube videos, talking to professors, and doing homework. Participants were asked "What recommendations would you have, if any, for helping students to be successful in developmental mathematics classes?" Five out of seven participants suggested making use of these resources. Exposure to institutional resources influence students' success (Tovar, 2015).

The interviews with the student participants indicated that they did not use the resources readily available to them. Students 1 and 4 mentioned that they were not aware of some of the resources that were available to them at the place of study.

Students also discussed how personal communication with the professor can help students voice their concerns and how reaching out to the professors about their progress could have helped them succeed. Student 2 explained:

> Students need to know that the professors have an open-door policy and for them to utilize their voice. They need to convey to the professor if they are not understanding it…so just by talking to the professor and utilizing any and all resources that are available.

Participants believed that individual sessions with the professor would be one of the components for success in the class. Tovar (2015) mentioned that providing academic support can bring about big changes in college outcomes and degree completion. Overall, students wanted support from their professors for academic success. Student 3 shared that additional attention after class would be appreciated. They surmised that a tutoring opportunity and more one-on-one time on a regular basis with the professors would have been extremely useful.

Dixson (2015) mentioned that there is a relationship between virtual learning and student performances. During interviews, about one-half of the student participants recommended the use of different online tutorials for student support to complete their assignments and homework. Evans, Kearney, Perry, and Sullivan (2017) added that when students are assisted with campus-provided tutors there is an increase in community

college completion rates. Furthermore, e-tutoring along with campus tutoring can strengthen student learning (ChanLin, Lin, & Lu, 2016). Student 4 mentioned that every day he would study at home watching tutorials and you tube.

Students indicated that making use of available resources could help them succeed in their developmental mathematics classes. As mentioned in the review of the literature, the CCCSE (Kimbark et al., 2017) listed the practices needed for educational institutions to help student retention. The list mentioned that community colleges needed to provide students with good support systems and sufficient academic foundations for underprepared students.

Theme 4: Teaching/Learning methods

Students wanted the professors to clearly explain the problems or use different approaches to explain the examples. I asked the students "Thinking back, what, if anything, could have been different about the class (classes) that would have led to your completing the course?"

Although students had different instructors, the common theme was that struggling in math was because their instructors did not explain problems in a method that they could understand. Student 6 said that he ended up with a professor who took time to explain the steps for each problem and that he was eventually able to succeed. Students were eager to share their ideas and thoughts regarding what would have helped them complete the developmental mathematics course. Five-sevenths of the students agreed that student engagement played a big role in their success. Several researchers illustrated that the instructor's role in student engagement can enhance student

satisfaction (Acosta-Tello, 2014; Boton & Gregory, 2015; Panizo, Hollander, Pappas, & Pierrakos, 2014). While four out of seven students talked about different learning strategies, Student 1 admitted that if the professor had started the semester with clear course expectations, it would have helped the students. Student 3 wanted materials that clearly moved from one point to the next.

Participants spoke about various methods of learning that could help them succeed. 70% of them mentioned how professors need to identify the needs of the students and teach using different learning methods. While Student 1 said "in the best way they could teach so that the best way I could understand," Student 5 added the following with regard to different teaching methods: "Breaking down the steps if I don't get it." Student 2 shared some thoughts:

> Professors only want to teach in one way and not recognizing the need that students might learn in a different way and be able to give a different example. I am not asking for 5 examples, just here is one way and here is the other way would have helped.

Another component that 90% of the students agreed on was that the professors need to make sure that the students understand a concept before moving on to a new one. Lack of understanding the concepts centered around the thought that professors did not explain the material and the procedure thoroughly. Student #3 provided this response:

> Making sure that we understand and move us on to the next point. In a class, especially with math, it's hard to keep up that the lot of issues with people with

> math because instead of us moving all together, a lot of instructors they just move on from here to here.

Students 2 and 5 recommended that the instructors should work out more examples so that students could understand the concepts better. They confided that when they saw similar examples, they learned the material without any difficulties. Student 7 pointed out the following:

> We need more help, better examples in class done slowly to better understand it. Going over the questions over and over is the best way to learn them but trying to do things on your own like that is much more difficult to understand.

When asked if the students used the free tutoring services at the campus, three out of the seven participants did use tutors. However, they did not think the tutors were helpful. All three students said that the tutors taught the material in a different way from what they learned from their respective professors. They became confused or did not understand. Student 1 confided that "it was kind of difficult to learn their method" and Student 5 also said "I tried tutoring…I didn't grasp very well." However, Drago, Rheinheimer, and Detweiler (2018) pointed out that tutoring had significant and positive effects on academic performance. Cole (2017) also mentioned the positive impact of tutoring on academic performances as well as student retentions.

Discrepant Cases

According to Gast and Ledford (2014), discrepant cases are outliers, or they hold inconsistencies in the data with the initially identified themes or categories. Even with 7 potential participants, discrepant cases are possible. Although discrepant cases are likely

to provide contrary evidence against the majority of the data findings, Yin (2014) suggested not excluding the discrepant data. After all the data were coded, there were no discrepant cases. All the students addressed the questions asked in a clear manner, and no responses were unclear or confused.

Evidence of Quality

First, I conducted face-to-face interviews with individual participants in a secure room in the library. I provided all participants with enough time to think about and answer the research questions. Having recorded all interviews on my phone, I transcribed the information following each interview. By listening to the interview recordings and transcribing them, I had the opportunity to really hear the participants' perceptions and ideas clearly and made sure that each participant interview was correctly captured and accurately transcribed. I showed each study participant a verbatim transcription of his or her recorded interview for the member checking process. I completed the member check process for accuracy, and none of the participants asked for changes. By using code-recode and member checking, I also ensured all findings were a reflection of the participants' thoughts and perceptions by sending the participants my initial findings.

The research questions were addressed by obtaining the students' perceptions of both why they dropped out of developmental mathematics courses and what might have helped them to successfully complete those courses. I organized the repeating words and phrases into codes in an Excel spreadsheet and then into themes which helped me to organize the findings. The data were grouped into emerged themes by the process of reading the transcripts and reviewing the audio of the interviews. From the 7 in-depth

interviews, I established 4 themes (Table 1), and the findings from the interviews were the following.

Findings from the Study

Perceived reasons for failure to complete course. The first guiding research question was "What are students' perceptions of their reasons for dropping out of developmental mathematics courses?" In addition to the academic difficulties, participants did reveal that factors external to class did contribute to their dropping out. They spoke about family and medical reasons, including psychological anguish as reasons for their dropping out. This supports Wood (2014) who mentioned that in addition to academic integration, social, psychological, and environmental factors impacted the persistence of nontraditional students. Tinto's theory on departure perceived that an individual's ability to pay for college or university could likely result in students dropping out of classes, a concern revealed by participants in my study.

With a completion rate of 22.9% for developmental mathematics courses at the local community college, the study's findings revealed important data regarding reasons for the high dropout rate. Participants openly shared their views and experiences about why they had dropped out of developmental mathematics classes. Some participants expressed their concern that some faculty did not want to help students outside class. Also further discussing issues with faculty, some participants noted that the classroom instruction was not helping them succeed. Additionally, others reported that they found the subject difficult, and some students confessed that even during their high school, they could not grasp the subject very well and had to repeat it. As mentioned in the review of

literature, students who are prepared well in high school are better positioned in college than students who are underprepared and are placed into developmental courses in community colleges (Bryk et al., 2015). Similarly, research conducted by Bryant (2015) mentioned that the skills of underprepared college students are linked to their high school preparation. Tinto (1975) also pointed out that when students faced academic difficulties, they were likely to drop out of the class.

Perceived needs for success. The second guiding question was "what are students' perceptions of supports that might have contributed to their completion of developmental mathematics courses?". Findings from the study offered insights about what students expect from faculty that could lead to a better understanding of the subject. Moreover, as noted earlier, the findings also provided additional insight indicating that students at the community college often benefit from faculty members that provide help during their office hours. I noted from the interviews that the expectations of the students from the professors were to make sure the students understood the material before moving on to the next topic and have student-centered learning. They wanted the professors to be available one on one and explain the problems by breaking them down in a manner that students understand. In the interviews, each participant consistently noted that if students had been provided steps to assist them to solve the math problems, they would have done better in the class. The step by step strategy, with a little reinforcement on breaking down the content, is what the students agreed would help them succeed.

In summary, the data collected from the students identified that students needed help in better understanding the subject. Of the 7 participants interviewed, there was a

strong emphasis on new teaching methods with active learning strategies and more student-centered lessons. The data revealed that faculty hold an important role for academic success. Additionally, students recommended the use of the available resources to be successful in the developmental mathematics classes. Overall, based on these results, I determined that professional development training could help prepare developmental studies faculty to promote academic success. To share the results of the study, I outlined a project deliverable of professional development training for the faculty. The main goal of this project was to share the outcomes about why students drop out of developmental mathematics and to provide suggestions for increased student success in those courses. Included in the training was active learning strategies, more student-centered lessons, and suggestions for effective use of the resources available at the campus.

In this section, I described the qualitative method for studying the perceptions of students regarding why they dropped out of developmental mathematics and what could have helped them to complete their course in a Texas community college. I outlined the method for selecting the 7 participants to interview and the procedures for conducting the interviews. I detailed the ethics, data collection, and researcher's role. Finally, I specified the way in which I conducted the data analysis and reported the findings. Section 3 will discuss the goals and rationale of the project, the review of literature, and the implementation and implications for social change. In Section 4, I will address the project's strengths and limitations, recommendations for alternative approaches,

scholarship, project development, leadership, change, implications, applications, and directions for future research.

Section 3: The Project

Introduction

In a case study design, this qualitative research captured the students' perceptions about why they dropped out of developmental mathematics and what could have helped them to complete their course of developmental mathematics classes in a Texas community college. Findings revealed that students need help in better understanding of the subject. They expect the faculty to explain the problem step by step using more than one way to explain, and they want their professors to break down the equations so the students can comprehend the content. Overall, the findings suggest the need for a project, based on the genre of professional development. The purpose of this project is to share the outcomes about why students drop out of developmental mathematics and to provide suggestions for increased student success in those courses. Specifically, the project will introduce developmental faculty members to successful instructional strategies. These strategies may help students better understand course content through the implementation of active learning strategies, more student-centered lessons, and increased use of campus resources. The training will occur during regularly scheduled professional development days where I will share the study findings. In addition, the project will include 3 days of group activities for academic strategies, student engagement, and active learning. This section includes the project rationale, description, goals, literature review, evaluation plans, and implementation.

Rationale

I considered various project genres to present the findings of this qualitative case study. Vedung (2017) pointed out that ongoing evaluations are required for educational programs to determine if they are efficient in yielding the desired outcomes. Researchers perform program evaluations to assess aspects of programs for modifications or improvement. My study, however, was not a program evaluation because I explored student perceptions about why they dropped out of developmental mathematics and what could have helped them to complete their course of developmental mathematics classes in a Texas community college. An evaluation report was not appropriate for my study.

Another genre that I considered for the project study was a policy recommendation with a position paper, commonly referred to as a white paper. A white paper supports a particular position as being the best direction to take or a specific solution that is better for a given problem or situation (Purdue, 2017). A white paper involves a comprehensive accounting of the needs of an organization or institution (Weatherwax, 2017). However, my case study did not focus on any policy recommendation/position paper.

The next genre that I considered was a curriculum plan. A curriculum plan refers to the creation of a curriculum: the planned engagement of learners (Henson, 2015). This genre was rejected since I did not create a curriculum. Developing a new curriculum may be something that faculty do as a result of taking part in my capstone project, which may facilitate developmental faculty in maximizing student learning.

The last genre I considered for my study was professional development (PD).The data collected from the study showed that student participants wanted better understanding of the subject, active learning strategies, student-centered lessons, and encouragement concerning campus resources. Therefore, the most applicable project genre that aligned with my findings was a faculty PD. Once faculty members have engaged in the PD, they might be more prepared to work with students, which may lead to more student success (Bayar, 2014). Hammond, Hyler, and Gardner (2017) stated that effective PD must be in place for teachers to be effective. For this reason, I selected PD as my project genre.

At this study site, students enrolled in the developmental mathematics courses are mandated to pass the class before enrolling into any college level classes. According to Kilgore and Wilson, (2017), students in developmental courses are often at risk of dropping out. A PD training for faculty that intentionally focuses on students' learning goals through active learning activities may help these students succeed.

Review of the Literature

Researchers from various disciplines have shed light on how to learn and teach to maximize student learning. The most significant strategies to implement student-centered learning experiences through PD training to enhance instructors were drawn from recent research. The focus was on professional developmental strategies to transform faculty's current teaching practices into new understandings in the college courses they teach. I searched scholarly literature on Walden University's library using the Academic Search Complete, Education from SAGE, in addition to the Google Scholar database. I used the

key words *adult learning, cooperative learning strategies, faculty professional development, student engagement,* and *active learning.* The main idea of this literature review was to provide scholarly justification as to why PD for the developmental mathematics faculty was appropriate for my study project.

Effective Professional Development Training

Impactful and transformative PD training plays a major role in ensuring teacher and student success (Kennedy, 2016). PD activities conducted for faculty can have a positive impact (Bayar, 2014). Because student learning is impacted by the quality of teaching, effective faculty growth is very important for all educational systems. Bayar (2014) conducted a study on effective PD training and concluded that effective PD should consist of these components: (a) high quality instructors, (b) instructors' involvement in professional development activities, (c) a match to existing faculty, (d) a match to existing student needs, and (e) active participation opportunities. To facilitate faculty growth, a PD must focus on active practices that will help students succeed (Bayar, 2014). Ultimately, the essential goal of a PD is to increase student success and instructionally focused PD should aim to meet this goal. Bayar (2014) stated that it is important to provide opportunities to faculty to learn effective instructional practices. Additionally, a PD that consists of crucial elements that focus on educators' growth and proficiency should be considered (Meissel, Parr, & Timperley, 2016).

To meet the continuous challenges and changes in the classroom, the faculty must be prepared. To help the faculty prepare for the classrooms, opportunities to develop new teachings skills and extend understanding of subject content should exist (Voogt et al.,

2015). When attempting to introduce new strategies in any program in education, it is very important that faculty are educated in the changes. Effective and high-quality PD is the best genre for faculty to update their teaching skills (Voogt et al., 2015). High impact PD training is an "indispensable factor in any efforts to aid in education reform" (Sanders, 2014, p. 37). Furthermore, an important component for an effective PD is collaboration and should focus on interactive learning experiences through faculty participation (Galosy, Gillespie, & Banilower, 2018).

Spillane, Hopkins, and Sweet (2018) conducted a study that examined the relationship between teachers' instructional ties and their beliefs about mathematical instruction at a school district. The results showed that teachers' beliefs did not change when they interacted with the students, but with peer interactions their beliefs changed over time. Teachers reported that the input and support from their colleagues were crucial in broadening their instructional abilities (Vangrieken, Meredith, Packer, & Kyndt, 2017). Meaningful learning and increased faculty knowledge of instructional methods can occur when there are social collaboration activities during PD (Alt, 2015). Thus, networking and collaboration are important for effective faculty development. Lamb (2015) pointed out that when less experienced faculty and seasoned faculty collaborate during PD, instructional methods are enhanced. Evers, Van der Heijden, and Kreijns (2016) also mentioned that developing training for educators to provide quality education to students in addition to networking should be promoted.

Teaching practices should be transformed focusing on student-centered learning in developmental mathematics (Clements, Sarama, Spitler, & Wolfe,2016). According to

Epstein and Willhite (2017), faculty PD training should focus on student engagement to learn and grow, rather than just participation. Stimulating creative thinking can help improve conceptual and practical skills. The data collected from the study implied that faculty need to equip themselves with a step-by-step strategy to help students understand better. The analyzed interviews show that there is a gap between students' expectations from the faculty and faculty's teaching methods. Students reported that the faculty's instruction methods did not improve students' learning. When students are equipped with better learning experiences, they seem to do better in their classes (Johnson et. al.,2016).

Andragogy

Andragogy is a theory of adult learning introduced by Knowles, meaning "the art of helping adults learn" in contrast to pedagogy, meaning "the art of helping children learn." For centuries, education has been researched to distinguish between adult learning and adult education. However, there is no single theory that explains the differences (Giannoukos, Besas, Galiropoulos, & Hioctour, 2015). Loeng (2017) summarized that the topic of andragogy was first introduced to the field of education by a German schoolteacher named Alexander Kapp but the concept was ignored for many years. He added that Rosenstock-Huessy revived the concept of adult learning to help the Germans after World War 1. Linderman brought this concept of adult education to the American society. However, Knowles followed another educator, Savicevic, to expand his knowledge on adult learning (Henschke, 2016).

Different researchers have presented many models and frameworks to understand adults as learners. One of the best known is Knowles' andragogy (Ozuah, 2016). His

concept was based on two attributes: first, leaners are self-directed and second, teachers are facilitators of learning. Andragogy was created by Knowles (1989) based on a number of assumptions about adult learners. He used these assumptions as a foundation to design programs for adults. He started with four assumptions and later added two: adults are self-directed, adult's experience is a resource for learning, adults' interest in learning is related to the relevance of their work, adult learning is focused on immediate application rather than future application of knowledge, adults' motivations are internal rather than external, and adults need to know why they are learning. He used these assumptions as a foundation to design programs for adults. Merriam (2014) mentioned that of all theories on adult learning, andragogy is the best known.

Levi-Keren and Patki (2016) stated that professional development should involve discussions. Additionally, Hagen and Park (2016) found that when adults are involved in problem-solving discussions, the discussions can lead to deeper thinking and learning. Even though there is a wide spectrum of professional development for adults, it can be challenging to have a professional development that accommodates all the participants' styles (Wang, & Storey, 2015). However, Knowles (1989) and Merriam (2014) agreed that when a professional development has problem-based discussions, active learning and student engagement, adults can be motivated.

Ferreira, Ryan, and Davis (2015) discussed that the quality of teaching and learning in mathematics needed attention. They mentioned that it is important that faculty are well-informed about how students learn mathematics in order for students to succeed. When faculty are exposed to innovative ideas of teaching, students' test scores increased

by 15% (Uribe -Flórez & Wilkins, 2017). Toll (2017) pointed out that when adults know why they need professional development, they will accept the information.

Access to Educational Resources

An external factor that affects student achievement is the access to educational resources. Kermani and Aldemir (2015) found that when low income students did not have any exposure to early learning programs, they had lower performances in STEM programs. They argued that these underprepared students found it difficult to adjust to college life because of their lower levels of skills and knowledge. Tutoring and other services are provided in some higher educational institutions to meet the needs of underprepared students (Wu, Jóhannsdóttir, & Sundar, 2017). Colleges that provide developmental courses may also provide tutoring services. Students who make use of these resources often have a positive learning attitude (Colver, & Fry, 2016). Wibrowski, Matthews, and Kitsantas (2017) conducted a longitudinal study with 137 first-generation students. These students needed access to resources such as academics, counseling, and financial support. The pre-test and post-test academic data were compared at the end of four years. Results were found that there was an increase in their academic achievements when students used the support programs.

Wu, Jóhannsdóttir, and Sundar (2017) studied the effect of tutoring and passing rates in remedial mathematics courses. According to the study, tutoring significantly improved the passing rates in the remedial courses. The researchers mentioned that colleges should provide supplemental instruction by offering tutoring services. Wu,

Jóhannsdóttir, and Sundar (2017) also added that when colleges offered assistance to students for advising and non-academic support, students' passing rates often improved.

Stemmer and Mahan (2016) conducted a survey on library use and student outcomes. They found that students are more likely to be retained when they use the library for academic needs rather than for social networking. Moreover, first-year students' library use has an impact on second year retention. Even though information about these resources was available to students, Yan and Sendall (2016) mentioned that students still confirmed that information about how to use these resources was not sufficient. Additionally, Ciscell, Foley, Luther, Howe, and Gjsedal (2016) found that mere advertising of the student resources was not enough because students still complained about their lack of knowledge regarding available resources. The researchers mentioned that there need to be more study on how to make the students aware of the available support services

Student Engagement

Student engagement is how involved the student is in the learning. Motivation in education is a part of student engagement and achievement (Sinatra, Heddy, & Lombardi, 2015). Sinatra et al. (2015) conceptualized student engagement as a continuance from student-centered to concept-centered instruction. They debated the conceptual and instrumentation issues related to engagement in science learning. They first started discussing the engagement of students (behavioral and emotional) to engagement of the concepts (subject related). Researchers have pointed out that student engagement cannot be described by a single attribute (Barkaoui et al., 2015). In fact, they added that there is

no single definition that actually comprehensively describes student engagement. When they conducted a study with the teachers and the administrators from three underachieving schools, the results indicated that student engagement enhanced their success (Barkaoui et al., 2015). The teachers who participated in the study described various strategies that they used to focus on student engagement. The researchers discussed how to facilitate student engagement in classrooms and how it would have profound effect on student learning.

Student engagement can be improved by effective instructional strategies such as activity, participation, and discussions (Lumpkin et al., 2015). The researchers mentioned that when instructors facilitate student engagement, the students' cognitive behavior can help them meet their expectations. Student engagement in mathematics classes can help promote critical thinking. When students are encouraged to interact with their classmates to understand the content, deeper and sustained learning is attained (Lumpkin et al., 2015). Interacting with classmates promotes teamwork, leadership and problem-solving skills. Engaging students is the major link for deeper learning and success. Bigatel and Williams (2015) asserted that a connection exists between engaging instructional strategies and student success. When the faculty's focus on enhancing the engagement through group activities, students not only learn the concepts but also learn the skills to work with their classmates. Additionally, Caruth (2018) identified student engagement as a notable component in college success. When students are engaged throughout their academic career, it helps them succeed and complete their course. Mellor et al. (2015) examined the reasons for poor academic performance in students' first semester. The

researchers conducted interviews and distributed questionnaires to students who were on academic probation and then introduced an intervention course for the students with low GPAs. The course focused on student engagement, and it helped students become aware of their own learning. This intervention resulted in a positive effect on student retention. The researchers noted that small interventions can reduce attrition.

Active Learning

Math faculty have struggled to determine if actively engaged students or traditional instruction is the most efficient method of teaching (Bottge et al., 2015). Clements and Sarama (2014) stated that some mathematics faculty use their own strategies to teach math problems effectively in class. However, these approaches often become formula-based instructions, which do not allow students to actively participate in the class. This results in the classroom becoming more faculty-centered rather than student-centered . Faculty can develop lessons that help in critical thinking and problem-solving skills by engaging students (Clements & Sarama, 2014). In a study, Lewin, Smith, Smith, Stetzer, and Vinson (2014) provided important implications for faculty PD that will gradually help them to use active learning strategies. When faculty implement a small change from faculty-centered instruction to student-centered learning, the transition to active learning strategies result in more effective learning (Ebert-May et al., 2015).

Jaleel (2016) mentioned that metacognition is being aware of a person's own ability to think. There are two features of metacognition: reflection and self -regulation. Reflection is thinking about what one already knows, and self-regulation is managing those thoughts (Jaleel, 2016). In terms of mathematics, these refer to the mathematical

processes that students have and their ability to solve problems. Their success in turn depends on how they use their thought or knowledge (Özsoy & Ataman, 2017). Improving the faculty's knowledge on metacognition can help them in developing and implementing student-centered learning in mathematics classes. Faculty should enhance student's mathematical learning by engaging them in active learning and developing student- centered strategies (Stols, Ono, & Rogan, 2015).

Active learning strategies enhance positive learning rather than passive learning (Streveler & Menekse, 2017). Furthermore, active learning is made effective by constructing knowledge through collaborative learning (Streveler & Menekse, 2017). Active learning helps the learning process through reflection as well as collaboration for more substantial learning (Virtanen, Niemi, & Nevgi, 2017). Additionally, it reflects the belief that students learn and absorb knowledge in unique ways (Burns, Pierson, & Reddy, 2014).

Cooperative Learning

Cooperative learning is a teaching strategy where students of different levels use learning activities to understand the subject (Riley &Ward, 2017). An experimental study conducted by Capar and Tarim (2015) compared traditional methods of teaching with cooperative learning methods in mathematics. The result of the study was that cooperative learning was more successful in promoting both achievement and positive attitudes. Faculty can engage students in group activities where students can have an equal role in helping other students, by which they gain mastery of the content (Lumpkin, Achen, & Dodd, 2015). This helps the students to work with each other to understand

certain concepts that may not be clear during traditional teaching. Through cooperative learning, the researcher suggests that the students share in the responsibility of learning.

Student achievement can have positive results when cooperative learning strategies are used (Powell, 2014). Rohani (2014) mentioned that students' test scores were higher when cooperative learning was implemented compared to when straight lecture was the teaching strategy. Alabekee, Samuel, and Osaat (2015) also found that student learning through cooperative learning and engagement showed improvements in students' academic achievements. They recommended the implementation of cooperative learning through workshops for the faculty. Cooperative learning and active learning in mathematics classrooms can improve student achievement (Johnson, Abbate, & Chase, 2017). Thus, PD training for faculty focusing on cooperative learning and active learning strategies can help students succeed.

I searched scholarly literature in Walden University's library using the Academic Search Complete, Education from SAGE, in addition to the Google Scholar database. Saturation of literature review was reached through a systematic search of research related to professional development, student engagement, cooperative learning and active learning strategies for teaching mathematics in higher education.

Project Description

The most effective and efficient way to broaden community college faculty instructional strategies is through PD training (Appendix A). Effective PD must have interactive learning experiences so that the faculty members can relate and transfer their own learning strategy and apply them in the classes that they teach. The main goal of the

professional development is to provide developmental faculty members and adjunct faculty members the results of the study and to share strategies that can promote student engagement and student success.

Needed Resources and Existing Supports

To conduct the PD training at the study site, I will require approval from the administration of the community college. Faculty at the community college are required and generally paid for attending professional development training. Moreover, the college offers online and face to face training sessions throughout the academic year. The proposed PD will not require a lot of resources from the study site. By including the PD in regularly scheduled professional development days, the college can use the resources (the rooms, projectors, and mikes) allocated for these events to support my proposed PD training. To reinforce student engagement and active learning in the classrooms, a PD training for developmental mathematics faculty will help the students succeed.

Potential Barriers and Potential Solutions

If the department of developmental mathematics offers an option that I could conduct the PD at any time throughout the academic year, I can propose a training schedule to accommodate the needs of the study site. However, there are some potential barriers that may include the possibility that some developmental mathematics faculty members may be reluctant to attend the training, and some may not have the time to participate. Additionally, some faculty members who attend the training may be reluctant to implement student engagement and active learning in their classrooms. This may decrease the effectiveness of the PD training.

The combination of the awareness on this study and the department chair's encouraging attendance or even making attendance mandatory should serve to increase faculty participation in the PD. Additionally I am willing to have a flexible schedule that would meet the needs of the study site and the participants

Implementation

The preferred option to implement the PD to all developmental mathematics faculty would be as soon as possible. Generally, all trainings for the developmental mathematics department require at least two months' notice. For that reason, I will submit my proposed PD training two months before the next section. I will have to coordinate with the department chair and the administration of the study site and give them details about my proposed training plan. I will then discuss all the required support to actually start the training at the study site.

The PD training will include 3 days of group activities for academic strategies, student engagement, and active learning. The faculty training will first include a presentation where I will share first the findings of the study and then information about active learning. I will be available to answer any questions about the study. During the second day of training, developmental mathematics faculty will discuss the best practices for student engagement, cooperative learning, and classroom strategies. Activities will include how to implement these strategies in their classrooms. Finally, during the third day, faculty will be provided information about student support services and how to refer students to necessary resources.

Project Evaluation Plan

The purpose of this project is to share the outcomes about why students drop out of developmental mathematics and to provide suggestions for increased student success in those courses. The PD will take place for 3 days. There are various approaches to evaluation of a PD. Formative evaluation was initially considered, but this evaluation is an on-going process and helps to evaluate during the learning process. Summative evaluation helps to assess the learning at the end of the project (Dixson & Worrell, 2016). Finding the effectiveness of the content of learning in this PD is the aim of this evaluation process. Consequently, once the PD training is finished, I will use a summative evaluation (Appendix A). A handout with four questions will be distributed to the participants of the PD. Additionally, the effectiveness of the project can be evaluated by the feedback received from the key stakeholders, such as the faculty members and the department chair of developmental mathematics.

The success of this PD will be based on faculty participation. Without their participation in the training, the intended goals to improve student learning will likely not be met. Additionally, the PD will be considered successful if the summative evaluation reflects an increase in awareness levels regarding the strategy that can promote student engagement and student success.

Project Implications

The purpose of this project is to share the outcomes about why students drop out of developmental mathematics and to provide suggestions for increased student success in those courses. As I discussed in Section 1, the success rates for community colleges

have been a major barrier for many students to complete their associate degree. At the local community college, students are required to complete their developmental mathematics sequence before they enter their college level mathematics courses. The proposed project training addresses the needs of these students.

Results from data analysis and evidence-based instructional practices will be presented to the faculty members and administration. At the study site, many faculty members are life-long learners and are ready to welcome new practices that impact student learning. After conducting the PD training, I anticipate that the proposed project will give the developmental mathematics faculty a better understanding of student challenges with regard to mathematics and active learning strategies to address such concerns. A high-quality professional training could positively impact not only student learning but also student success rates at the local college because faculty will better understand students' needs and have improved teaching methods with which to address those needs. Improved teaching and learning in the developmental mathematics courses is the social change that could occur as a result of this study and PD.

In section 1, the review of the literature states that the problem of students dropping out of developmental mathematics is widespread. I believe that my study results could be valuable to community college faculty, especially those who teach developmental mathematics. The PD training created for the study site can serve as a framework for other community colleges to promote their own PD training, which could be adjusted to meet the needs of their students. Other colleges and faculty can use my study as a model to conduct studies on their campuses to better understand the

perceptions of their students. Then, the results can be used to implement their own student-engagement programs.

Section 4: Reflections and Conclusions

Introduction

The purpose of the qualitative case study was to explore students' reasons for dropping out of developmental mathematics and what might have helped them be successful. The research process has been a phenomenal experience for me by helping me to understand the problems of the students at the local setting. This section will describe the strengths and limitations of the project and ways to address the limitations. It will also include my reflections as a project developer and a scholar. Finally, I will describe the recommendations for future research.

Project Strengths and Limitations

Researchers have found that when educators are engaged in PD training, they are better informed with the latest academic strategies to improve the outcomes of learners (Evers et al., 2016). I created my PD based on the feedback of the students in order to promote faculty awareness of the importance of the learning environment that students expect. Strengths of the project include the format, the ease of understanding, and detailed evidence. I created an in-depth, interactive, and collaborative PD that can equip faculty to focus on student learning. The format of the PD is easy to comprehend and allows the faculty to have their questions completely answered. The project was designed with activities, discussions, and interactions. Faculty's interactions through their shared experiences during the training can help bring out ideas for student engagement. Mundy, Howe, and Kupezynski (2015) pointed out that PDs that incorporated activities, discussions, and interactions can be successful.

Another strength of the project is that if the trained faculty can implement the knowledge and strategies they gained through training, they may see improved student success (Banta & Palomba, 2014). This strength of the project is realistic and has promise. Additionally, this project can be used as a potential resource for developmental mathematics faculty as they plan their teaching strategies. Because the project is designed to use active learning and student engagement that faculty can transfer to the classroom, increased student success may be one outcome (Bottge et al., 2015). Finally, the PD may be applicable to community colleges with similar demographics that offer developmental mathematics in their curriculum.

The limitations of the PD training could include the lack of involvement of the faculty. Interested faculty members may not be willing to invest their time and effort to attend the PD training. They might be too overwhelmed with their everyday responsibilities to learn new instructional practices. Subsequently, they could opt out of the training. Furthermore, the project focuses on the developmental faculty who attend the PD to make the changes that could help the students succeed to their classrooms; however, this may not happen in all cases.

Recommendations for Alternative Approaches

This case study had a sample size of seven students. Normally, this sample size of seven would be considered very small. A qualitative study with at least 15 students for this study might give the local study site more in-depth and richer data. There might be further student attributes associated with students' dropping out that could be helpful to this study. An alternative approach would be interviewing the developmental faculty

members to examine their perceptions of students' success and failures. This could also lead to research of faculty's different teaching styles and their impact on student success and failures.

The purpose of this project is to share the outcomes about why students drop out of developmental mathematics and to provide suggestions for increased student success in those courses. An alternative approach would be to start a mandatory self-paced online professional training for the faculty. It could be a valuable resource for the new faculty. Moreover, it would be easier to accommodate the faculty's teaching schedules.

Scholarship, Project Development, Leadership and Change

Scholarship

I have been an instructor of learning for almost 15 years in the community college system and have always wanted to learn and teach new ways that impacted student learning. Additionally, I have always been interested in and concerned about student retention. I entered the doctoral journey to learn innovative approaches and practices for my professional and personal learning. The doctoral program has helped me understand and appreciate the importance of scholarship and one's own development as a scholar practitioner. I have learned that scholarship is a process where the problem starts as an inquiry and results in potential solutions. The lessons learned through the course work helped immensely in my preparation for the challenges of the final study. I also learned the areas of my weakness in addition to the skills needed to improve in the field of education. With the experience of the doctoral process, I can move forward as a better learner.

Project Development

After the completion of the study, I started exploring different genres for the project. It was challenging to educate myself about the different genres and find a suitable one for the project. Alignment of my goals and review of the literature addressing the project helped me understand the importance of project development. The process took longer than I anticipated. Initially, I only had a general idea of the project and did not have the strategy or the details. I wanted to design the project such that it would be helpful for student learning. Through continuous drafting and rewriting, I was able to achieve that and finalize the details of the project.

Leadership and Change

Being a faculty member or an educational leader comes with an important responsibility to be concerned about student success. As a faculty member, I have the opportunity to mold and support students' academic development. Effective faculty organize their classrooms to meet the needs of the students. This project has helped me realize that I can bring about positive change starting with my own class. During the interviews, I realized that empathy is required for leadership development. The interviews helped me think of the students' struggle and how to help them succeed. Leadership is about working towards good for others and bringing about positive change.

Reflection of Self as Scholar

Throughout the research process, I learned a lot and found this study to be time consuming, especially reviewing the literature. Hours were spent reading and gathering information. Additionally, there were a lot of challenges in writing the paper. Because I

am mathematician, I rarely have the need to engage in scholarly writing. There were several situations where I was frustrated, but with the help of my committee chair and my family, I continued to make progress.

I gained knowledge through interviewing students, including developing better insights of what the students experienced and what expectations they had regarding the instructor. I learned a lot of valuable lessons by being patient while going through the protocol of getting the IRB approvals from both Walden and from the study site. When I began the doctorate program, I was underprepared for the commitment involved; however, I developed the strength and rigor to successfully complete the journey. Every course through the process provided opportunities for learning and development of scholarship.

Reflection of Self as a Practitioner

I love teaching and helping students in the community college system, especially the ones struggling in developmental mathematics classes. This doctoral capstone project has been a learning experience for me as a practitioner and has helped me understand what students value from their classes and why. This project has also helped me understand that I should incorporate active learning and different teaching strategies that could improve student learning. My own experience as a student has made me a better practitioner because my stimulating experiences not only allowed me to better understand my strengths but also identify the areas that needed improvement. It has taught me to be a lifelong learner and to never give up. Additionally, I have learned the importance of educational research and that as an educator it is my responsibility to help students

become valuable members of society. As a practitioner, I have grown in my ability to bring about these changes by improving my instructional methods in the classroom.

Reflection as a Project Developer

I felt great satisfaction in working with the research and using the results to create a PD, a product that could ultimately enhance faculty teaching and result in improved student success. I learned that during the planning process, it was important to understand and create a training that was realistic. As a faculty member and researcher, I gained knowledge regarding strategies for effective training methods to help the underprepared students. As I developed the project, I infused strategies in the PD that faculty could also practice in their own teaching, such as active learning and cooperative learning. I am excited that the PD training may begin to bring about positive change in the teaching of developmental mathematics at the study site and even may be offered at other, similar community colleges.

Reflections on the Importance of the Work

This study was small but an important contribution to developmental mathematics at the study site and perhaps at other community colleges. I obtained findings directly from the perceptions of the students. If this study could help developmental faculty understand that instructional delivery is important and that active learning and student engagement strategies could improve students' performance, then I would be satisfied.

The knowledge that I have gained during this doctoral program has revealed how important it is to feel empathy with my students during their academic journey. This study process is about putting into actual practice what I have learned. As I reflect on the

importance of this work, I find myself realizing how powerful collaborative learning can be to each student's learning and how it can build confidence in students. Students need not only the knowledge of the subject but also the tools to positively contribute to the society. I want my students to be successful learners. I also want them to take responsibility and ownership for their learning so that when they leave the school environment they will be better prepared to cope with the challenges of the world. Collaborative learning in the classrooms can help students handle both challenges and setbacks (Mundy et al., 2015).

Implications, Applications, and Directions for Future Research

Even though social changes generally happen slowly, this study has the opportunity to create a positive change for the students and the local setting. The findings from the study revealed that students need help in better understanding of the subject. This led to the development of a PD training for the faculty. This project can impact a social change at the research site by bringing developmental mathematics faculty together to work towards the common goal of increasing student success. Moreover, if the faculty benefit from the PD and practice active learning techniques and cooperative learning in their classes, the study site should eventually see progressive improvement in student success in developmental mathematics. Student success comes with better career opportunities in the globally evolving economy that requires a minimum of a post high school degree (Gándara, 2015).

It is important that future research focus on methods and practices that can strengthen instruction to increase student achievement in developmental mathematics.

Research can be conducted to find other factors that impact student success. Additionally, research could be initiated in the high schools to check graduating students' college readiness. If more researchers report findings that support the need of collaborative and active learning so that students can better understand the subject of developmental mathematics, then other community colleges may choose to implement similar training. Faculty who attempt to ensure that students must be prepared to become successful and productive citizens in the ever-changing world make unparalleled contributions to the community.

Conclusion

In the concluding section of this research study, I included the project's strengths, the project's limitations, a description of my personal growth as a scholar, and a practitioner, and my growth as a project developer. Community college educators struggle to understand why students drop out of developmental mathematics classes. Studies, including this one, are needed to address this problem. I gained immense knowledge during the process of this doctoral study and project development.

As highlighted by the findings of this study, an opportunity exists for postsecondary faculty on a national scale to increase their awareness regarding how to incorporate active learning in their teaching. Optimistically, faculty implementation of the findings of this study may lead to increased student success at the community college.

References

Abraham, R. A., Slate, J. R., Saxon, D. P., & Barnes, W. (2014). College-readiness in math: A conceptual analysis of the literature. *Research & Teaching in Developmental Education*, *30*(2), 4. Retrieved from http://www.nyclsa.org/index.html

ACT. (2007). *COMPASS guide to effective student placement and retention in mathematics.* Iowa City, IA: ACT National Office. Retrieved from https://www.act.org/content/dam/act/unsecured/documents/Compass-MathPlacementGuide.pdf

Acosta-Tello, E. (2014). Tools for engaging online learners: Increasing student involvement in online classes. *Journal of Instructional Pedagogies, 15,* 1-5. Retrieved from http://www.aabri.com/manuscripts/142089.pdf

Alabekee, E. C., Samuel, A., & Osaat, S. D. (2015). Effect of cooperative learning strategy on students learning experience and achievements in mathematics. *International Journal of Education Learning and Development*, *3*(4), 67-75. Retrieved from https://pdfs.semanticscholar.org/ca90/e245d2cd6c0651c6a4ae4f482e20f037b40c.pdf

Albright, M. I., & Weissberg, R. P. (2010). School-family partnerships to promote social and emotional learning. *Handbook of school-family partnerships*, 246-265.

Alt, D. (2015). Assessing the contribution of a constructivist learning environment to academic self-efficacy in higher education. *Learning Environment Research,*

1(21), 47-67. doi:10.1007/s10984-015-9174-5

Ariovich, L., & Walker, S. A. (2014). Assessing course redesign: The case of developmental math. *Research & Practice in Assessment*, *9*, 45-57. Retrieved from https://www.learntechlib.org/p/157945/

Bahr, P. R., Hetts, J., Hayward, C., Willett, T., Lamoree, D., Newell, M. A., & Baker, R. B. (2017). Improving placement accuracy in California's community colleges using multiple measures of high school achievement. *Community College Review*. Retrieved from https://rpgroup.org/Portals/0/Documents/Projects/MultipleMeasures/Publications/Bahr_et_al-2017-Improving_Placement_Accuracy_in_California.pdf

Bailey, T., & Jaggars, S. S. (2016). When college students start behind. *The Century Foundation*. Retrieved from https://tcf.org/content/report/college-students-start-behind/

Banta, T. W., & Palomba, C. A. (2014). *Assessment essentials: Planning, implementing, and improving assessment in higher education*. New York, NY: John Wiley & Sons.

Barkaoui, K., Barrett, S. E., Samaroo, J., Dahya, N., Alidina, S., & James, C. (2015). Teachers' conceptions of student engagement in learning: The case of three urban schools. *Alberta Journal of Educational Research, 61*(1), 80-99. Retrieved from https://journalhosting.ucalgary.ca/index.php/ajer/index

Bawa, P. (2016). Retention in online courses: Exploring issues and solutions—A literature review. *Sage Open*, *6*(1). doi: 10.1177/2158244015621777

Bayar, A. (2014). The components of effective professional development activities in terms of teachers' perspective. *International Online Journal of Educational Sciences, 6*(2), 319-327.

Beach, J. M. (2012). *Gateway to opportunity?: A history of the community college in the United States*. Stylus Publishing, LLC.

Bean, J. P., & Metzner, B. S. (1985). A conceptual model of nontraditional undergraduate student attrition. *Review of educational Research*, *55*(4), 485-540.

Bernstein, L., Edmunds, J., & Fesler, L. (2014). *Closing the performance gap: The impact of the early college high school model on underprepared students*. Abstract presented at Society for Research on Educational Effectiveness Spring 2014 Conference, Washington, D.C. Retrieved from https://eric.ed.gov//id=ED562689/

Bigatel, P., & Williams, V. (2015). Measuring student engagement in an online program. *Online Journal of Distance Learning Administration, 18*(2). Retrieved from http://www.westga.edu/~distance/ojdla/summer182/bigatel_williams182.html

Boatman, A., & Long, B. T. (2018). Does remediation work for all students? How the effects of postsecondary remedial and developmental courses vary by level of academic preparation. *Educational Evaluation and Policy Analysis*, *40*(1), 29-58.

Bol, L., Campbell, K. D., Perez, T., & Yen, C. J. (2016). The effects of self-regulated learning training on community college students' metacognition and achievement in developmental math courses. *Community College Journal of Research and*

Practice, *40*(6), 480-495.

Boton, E. C., & Gregory, S. (2015). Minimizing attrition in online degree courses. *Journal of Educators Online, 12*(1), 62-90. Retrieved from https://www.thejeo.com/

Bottge, B. A., Toland, M. D., Gassaway, L., Butler, M., Choo, S., Griffen, A. K., & Ma, X. (2015). Impact of enhanced anchored instruction in inclusive math classrooms. *Exceptional Children, 81*(2), 158-175. doi:10.1177/0014402914551742

Brannen, J. (2016). Combining qualitative and quantitative approaches: An overview. In J. Brannen (Ed.), *Mixing methods: Qualitative and quantitative research* (pp. 3-37). New York, NY: Routledge. (Original work published 1995.)

Brubacher, J. S., & Willis, R. (2017). *Higher education in transition: History of American colleges and universities* (4th ed.). New York, NY: Routledge.

Bryant, F. (2015). College preparation for African American students: *Center for Law and Social Policy*. Retrieved from http://www.clasp.org/resources-and-publications/publication-1/College-readiness2-2.pdf

Bryk, A. S., Gomez, L. M., Grunow, A., & LeMahieu, P. G. (2015). *Learning to improve: How America's schools can get better at getting better*. Cambridge, MA: Harvard Education Press.

Burns, M., Pierson, E., & Reddy, S. (2014). Working together: How teachers teach and students learn in collaborative learning environments. *International Journal of Instruction, 7*(1), 17-32. doi: 10.1080/0305764X

Callan, P. M. (2017). Stewards of opportunity: America's public community colleges.

Daedalus, 126(4), 95-112. Retrieved from http://www.jstor.org/stable/20027460

Capar, G., & Tarim, K. (2015). Efficacy of the cooperative learning method on mathematics achievement and attitude: A meta-analysis research. *Educational Sciences: Theory and Practice, 15*(2), 553-559.

Caruth, G. D. (2018) Student engagement, retention, and motivation: Assessing academic success in today's college students. *Participatory Educational Research, 5*(1), 17-30. Retrieved from http://www.perjournal.com

ChanLin, L. J., Lin, H. Y., & Lu, T. H. (2016). College students' engagement in e-tutoring children in remote areas. *Innovations in Education and Teaching International*, *53*(5), 519-531.

Cho, S. W., & Karp, M. M. (2013). Student success courses in the community college: Early enrollment and educational outcomes. *Community College Review*, *41*(1), 86-103.

Ciscell, G., Foley, L., Luther, K., Howe, R., & Gjsedal, T. (2016). Barriers to accessing tutoring services among students who received a mid-semester warning. *Learning Assistance Review, 21*(2), 39-54. Retrieved from http://www.nclca.org/tlar_issues

Clements, D. H., & Sarama, J. (2014). *Learning and teaching early math: The learning trajectories approach.* New York, NY: Routledge.

Cole, R. (2017). Estimating the impact of private tutoring on academic performance: Primary students in Sri Lanka. *Education Economics*, *25*(2), 142-157.

Colver, M., & Fry, T. (2016). Evidence to support peer tutoring programs at the

undergraduate level. *Journal of College Reading and Learning, 46*(1), 16-41. doi: 10.1080/10790195.2015.1075446

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage Publications.

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development.* Palo Alto, CA: Learning Policy Institute.

Daloz, L. A. (2012). *Mentor: Guiding the journey of adult learners* (2nd ed.). San Francisco, CA: Jossey-Bass.

DePaoli, J. L., Fox, J. H., Ingram, E. S., Maushard, M., Bridgeland, J. M., & Balfanz, R. (2015). *Building a grad nation: Progress and challenge in ending the high school dropout epidemic*. Annual Update 2015. Civic Enterprises.

Dixson, M. D. (2015). Measuring student engagement in the online course: The online student engagement scale (OSE). *Online Learning, 19*(4). doi:10.24059/olj.v19i4.561

Dixson, D. D., & Worrell, F. C. (2016). Formative and summative assessment in the classroom. *Theory into Practice*, *55*(2), 153-159.

Drago, A., Rheinheimer, D. C., & Detweiler, T. N. (2018). Effects of locus of control, academic self-efficacy, and tutoring on academic performance. *Journal of College Student Retention: Research, Theory & Practice*, *19*(4), 433-451.

Drew, D. E. (2015). *STEM the tide: Reforming science, technology, engineering, and math education in America*. Baltimore: JHU Press.

Dreiband, E. S., Swearingen, B., & Day, J. (2015). The evolution of Title VII—Sexual

orientation, gender identity, and the Civil Rights Act of 1964. *Jones Day,* Cleveland, OH.

Dwyer, T. (2017). Persistence in higher education through student–Faculty interactions in the classroom of a commuter institution. *Innovations in Education and Teaching International, 54*(4), 325-334.

Ebert-May, D., Derting, T. L., Henkel, T. P., Middlemis Maher, J., Momsen, J. L., Arnold, B., & Passmore, H. A. (2015). Breaking the cycle: Future faculty begin teaching with learner-centered strategies after professional development. *CBE—Life Sciences Education, 14*(2), ar22.

Edwards, A. R., Sandoval, C., & McNamara, H. (2015). Designing for improvement in professional development for community college developmental mathematics faculty. *Journal of Teacher Education, 66*(5), 466-481.

Epstein, A., & Willhite, G. L. (2017). Teacher efficacy in an early childhood professional development school. *International Electronic Journal of Elementary Education*, *7*(2), 189-198.

Evans, W. N., Kearney, M. S., Perry, B. C., & Sullivan, J. X. (2017). *Increasing community college completion rates among low-income students: evidence from a randomized controlled trial evaluation of a case management intervention* (No. w24150). National Bureau of Economic Research.

Evers, A., Van der Heijden, B., & Kreijns, K. (2016). Organizational and task factors influencing teachers' professional development at work. *European Journal of Training and Development*, *40*, 36-55. doi: 10.1108/EJTD-03-2015-0023

Farmer, E. D., & Hope, W. C. (2015). Factors that influence African American male retention and graduation: The case of Gateway University, a historically Black college and university. *Journal of College Student Retention: Research, Theory & Practice*, *17*(1), 2-17.

Ferreira, J. A., Ryan, L., & Davis, J. (2015). Developing knowledge and leadership in pre-service teacher education systems. *Australian Journal of Environmental Education*, *31*(2), 194-207.

Fontaine, K. (2014). Effects of a retention intervention program for associate degree nursing students. *Nursing Education Perspectives*, *35*(2), 94-99.

Fraser, B. (2015). Classroom learning environments. In *Encyclopedia of Science Education* (pp. 154-157). Springer, Netherlands: Kluwer Academic Publishers.

Fulcher, G. (2015). *Disabling policies?: A comparative approach to education policy and disability*. New York, NY: Routledge.

Galosy, J. A., Gillespie, N. M., & Banilower, E. R. (2018). Sowing the seeds of change: Supporting teachers to be agents of social capital development. In S. A. Yoon & K. J. Baker-Doyle (Eds.), *Networked by design: Interventions for teachers to develop social capital* (pp. 129-148). New York, NY: Routledge.

Gándara, P. (2015). Fulfilling America's future: Latinas in the U.S., 2015. *Civil Rights Project and the White House Initiative on Educational Excellence for Hispanics.* Washington, DC.

Gast, D. L., & Ledford, J. R. (2014). *Single case research methodology: Applications in special education and behavioral sciences*. New York, NY: Routledge.

Gaytan, J. (2015). Comparing faculty and student perceptions regarding factors that affect student retention in online education. *American Journal of Distance Education*, *29*(1), 56-66.

Giannoukos, G., Besas, G., Galiropoulos, C., & Hioctour, V. (2015). The andragogy, the social change and the transformative learning educational approaches in adult education. *Journal of Education and Practice, 6*(10), 46-50. Retrieved from iiste.org/Journals/index.php/JEP

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods, 18*(1), 59-82.

Hagen, M., & Park, S. (2016). We knew it all along! Using cognitive science to explain how andragogy works. *European Journal of Training & Development, 40*(3), 171-190. doi:10.1108/EJTD-10-2015-0081

Hancock, D. R., & Algozzine, B. (2016). *Doing case study research: A practical guide for beginning researchers*. New York, NY: Teachers College Press.

Harada, V. H., Kirio, C., & Yamamoto, S. (2015). Project-based learning: Rigor and relevance in high schools. *School Library Management*, 157.

Harbour, C. P. (2015). *John Dewey and the future of community college education*. New York: Bloomsbury Publishing USA.

Harwell, M., Moreno, M., & Post, T. (2016). A study of the relationship between the ACT college mathematics readiness standard and college mathematics achievement. *Journal of Psychoeducational Assessment*, *34*(3), 269-281. doi:10.1177/0734282915594069

Hernandez, L., Day, A., & Henson, M. (2017). Increasing college access and retention rates of youth in foster care: An analysis of the impact of 22 state tuition waiver programs. *Journal of Policy Practice*, *16*(4), 397-414.

Henschke, J. A. (2016). New Perspectives from a Quasi-English Translation of Dusan Savicevic's 2000 Work on Roots in the Development of Andragogy: The 2016 Update of History and Philosophy of Andragogy. *Commission for International Adult Education*.

Henson, K. T. (2015). *Curriculum planning: Integrating multiculturalism, constructivism, and education reform*. Long Grove, IL: Waveland Press.

Hoxby, C., & Turner, S. (2013). Expanding college opportunities: Intervention yields strong returns for low-income high-achievers. *Education Next*, *13*(4), 66-74.

Hsu, J., & Gehring, W. J. (2016). Measuring student success from a developmental mathematics course at an elite public institution. *Society for Research on Educational Effectiveness*. Retrieved from https://www.sree.org/conferences/2016s/program/downloads/abstracts/1818.pdf

Jaleel, S. (2016). A study on the metacognitive awareness of secondary school students. *Universal Journal of Educational Research*, *4*(1), 165-172.

Johnson, L., Becker, S. A., Cummins, M., Estrada, V., Freeman, A., & Hall, C. (2016). *NMC horizon report: 2016 higher education edition*. Austin, TX: The New Media Consortium.

Johnson, I. L., Abbate, V., & Chase, R. (2017). Strategies for integrating elementary classroom concepts and physical activity. *Strategies, 30*(6), 53-58.

Kemparaj, U., & Chavan, S. (2013). Qualitative research: a brief description. *Indian Journal of Medical Sciences*, *67*.

Kennedy, M. M. (2016). How does professional development improve teaching? *Review of Educational Research*, *86*(4), 945-980.

Kermani, H., & Aldemir, J. (2015). Preparing children for success: integrating science, 95 math, and technology in early childhood classroom. *Early Child Development & Care, 185*(9), 1504-1527. doi:10.1080/03004430.2015.1007371

Kilgore, W., & Wilson, J. I. (2017). *The state of college completion initiatives at US community colleges.* Washington, DC: American Association of Collegiate Registrars and Admissions Officers (AACRAO).

Kimbark, K., Peters, M. L., & Richardson, T. (2017). Effectiveness of the student success course on persistence, retention, academic achievement, and student engagement. *Community College Journal of Research and Practice*, *41*(2), 124-138.

Klasik, D., & Strayhorn, T. L. (2018). The complexity of college readiness: Differences by race and college selectivity. *Educational Researcher*, *47*(6), 334–351.

Knowles, Malcolm S. (1989): The Making of an Adult Educator. San Francisco: Jossey-Bass.

Kowalski, K. (2016). What shall we do with our boys? An Impact of the GI Bill on the US economy. *Annales. Ethics in Economic Life, 19*(4), 167-180.

Kranzow, J., Hinkle, S. E., & Foote, S. M. (2015). Supporting the transition of sophomores, transfers, and seniors: Opportunities for residence life professionals. *Journal of College & University Student Housing*, *42*(1), 212-233.

Lamb, H. (2015). Social development theory, social identity theory and computer supported collaborative learning: An examination of peer group influences, factors and behaviors. In D. Slykhuis & G. Marks (Eds.), *Proceedings of society for information technology & teacher education international conference 2015* (pp. 108-113). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE). Retrieved from http://www.editlib.org/p/149975

Leijen, Ä., Lepp, L., & Remmik, M. (2016). Why did I drop out? Former students' recollections about their study process and factors related to leaving the doctoral studies. *Studies in Continuing Education, 38*(2), 129-144.

Levi-Keren, M. K, & Patkin, D. P. (2016). Mathematics teachers' professional development program needs and expectations. *International Journal for Mathematics Teaching and Learning,* 1-33. Retrieved from http://www.cimt.org.uk/

Lewis, S. (2015). Qualitative inquiry and research design: Choosing among five approaches. *Health Promotion Practice, 16*(4), 473-475.

Loeng, S. (2017). Alexander Kapp–the first known user of the andragogy concept. *International Journal of Lifelong Education, 36*(6), 629-643.

Lumpkin, A., Achen, R. M., & Dodd, R. K. (2015). Student perceptions of active learning. *College Student Journal*, *49*(1), 121-133.

Malterud, K., Siersma, V. D., & Guassora, A. D. (2016). Sample size in qualitative interview studies: Guided by information power. *Qualitative Health Research*, *26*(13), 1753-1760.

Mason, M. (2010, August). Sample size and saturation in PhD studies using qualitative interviews. In *Forum qualitative Sozialforschung/Forum: qualitative social research*, *11*(3). Art. 8, http://nbnresolving.de/urn:nbn:de:0114-fqs100387

McClenney, K. (2013). Community colleges: Choosing change. Change: *The Magazine of Higher Learning, 45*(4), 26-35.

McCusker, K., & Gunaydin, S. (2015). Research using qualitative, quantitative or mixed methods and choice based on the research. *Perfusion*, *30*(7), 537-542.

McKinney, L., & Hagedorn, L. S. (2017). Performance-based funding for community colleges: *Are colleges disadvantaged by serving the most disadvantaged students? The Journal of Higher Education, 88*(2), 159-182.

Meissel, K., Parr, J., & Timperley, H. (2016). Can professional development of teachers reduce disparity in student achievement? Teaching and Teacher Education, 58, 163-173. doi: 10.1016/j.tate.2016.05.013

Mejia, M. C., Rodriguez, O., & Johnson, H. (2016). *Preparing students for success in California's community colleges.* San Francisco, CA: Public Policy Institute of California.

Mellor, D. T., Brooks, W. R., Gray, S. A., & Jordan, R. C. (2015). Troubled transitions into college and the effects of a small intervention course. *Journal of College Student Retention: Research Theory & Practice, 17*(1), 44-63.

doi:10.1177/152102511571102

Merriam, S. B. (2014). *Qualitative research: A guide to design and implementation.* San Francisco, CA: John Wiley & Sons.

Merriam, S. B., Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation* (4thed). San Francisco, CA: John Wiley & Sons.

Merriam, S. B., & Grenier, R. S. (Eds.). (2019). *Qualitative research in practice: Examples for discussion and analysis*. San Francisco, CA: Jossey-Bass.

Miller, D. A. (2015). Learning how students learn: An exploration of self-regulation strategies in a two-year college general chemistry class. *Journal of College Science Teaching*, *44*(3), 11-16.

Monaghan, D. B., & Attewell, P. (2015). The community college route to the bachelor's degree. *Educational Evaluation and Policy Analysis*, *37*(1), 70-91.

Moore, K. C., & Thompson, P. W. (2015). Shape thinking and students' graphing activity. In *Proceedings of the 18th Meeting of the MAA Special Interest Group on Research in Undergraduate Mathematics Education* (pp. 782-789). Pittsburgh, PA: West Virginia University.

Moore, J. L., Way, J. D., Casillas, A., Burrus, J., Allen, J., & Hanson, M. A. (2016). Effects of psychosocial characteristics of middle school students on high school grades and on-time graduation. *European Journal of Psychological Assessment, 32*(1), 75–83.

Mundy, M., Howe, M. E., & Kupczynski, L. (2015). Teachers' perceived values on the effect of literacy strategy professional development. *Teacher Development: An*

International Journal of Teachers' Professional Development, 19(1), 116-131. doi:10.1080/13664530.2014.986335

Norman, J. (2017). *Pathways post-participation outcomes: Preliminary findings. Carnegie math pathways research brief*. Stanford, CA: Carnegie Foundation for the Advancement of Teaching.

Nichols, K., & Larson, M. (2016, October). Academic skills training & assistance: Supporting student success through connecting activities. Info brief series for community colleges. *National Collaborative on Workforce and Disability for Youth*. Retrieved from https://eric.ed.gov/?id=ED585171

Nyberg, D. (2012). *An investigation of qualitative research methodology for perceptual audio evaluation* (Doctoral dissertation, Luleå tekniska universitet).

Osborne, M., Rimmer, R., & Houston, M. (2015). Adult access to higher education: An international overview. In J. Yang, C. Schneller, & S. Roche (Series Eds.), *The role of higher education in promoting lifelong learning*. UNESCO Institute for lifelong learning policies and strategies, No. 3 (pp. 17-39). Hamburg, Germany. Retrieved from https://eric.ed.gov/?id=ED564050

Özsoy, G., & Ataman, A. (2017). The effect of metacognitive strategy training on mathematical problem solving achievement. *International Electronic Journal of Elementary Education*, *1*(2), 67-82.

Ozuah, P. O. (2016). First, there was pedagogy and then came andragogy. *Einstein journal of Biology and Medicine, 21*(2), 83-87.

Panizo, M. T., Hollander, J., Pappas, J., & Pierrakos, O. (2014). Faculty

perceptions of student engagement: A qualitative inquiry. Paper presented at the 121st ASEE Annual Conference and Exposition, Indianapolis, MN. Abstract retrieved from http://www.asee.org/public/conferences/32/papers/9695/view

Planas, N., & Civil, M. (2015). Bilingual mathematics teachers and learners: The challenge of alternative worlds. In Proceedings of the 39th Conference of the International Group for the Psychology of Mathematics Education (Vol. 4, pp. 41-48). Retrieved from https://www.academia.edu/16998768/Bilingual_mathematics_teachers_and_learners_The_challenge_of_alternative_worlds

Powell, S. R. (2014). The influence of symbols and equations on understanding mathematical equivalence. *Intervention in School and Clinic.* doi:1053451214560891

Pruett, P. S. (2015). Factors influencing retention of developmental education students in community colleges. *Delta Kappa Gamma Bulletin, 81*(4), 32-40. Retrieved from https://www.questia.com/library/journal/1P3-3787386681/factors-influencing-retention-of-developmental-education.

Purdue (2017). White paper: Purpose and audience. Online Writing Lab. Retrieved from https://owl.english.purdue.edu/owl/resource/546/1/

Reilly, K. L. (2015). Are college student success courses effective corequisites to developmental mathematics in community colleges? (Doctoral dissertation). Available from ProQuest Dissertation and Theses database. (ATT 3616906)

Rhoads, R. A., & Valadez, J. R. (2016). *Democracy, multiculturalism, and the community college: A critical perspective*. New York, NY: Routledge.

Riconscente, M. M. (2014). Effects of perceived teacher practices on Latino high school students' interest, self-efficacy, and achievement in mathematics. *The Journal of Experimental Education*, *82*(1), 51-73.

Riley, J., & Ward, K. (2017). Active learning, cooperative active learning, and passive learning methods in an accounting information systems course. *Issues in Accounting Education*, *32*(2), 1-16. doi:10.2308/iace-51366

Robinson, O. C. (2014). Sampling in interview-based qualitative research: A theoretical and practical guide. *Qualitative Research in Psychology*, *11*(1), 25-41.

Rohani, A. (2014). Cooperative learning motivational effects, and students' characteristics on academic performance. *Applied Psychology. 8*: 20-8.

Rossetto, K. R. (2014). Qualitative research interviews Assessing the therapeutic value and challenges. *Journal of Social and Personal Relationships*. doi:10.1177/0265407514522892

Rotgans, J. I., & Schmidt, H. G. (2014). Interest in subject matter: The mathematics predicament. *Higher Education Studies*, *4*(6), 31.

Saldaña, J. (2015). *The coding manual for qualitative researchers*. Los Angeles, CA: Sage Publications.

Sanders, M. G. (2013). *Schooling students placed at risk: Research, policy, and practice in the education of poor and minority adolescents*. Routledge.

Sarama, J., Clements, D. H., Wolfe, C. B., & Spitler, M. E. (2016). Professional development in early mathematics: Effects of an intervention based on learning trajectories on teachers' practices. *Nordic Studies in Mathematics Education*, *21*(4), 29-55.

Schargel, F., & Smink, J. (2014). *Strategies to help solve our school dropout problem*. Larchmont, NY: Routledge.

Scherer, J., & Anson, M. (2014). Community colleges and the access effect*: Why open admissions suppresses achievement*. Springer.

Scott-Clayton, J., Crosta, P. M., & Belfield, C. R. (2014). Improving the targeting of treatment: Evidence from college remediation. *Educational Evaluation and Policy Analysis*, *36*(3), 371-393.

Sinatra, G. M., Heddy, B. C., & Lombardi, D. (2015). The challenges of defining and measuring student engagement in science. *Educational Psychologist, 50*, 1-13. doi:10.1080/00461520.2014.1002924

Smith, M. K., Vinson, E. L., Smith, J. A., Lewin, J. D., & Stetzer, M. R. (2014). A campus-wide study of STEM courses: New perspectives on teaching practices and perceptions. *CBE—Life Sciences Education, 13*(4), 624-635.

Spady, W. G. (1971, February). The influence of major ambition resources on college aspirations and attainments: Toward a comprehensive model. Paper presented at the 55th annual meeting of the American Educational Research Association, New York, NY. Retrieved from https://eric.ed.gov/?id=ED049695

Spillane, J. P., Hopkins, M., & Sweet, T. M.(2018). School district educational infrastructure and change at scale: Teacher peer interactions and their beliefs about mathematics instruction. *American Education Research Journal*, *55*(3), 532-571.

Stanley, D., Hamilton, S., Allgyer, C., Ramsey, B. C., & Pippin, D. (2012, February, 22). *Promising practices in developmental mathematics and first-year experience at two Virginia leader colleges*. Paper presented at the 2012 Achieving the Dream (ATD) Conference in Big Stone Gap, VA.

Stemmer, J. K., & Mahan, D. M. (2016). Investigating the relationship of library usage to student outcomes. *College & Research Libraries, 77*(3), 359-375. doi: 10.5860/crl.77.3.359

Stewart, S., Lim, D. H., & Kim, J. (2015). Factors influencing college persistence for first-time students. *Journal of Developmental Education, 38*(3), 12.

Stols, G., Ono, Y., & Rogan, J. (2015). What constitutes effective mathematics teaching? Perceptions of teachers. *African Journal of Research in Mathematics, Science and Technology Education*, *19*(3), 225-236.

Streveler, R. A., & Menekse, M. (2017). Taking a closer look at active learning. *Journal of Engineering Education. 106*(2),186-190. doi:10.1002/jee.20160.

Sullivan, P. (2017). The Truman commission report. In *Economic Inequality, Neoliberalism, and the American Community College* (pp. 145-151). Cham, Switzerland: Palgrave Macmillan.

Taylor, A. (2015). Freshman Orientation, Academic Achievement, and Persistence of Underprepared Community College Students. (Doctoral dissertation, North Central University). Retrieved from https://search.proquest.com/openview/0aac15c33f5417ec9dde3ba44bdeeffd/1?pq-origsite=gscholar&cbl=18750&diss=y

Taylor, S. J., Bogdan, R., & DeVault, M. (2015). *Introduction to qualitative research methods: A guidebook and resource*. New York: John Wiley & Sons.

Tella, A. (2014). Globalisation, blended learning, and mathematics education: Implications for pedagogy. *STEM Education: Concepts, Methodologies, Tools, and Applications* (pp. 190-211). Hershey, PA: IGI Global.

Texas Higher Education Coordinating Board. (2014). Overview: *Texas Higher Education Coordinating Board.* Austin, Texas: THECB. Retrieved from http://www.thecb.state.tx.us/

Terriquez, V. (2015). Dreams delayed: Barriers to degree completion among undocumented community college students. *Journal of Ethnic and Migration Studies*, *41*(8), 1302-1323.

Terriquez, V., & Gurantz, O. (2015). Financial challenges in emerging adulthood and students' decisions to stop out of college. *Emerging Adulthood, 3*(3), 204-214.

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research, 45*(1), 89-125.

Tinto, V. (1987, November). The principles of effective retention. Presented at the Fall Conference of the Maryland College Personnel Association, Largo, MD.

Retrieved from http://www.eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=ED301267

Tinto, V. (2012). *Completing college: Rethinking institutional action*. Chicago, IL: University of Chicago. doi:10.7208/chicago/9780226804545.001.0001

Toll, C. (2017). 5 Perspectives for leadership success. *Educational Leadership, 74*(8), 28-31. Retrieved from http://www.ascd.org

Tovar, E. (2015). The role of faculty, counselors, and support programs on Latino/a community college students' success and intent to persist. *Community College Review, 43*(1), 46-71.

Uribe-Flórez, L. J., & Wilkins, J. L. (2017). Manipulative use and elementary school students' mathematics learning. *International Journal of Science and Mathematics Education*, *15*(8), 1541-1557.

Vangrieken, K., Meredith, C., Packer, T., & Kyndt, E. (2017). Teacher communities as a context for professional development: A systematic review. *Teaching and Teacher Education, 61*, 47-59.

Vedung, E. (2017). *Public policy and program evaluation*. New York, NY: Routledge, doi: 10.4324/9781315127767. (Original work published 1997.)

Virtanen, P., Niemi, H. M., & Nevgi, A. (2017). Active learning and self-regulation enhance student teachers' professional competences. *Australian Journal of Teacher Education*, *42*(12), 1-20.

Voogt, J., Laferrière, T., Breuleux, A., Itow, R. C., Hickey, D. T., & McKenney, S. (2015). Collaborative design as a form of professional development. *Instructional Science*, *43*(2), 259-282.

Wang, V. X., & Storey, V. A. (2015). Andragogy and teaching English as a foreign language in China. *Reference Librarian, 56*(4), 295-314. doi:10.1080/02763877.2015.1057680

Wang, X., Sun, N., Lee, S. Y., & Wagner, B. (2015). Does active learning contribute to transfer intent among community college students beginning in STEM? In the 40th annual conference of the Association for the Study of Higher Education, Denver, CO. doi: 10.1080/00221546.2016.127090

Weatherwax, K. (2017). Elementary teachers' perceptions on writing proficiency of military-connected students. Completed doctoral dissertation, Walden University. Retrieved from https://scholarworks.waldenu.edu/dissertations/4576/

Weiss, M. J., Visher, M. G., Weissman, E., &Wathington, H. (2015). The impact of learning communities for students in developmental education: A synthesis of findings from randomized trials at six community colleges. *Educational Evaluation and Policy Analysis*, *37*(4), 520-541.

Wibrowski, C. R., Matthews, W. K., & Kitsantas, A. (2017). The role of a skills learning support program on first-generation college students' self-regulation, motivation, and academic achievement: A longitudinal study. *Journal of College Student Retention: Research, Theory & Practice*, *19*(3), 317-332.

Wlodkowski, R. J., & Ginsberg, M. B. (2017). *Enhancing adult motivation to learn: A comprehensive guide for teaching all adults*. San Francisco: John Wiley & Sons.

Wood, J. L. (2014). Examining academic variables affecting the persistence and attainment of black male collegians: A focus on academic performance and integration in the two-year college. *Race Ethnicity and Education*, *17*(5), 601-622.

Wu, Y., Jóhannsdóttir, B., & Sundar, V. (2017). Effect of Tutoring on Passing Remedial Mathematics Courses. *International Electronic Journal of Mathematics Education*, *12*(3), 827-835.

Wurtz, K. A. (2015). Impact of learning assistance center utilization on success. *Journal of Developmental Education, 38*(3), p. 2-10.

Yan, Z., & Sendall, P. (2016). First year experience: How we can better assist first-year international students in higher education. *Journal of International Students, 6*(1), 35-51.

Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). Thousand Oaks, CA: Sage Publications.

Yin, R. K. (2017). *Case study research and applications: Design and methods*. Thousand Oaks, CA: Sage Publications.

Appendix A: The Project

Faculty Training for Developmental Mathematics

Professional Development Training Plan

2019

Introduction

This project was created to address the problems found in the case study of the developmental mathematics students' perceptions of both why they dropped out of developmental mathematics courses and what might have helped them to successfully complete those courses. The purpose of this project is to share the outcomes about why students drop out of developmental mathematics and to provide suggestions for increased student success in those courses. The professional development training in this project study was customized for the faculty at this study site, but it could be easily modified so that it would be beneficial to other community colleges.

Professional Development Training Plan

Topic-Introduction and Overview

Proposed topics	Proposed activities	Resources	Timeline
Day 1 Introduction and Active Learning Presentation	An introduction and study findings presentation Active Learning Activity will be conducted. A participant Q&A session will follow each topic.	Campus classroom or training room Laptop Digital projector White board Copier PPT slides with accompanying Handouts	During the next possible faculty develop-ment training week 8 hours
Day 2 Student Engagement and Cooperative Grouping Activities	Student Engagement Discussion Cooperative grouping Activity will be conducted. A participant Q&A session will follow each topic. Finally, a summary of the training will be conducted	Campus classroom or training room Laptop Digital projector White board Copier PPT slides with accompanying Handouts	During the next possible faculty develop-ment training week 8 hours
Day 3 Student support services	Learn about student support services Active Learning Activity will be conducted. An audience Q&A session will follow each topic. Finally, a summary of the training will be conducted	Campus classroom or training room Laptop Digital projector White board Copier PPT slides with accompanying handouts	During the next possible faculty develop-ment training week 8 hours

Day 1 Topic -Introduction and Active Learning Presentation

Presenter: Sumithra Iyer

Training Time: 8 hours

Objectives/Desired outcomes

By the end of today's training, participants will

- understand the results of the study
- recognize the challenges of the students
- identify active learning strategies
- be able to implement active learning in classrooms.

Materials and resources for training

- ❖ Campus classroom or training room
- ❖ Laptop computer
- ❖ Digital projector
- ❖ White board
- ❖ PPT presentation and accompanying handouts
- ❖ Copier

Professional Training Sign in sheet for Day 1	
Presenter: Sumithra Iyer	Training date:
Training hours:8 From: 8:00am To: 4:00pm	Building number: Room number:

	Last name	First name	Title/Position	Department	Signature
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Agenda and Handout for Day 1

Day 1 – Introduction and Active learning

8:00am -8:15am: Participant sign-in sheet completion (approx. 15 mins)

8:15am-8:30am: *Presenter introduction and discussion of the importance of the training* (approx. 15 mins)

8:30am-9:00am: *Participant introductions (*Participants individually stand and state their name, discipline, years teaching, etc. (approx. 15 mins)

9:00am-10:30am: Study Findings Discussion

10:30am-10:45am: Break

10:45am-12:00pm: PPT Slides 1-10: Active Learning

12:00pm-1:00pm: Lunch Break (1hour)

1:00pm-2:00pm: Active Learning Activity**:** To promote interactions between faculty and student and also student to student. Participants will break into small groups of 3-4. Participants will choose a unit of study from a course that they currently teach (Participants will be notified earlier via email to choose and bring a unit from the course they currently teach),discuss what should be incorporated or changed to facilitate the interactions between the faculty and student as well as student to student while teaching that unit.

2:00pm-3:00pm: Small groups will select one suggestion for improving the interactions and also identify potential challenges of the interactions. Group members assign a spokesperson to present. Members of other groups will comment on and provide additional input and suggestions regarding presented scenarios (approx. 1 hour).

3:00pm-3:15pm: Break

3:15pm-3:35pm: Participant questions for the presenter regarding the groups' scenarios (approx. 20 mins)

3:35pm-3:45pm: Summary (approx. 10 mins)

3:45pm-3:55pm: Day 1 Training evaluation form (approx. 10 mins)

3:55pm-4:00pm: Closing remarks for the day (approx. 5 mins)

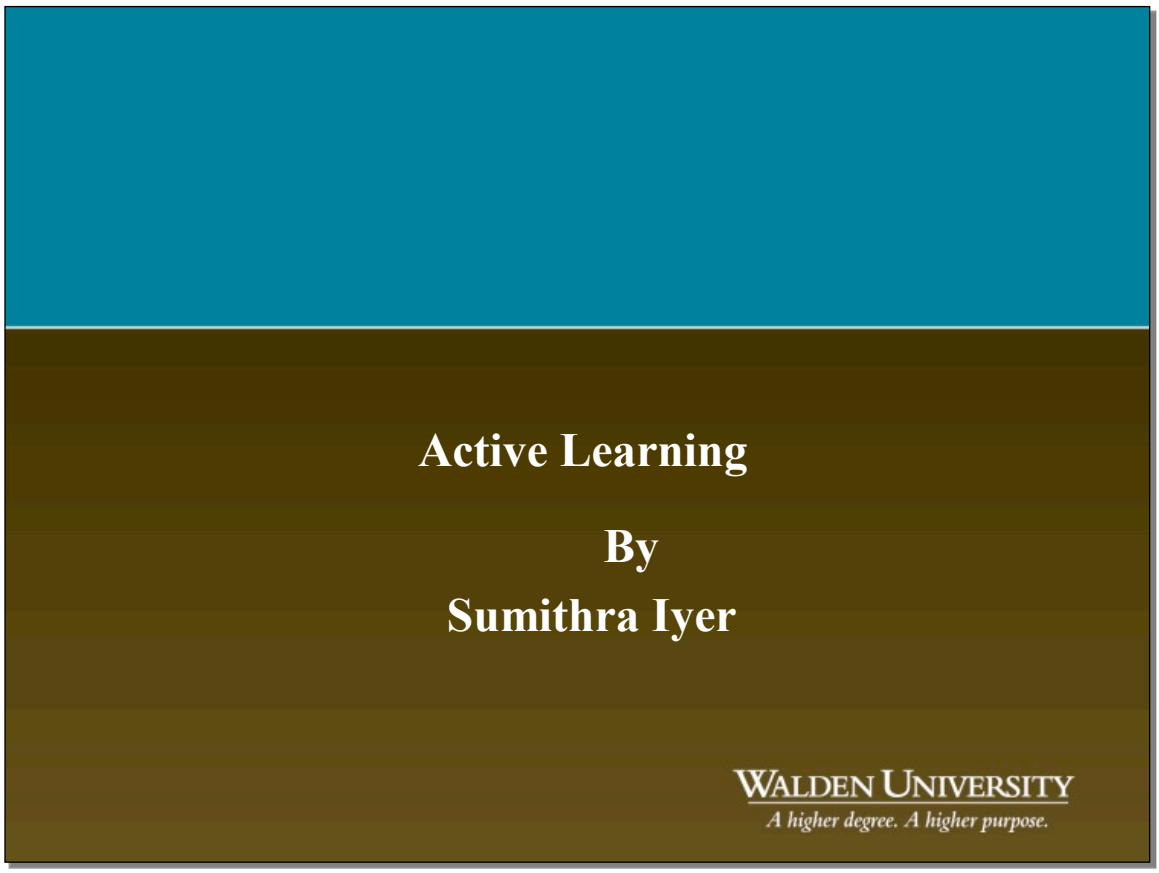
Handout 1

Review and Discussion of the Findings from the Interviews

The data collected from the students identified that students needed help in better understanding the subject. From the 7 participants I interviewed, there was a strong emphasis on new teaching methods with active learning strategies and more student-centered lessons. The results revealed that faculty hold an important role for academic success. Additionally, students recommended the use of the available resources to be successful in the developmental mathematics classes. A brief synopsis of the interview results, including themes, and selected response examples are displayed inTable 2.

Table 2. Interview Results

Theme	Codes	Students Response Examples
Lack of subject comprehension	Not comprehending Could have studied harder Falling behind	It's a little bit too much I did not understand it, did not click It's very hard for me to comprehend
Factors external to the class	Medical reasons Test anxiety Finances Mental anguish Work schedule	Family and medical reasons Mental frustration Doing bad things with my friends Other reason that influenced to drop out was money
Resources	Tutoring YouTube videos Talk to professors Do homework	Set up something like a tutor Use online different tutorial Utilize all resources
Teaching/Learning methods	Explain by breaking down Teach/learn in a different way Ensure understanding	Explaining the material in a way student understands Give a different example Making sure that we understand and move us on to the next point We need more help, better exam


Active Learning
By
Sumithra Iyer
WALDEN UNIVERSITY
A higher degree. A higher purpose.

Introduction:

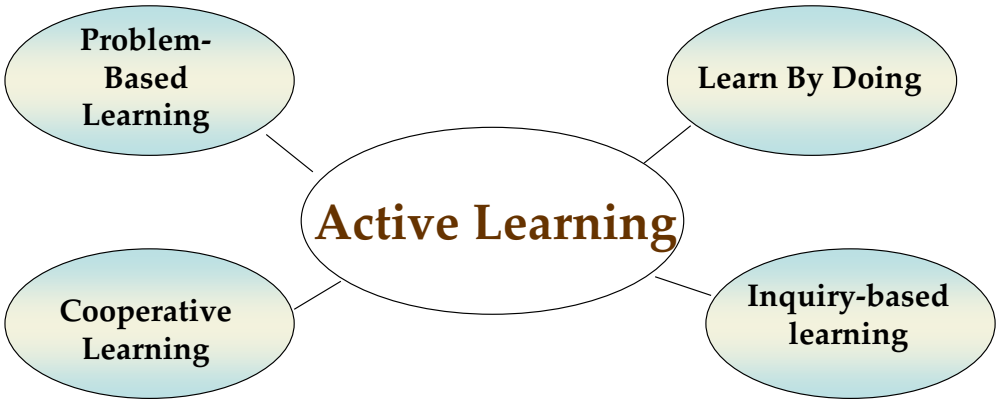
- Introduction and background of presenter
- Self introduction of attendees

Why this training?

- Introduction: Why Professional Development?
- Attendees: Benefits?

What is active learning?

Students **solve** problems, **answer** questions, **formulate** questions of their own, **discuss**, **explain, debate**, or **brainstorm** during class.



What is the purpose?

- Increase student participation
- Increase student engagement
- Increase student retention
- More student ownership in course
- Less lecturing by instructor
- More exciting classroom experience
- Higher level thinking

Active Learning implementation

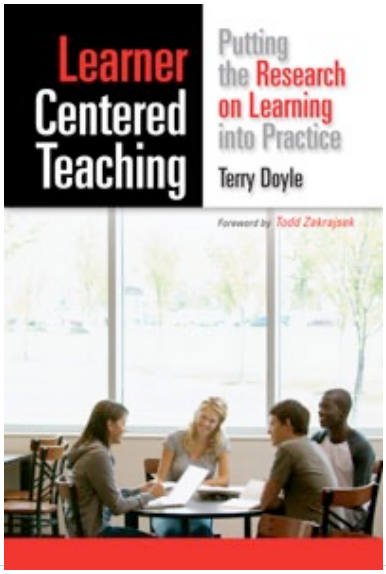
- Plan objectives
- Include graphics, charts, graphs, etc
- Plan what you want to annotate
- Learn students' names
- Cue important points
- Give short activities
- Give students time to generate questions
- Have students summarize major points

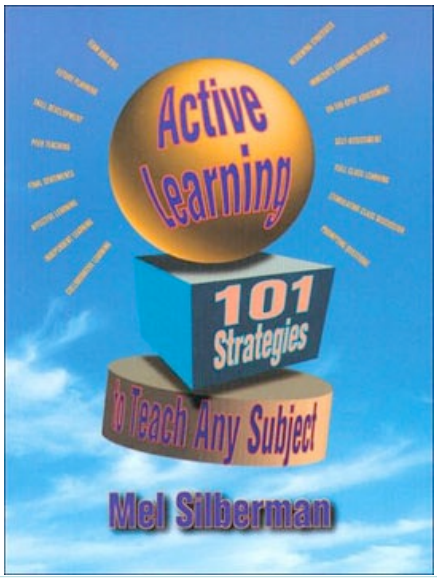
Active learning Cycle

Active Learning Strategies annotated

- Think- Pair- Share
- Group activities
- Group quizzes
- Interactive games

Resources





Day 2 Topic –Student Engagement and Cooperative Grouping Activity

Presenter: Sumithra Iyer

Training Time: 8 hours

Objectives/Desired outcomes

By the conclusion of today's training, participants will

- be knowledgeable of student engagement
- be knowledgeable of how to incorporate student engagement in a classroom
- be knowledgeable of cooperative learning

Training Materials & Resources

- ❖ Campus classroom or training room
- ❖ Laptop computer
- ❖ Digital projector
- ❖ White board
- ❖ PPT presentation and accompanying handouts
- ❖ Copier

Professional Training Sign in sheet for Day 2	
Presenter: Sumithra Iyer	Training date:
Training hours:8 From: 8:00am To: 4:00pm	Building number: Room number:

	Last name	First name	Title/Position	Department	Signature
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Agenda and Handout for Day 2

Day 2 – Student Engagement and Cooperative Learning

8:00am-8:30am: Participant sign-in sheet completion (approx. 15 mins)

8:30am-10:00am: Student engagement discussion

10:00am-10:15am: Break

10:15am-12:00pm: Discussion on how to encourage faculty to promote student engagement and cooperative learning in classrooms

12:00pm-1:00pm: Lunch Break (1 hour)

1:00pm-2:00pm: Cooperative learning activity
Participants will break into small groups of 3-4 and discuss cooperative learning. In addition, participants will discuss within their small group how they would incorporate cooperative learning in their classrooms. Participants will also receive feedback from the other 2-3 group members regarding the implementation.

2:00pm-3:00pm: Small groups will select one cooperative learning topic from the presentation and assign a spokesperson to present the ideas generated from their group members. Members of other groups will comment on and provide additional input and suggestions regarding presented scenarios (approx. 1 hour).

3:00pm-3:10pm: Break

3:15pm-3:30pm: Participant questions for the presenter regarding the groups' scenarios (approx. 15 mins)

3:30pm-3:50pm: Summary

3:50pm-4:00pm: Closing remarks for the day


Student Engagement
By
Sumithra Iyer
WALDEN UNIVERSITY
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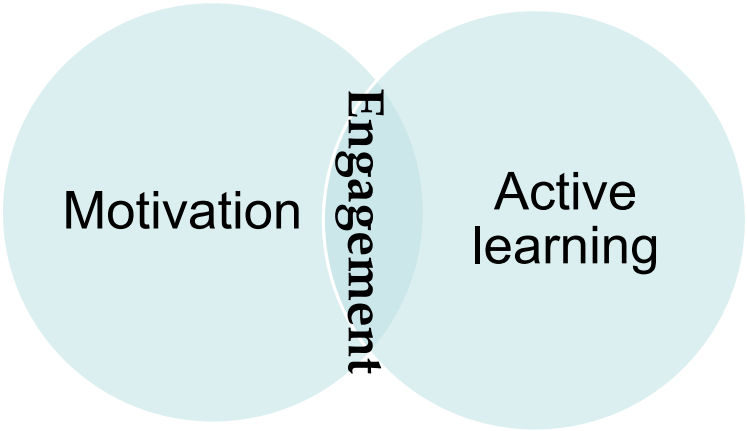
What is engagement:



Practices of Student Engagement

- Interaction with the content.
- Interaction with each other.
- Interaction with faculty

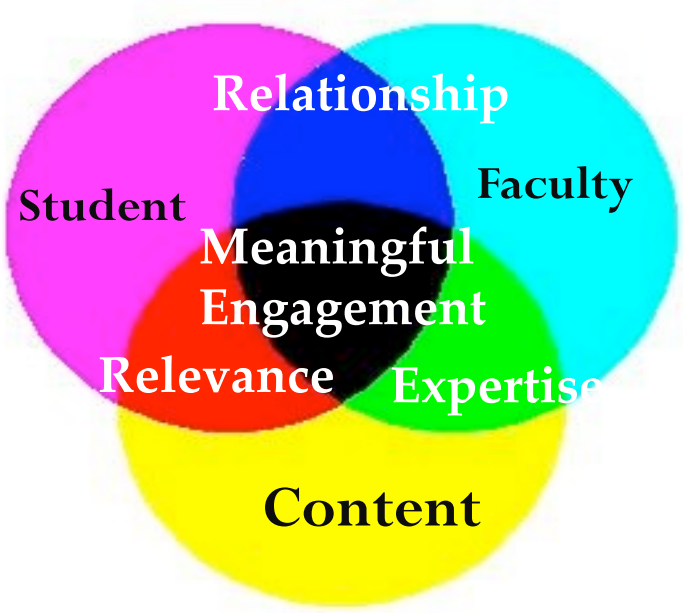
Shift in Thinking

- Less teaching
- More activity
- Critical thinking

Levels of Student Engagement

- Authentic Engagement
- Strategic Compliance
- Ritual/Passive Compliance
- Retreatism
- Rebellion

Student Engagement Relationships



Student Engagement Strategies

- Higher-order thinking skills
- Variety
- Collaboration
- Choice
- Relevance
- Project-based learning

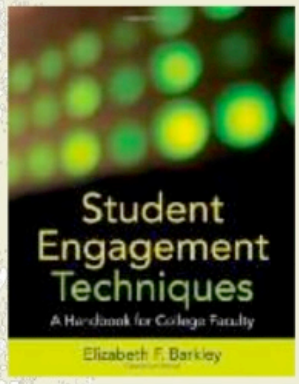
Planning the lesson

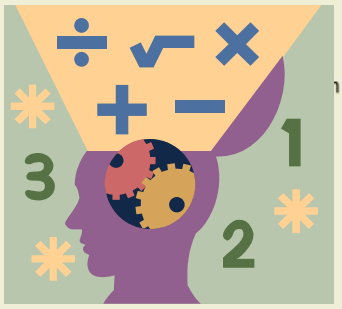
- Learning Objective
- Key Content Standard
- Assessment
- Concepts & Academic Language

Teaching the lesson

- Introduction
- Anticipatory Set
- Presentation
- Key Content
- Scaffolding
- Check for Understanding
- Differentiated Instruction

Resources





Barkley, E. (2010). *Student engagement techniques: A handbook for college faculty.* San Francisco, CA: Jossey-Bass.


Cooperative Learning
By
Sumithra Iyer
WALDEN UNIVERSITY
A higher degree. A higher purpose.

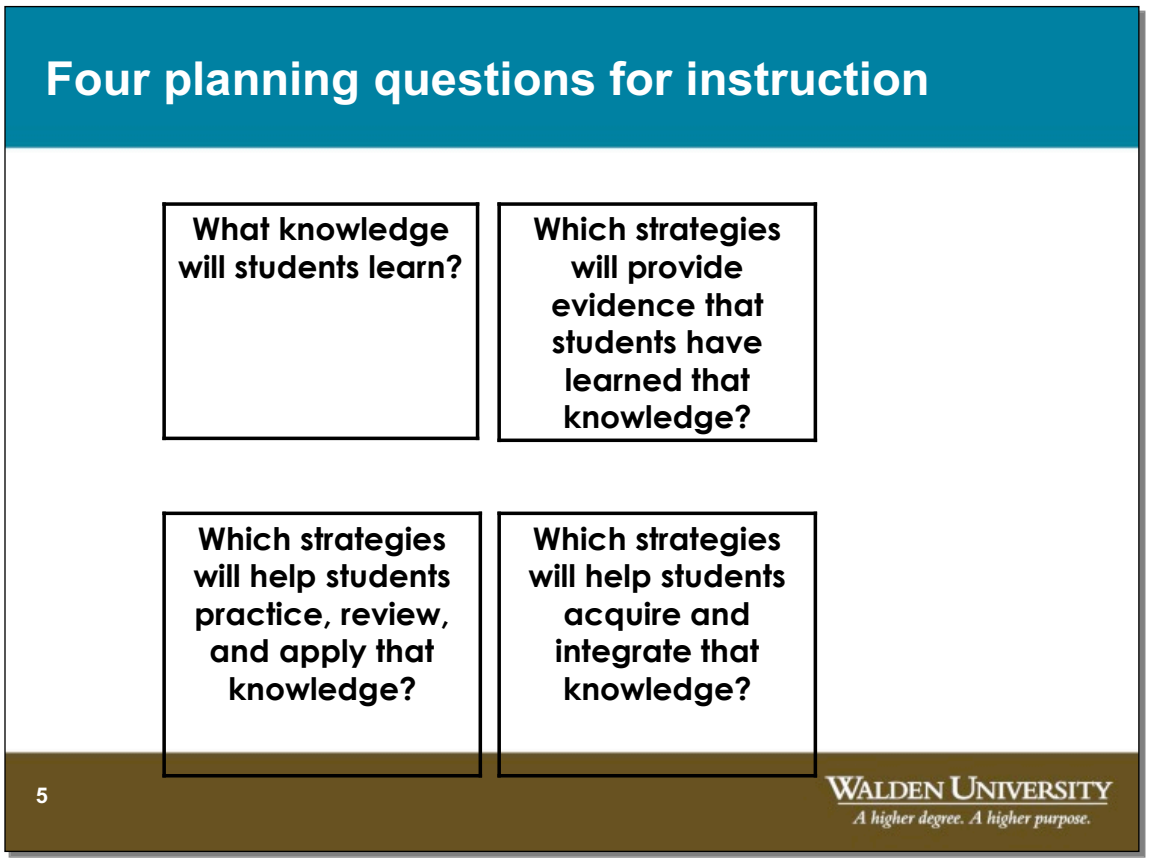
Why Cooperative Learning?

Benefits

- ✓ Increased Achievement
- ✓ Increase in Positive Relationships
- ✓ Greater Intrinsic Motivation
- ✓ Higher Self-Esteem
- ✓ More "On-Task" Behavior
- ✓ Better Attitudes Toward School

What is a Team:

- Goals shared
- Information circulated
- Roles assigned
- Materials managed


Four planning questions for instruction
What knowledge will students learn?
Which strategies will provide evidence that students have learned that knowledge?
Which strategies will help students practice, review, and apply that knowledge?
Which strategies will help students acquire and integrate that knowledge?
5
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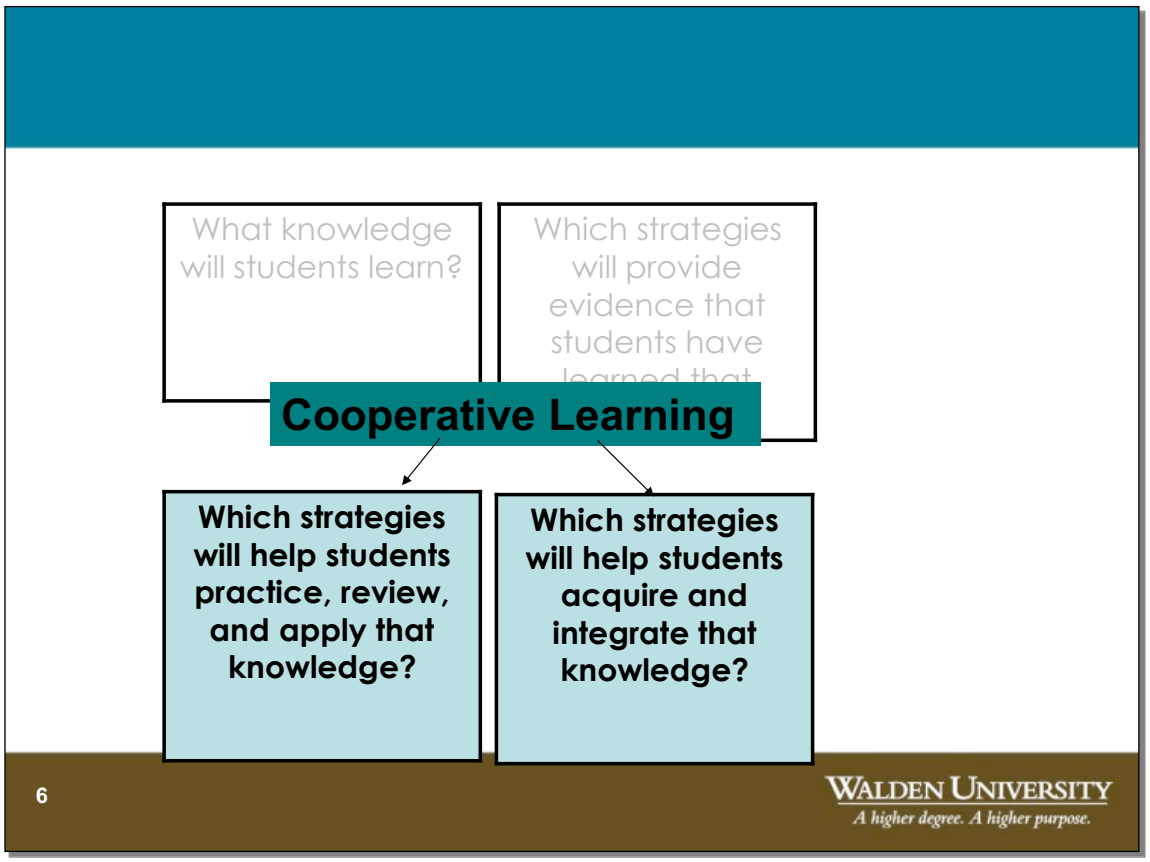
What knowledge will students learn?
Which strategies will provide evidence that students have
Cooperative Learning
Which strategies will help students practice, review, and apply that knowledge?
Which strategies will help students acquire and integrate that knowledge?
6
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Faculty Role

Before class:

Objectives:

- Academic.
- Group Participation.
- Social Skills.

Faculty Role

- Start of Class:
  - Assign roles.
  - Explain objectives.
  - Explain criteria for success.
  - Specify desired behaviors.

Faculty Role

- During Activity:
  - Reinforce positive interactions.
  - “Notice”.
  - Avoid giving answers.
  - Re-teach as necessary.
  - Assess.

Faculty Role

- At completion:
  - Provide closure.
  - Direct processing activity.
  - Provide feedback.

Development of skills

- Social
- Leadership
- Communication
- Decision Making
- Problem Solving
- Conflict Resolution

Day 3 Topic: Lesson Plan Planning/Development and Student Support Services

Presenter: Sumithra Iyer

Training time: 8 hours

Objectives/Desired outcomes

By the conclusion of today's training, participants will

- learn to develop a lesson plan for students
- learn to inform students about the support services
- learn how to encourage students use the support services

Training Materials & Resources

- ❖ Campus classroom or training room
- ❖ Laptop computer
- ❖ Digital projector
- ❖ White board
- ❖ PPT presentation and accompanying handouts
- ❖ Copier

Professional Training Sign in sheet for Day 3	
Presenter: Sumithra Iyer	Training date:
Training hours:8 From: 8:00am To: 4:00pm	Building number: Room number:

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Agenda and Handout for Day 3

	Day 3 – Lesson Plan and Student Services

8:00am-8:30am: Participant sign-in sheet completion

8:15am-9:15am: Prior Days (Day 1 & 2) Review

9:15am-10:45am: Student Support Services
This session will be an overview of student support services, facilitated by a guest from student affairs. This session will provide participants the opportunity to learn what services are available to developmental mathematics students who may be struggling with academic success.

10:45am-11:00am: Break

11:00am-12:00pm: Student Support Services continued
Some items this session will cover are services available at the campus, how students can access these services, and what resources are available to faculty for student referrals. Other services include tutoring, personal counseling, mentoring, early alert intervention, and financial resources.

12:00pm-1:00pm: Lunch Break (1 hour)

1:00pm-2:00pm: Active Learning Activity Student Support Services
Participants will break into small groups of 3-4 and discuss types of resources available to promote student success in basic skills courses, student services incorporated into classrooms, and student use of the available services. In the small groups, participants will discuss their newfound insights, thoughts, and actions going forward based upon what they learned about the subject and situation. Participants will also receive feedback from the other group members regarding their respective choices.

2:00pm-3:00pm: Small groups will select one support service to report on and assign a spokesperson to present the insight and one planned action going forward based upon their newly acquired knowledge of the subject and situation, including beneficial input that they obtained from their group members. Members of other groups will comment on and provide additional input and suggestions regarding presented scenarios

3:15pm-3:30pm: Participant questions for the presenter regarding the groups' scenarios (approx. 15 mins)

3:30pm-3:50pm: Summative Evaluation

3:50pm-4:00pm: Closing remarks for the day

Summative Evaluation

Professional development training evaluation form

Presenter: Sumithra Iyer

Your assistance is requested! Please complete and return this form to the presenter at the conclusion of this professional development session. Completion of this evaluation of the training will provide important feedback regarding the value and effectiveness of the training and directions for future professional development training. Thank you for your participation!

Post training survey	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
The training content was informative and well- organized					
I have learned something new about active learning					
I have the skills to facilitate engagement in the classroom					
I have the knowledge necessary to inform students about the support services available at the campus					

Will you apply today's workshop in your class? If so, how?

_____

Appendix B: Interview Protocol Form

Project: Community College Students' Perceptions of Developmental Mathematics and Influences on Persistence

Date _____

Time _____

Location _____

Interviewer _____

Interviewee _____

Consent form signed? ____

Comments to interviewee:

Thank you for your participation. I believe your input will be invaluable to this research and will help college professionals to better understand why students sometimes do not complete developmental mathematics courses.

Any answers you give to the questions I ask will be strictly confidential.

Approximate length of interview: 45-60 minutes, five major open-ended questions. There are no right or wrong answers to these questions. Just answer the questions in a way that reflects your feelings or experience.

3. Can you tell me which developmental mathematics class (classes) you have dropped since being at the community college?
    (a) Did you subsequently re-take the class?
    (b) Were you successful in completing the class the second time?
    (c) Why do you think you were successful when you took the class the second time?

Response from the Interviewee:

4. What, if any, characteristics about the class itself led you to decide to withdraw from your developmental mathematics class?

Response from the interviewee:

Reflection by Interviewer:

5. Were there reasons outside of the class itself that led you to withdraw from the developmental mathematics class (classes)? If so, what were the reasons?

Response from Interviewee:

Reflections by Interviewer:

6. Thinking back, what, if anything, could have been different about the class (classes) that would have led to your completing the course?

   Why do you think that this would have helped you to be successful?

   Response from interviewee:

Reflection by interviewer

7. What recommendations would you have, if any, for helping students to be successful in developmental mathematics classes?

Response from interviewee:

Reflection by Interviewer:

- Closure
  - Thank the interviewee for their time and for participation.
  - Reassure them the confidentiality on their answers.
  - Ask them for permission to follow-up.