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Community College Students' Experiences of Successfully Completing Developmental Mathematics Option

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Walden University

College of Education

This is to certify that the doctoral study by

Gracie B. Otin

has been found to be complete and satisfactory in all respects,
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Walden University
2021

Abstract

Community College Students' Experiences of Successfully Completing Developmental Mathematics Option

by

Gracie B. Otin

Project Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

December 2021

Abstract

Only 41% of first-time college students at a community college in the southwestern United States passed developmental mathematics (DM). To improve the success rate, the state's higher education coordinating board proposed a corequisite model supporting non-course competency-based options (NCBO). The purpose of this basic qualitative study was to explore the lived experiences of community college students who successfully completed the DM NCBO sequence. Tinto's theory of student integration and retention informed the study. The research questions for this basic qualitative study addressed the perceptions of participants regarding the DM NCBO intervention program, conditions participants identified as influencing success of DM NCBO, and participants' perceptions about future success in college-level courses. Face-to-face semistructured interviews were conducted with 11 junior level students during the 2015-2016 academic year who successfully completed the DM NCBO sequences with a grade of C or higher. Data analysis was conducted using NVivo software to identify codes and themes, and three findings emerged supporting DM students' success: (a) the need for a convenient location to attend classes and schedule of classes, (b) small class sizes to support peer collaboration and one-on-one interaction with instructors, and (c) enhanced student preparation for college-level courses. A policy recommendation supporting a corequisite model of instruction for DM students was developed. The study promotes social change by addressing how community colleges can better prepare developmental education students to succeed in college through graduation to enter the workforce fulfilling gaps in the labor market.

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Dedication

I dedicate this research to my heavenly Father, to whom I give all honor and glory for making my education possible. I also dedicate my dissertation to my earthly father, who inspired me and instilled in me the value of hard work, dedication, persistence, and to aim for the highest level of educational attainment; to my loving mother whose unconditional love carried me through; and to my lovely children whose enduring patience and encouragement are deeply appreciated.

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Joan Hyatt gave generously of her time and provided guidance and encouragement from the beginning. She is one of the most astute scholars of education and someone who inspired and equipped me to think critically about the educational process. I am enormously grateful for her queries and suggestions. I would like to thank everyone I interviewed for sharing his or her experiences and views with me. My gratitude also goes out to the many instructors and engaging students with whom I worked. It is in large measure because of them I chose to enter academia and why I find my job enormously invigorating and rewarding.

Finally, I would like to thank my family for all their love, encouragement, and support, and for providing me with patience and understanding. This study is dedicated to my parents who are my champions, my children who are the center of my life, and to Joan Hyatt for her unwavering support, wonderful editing, thoughtful discussions, and backing me 100%.

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Section 1: The Problem

The Local Problem

Several researchers have conducted studies on developmental education at the postsecondary level (Boatman & Long, 2017; Brower et al., 2018). In the present study, "developmental education" and "remediation*"* were used interchangeably. *Developmental education (DE)* can be defined as "pre-college, non-degree courses, interventions, tutorials, laboratories, and other means of assistance that ensure the success of a student in performing entry-level academic coursework" (Higher Education Law Bulletin [HELB], 2020, p. 698). According to the higher education coordinating board in the state where the study was conducted, DE is comprised of incremental courses that aim to help raise students-to the acceptable level required of all who enter as college freshmen.

While research indicates that more people are enrolling in community colleges, many are not ready for college level courses (Acee et al., 2017; American Association of Community Colleges [AACC], 2018). According to Williams and Siwatu (2017), college level administration and counselors place underprepared freshmen learners into *developmental mathematics (DM)*. As an illustration, a recent report released by American College Test (ACT I) suggested that only 26% of the 1.8 million high school graduates who took the ACT in 2013 reached the college readiness benchmarks in all four subjects (AACC, 2017). Similarly, in 2013, nearly 87% of all ACT-tested high school graduates noted that they intended to obtain at least a 2-year college degree (AACC, 2017).

In this study, I examined students' experiences in non-semester-length and non-course-based options (NCBO) in DM coursework at Gulf Community College (GCC; a pseudonym), a community college in the southwestern United States. At the study site, only 41% of first-time college students passed DM (Mathematics Department Chair, personal communication, April 20, 2009). In response to similar low success rates in community colleges across the state, the states' higher education coordinating board proposed a corequisite model supporting non-course competency-based options (HECB, 2009). The local state legislature emphasized that DE could be offered to learners in different ways to address the unique developmental needs that students have, especially through non-semester-based or non-course-based developmental interventions (HECB, 2009, p. 2). Therefore, the statewide DE plan for 2010–2011 academic year described the need to pioneer creative or novel projects aimed at effectively addressing the distinct needs that learners should improve their career readiness and overall academic performance (HECB, 2009).

In response to the state legislature's recommendation, officials at GCC implemented the NCBO accelerated program at the research site in September 2012 (Mathematics Department Chair, personal communication, August 15, 2012). Prior to 2012, NCBO coursework was not mandatory for community colleges or for traditional 4-year colleges in the study state (Goldwasser et al., 2017). However, since September 1, 2012, higher education institutions in the study state were obligated to reconsider NCBO interventions to assess the extent to which certain interventions or programs were

effective in addressing students' needs compared to the traditional DE courses (Denning et al., 2021; HECB, 2009; Williams & Siwatu, 2017).

The implications for students placed in remedial courses may be discouraging. For example, Acee et al. (2017) reported that students enrolled in basic arithmetic courses may require at least 2 years of remedial classes in preparation for their admission into a college-level class. During the remedial classes, the inductors may consider placing leaners on academic probation prior to starting their next module for falling their previous courses (Denning et al., 2021). Delayed learning or starting of modules following students' failure to pass their previous courses negatively impacts their academic outcome and career growth, including employment by falling to graduate on time (Atkins & Beggs, 2017). According to HECB (2018), the local state has initiated numerous pilot efforts to increase college access, persistence, and graduation rates for undergraduates who were not ready for college-level classes. However, these efforts have yielded few positive outcomes (National Center for Education Statistics [NCES], 2017). For example, several colleges, including the research site, provide a sequence that starts with fundamental arithmetic followed by pre-algebra, elementary algebra, and intermediate algebra. Students are required to pass their current courses before enrolling to the next level or classes (Woods et al., 2018). However, it is important to note that students' inability to pass their current program may discourage them from maintaining the required academic motivation toward the realization of their educational goals (Williams & Siwatu, 2017).

Despite the negative consequences attributable to DE, remediation does not tend to impact student persistence negatively, and may even improve persistence (Edgecombe & Bickerstaff, 2018). To solve DM attrition problems, research has focused on the effectiveness of intervention strategies, including mentoring and learning communities (Bahr et al., 2019; Edgecombe & Bickerstaff, 2018). Although the evidence regarding strategies to create improvement in DM at GCC is important, it is equally important to understand why DM NCBO works for some students. Therefore, in this study, I investigated the lived experiences of students in DM courses who were successful, that is, the students who had completed the sequences and moved on to college-level courses. In doing so, rather than focus on why many DM students do not complete mathematics sequences, I aimed to enhance an understanding of what helps students in DM NCBO courses to persist.

Definition of the Problem

Underrepresentation of students in learning institutions in the United States is an issue of concern among stakeholders as it directly affects learners' academic and future acre pathways (Bahr et al., 2019; HECB, 2018). Underprepared students are advised and encouraged to enroll in developmental programs (Williams & Siwatu, 2017). Generally, students with inadequate skills in mathematics finish a minimum of two remedial-level semesters of work before they can attempt college-level courses in the subject areas related to the remedial work (AACC, 2018). However, students may not benefit from lengthy sequences of remedial coursework. Researchers have reported an alarming dropout out rate among students enrolled in algebra courses when learners failed to meet

the required point to proceed to the next level (Boylan et al., 2017; Foster & Inglis, 2017, 2018). In addition, the time spent taking the remediation courses can discourage students from seeking majors that require the use of mathematics. Given these factors, an instructional method is required to address the needs of current students, and the growing population of incoming college students-who require remedial coursework (Fay, 2017; HECB, 2018).

Community college campuses across the nation offer DM most frequently; however, these are also the courses with the lowest success rates (Bahr et al., 2019; Valenzuela, 2018). Retention programs have not been effective either at the state level, or at the study site (HECB, 2018). Previously, the focus has been placed on exploring the concept of student academic performance (Woods et al., 2018). According to Zientek et al. (2019), educators have been focusing on student academic achievement because success in mathematics and other technical subjects is directly linked to academic motivation and persistence among learners. Academic motivation and persistence may create internal motivation among learners to develop strong mystery of subject, focus on self-improvement, and build their self-efficacy that is important for academic success (Cox & Dougherty, 2019). To date, I have been unable to locate a qualitative study carried out to explore the lived experiences of students in a DM NCBO program. A better understanding of remedial students' perspectives may help college administrators to develop effective developmental programs to serve underprepared students.

There is a known potential shortage of teachers to meet the surge in student numbers (Bureau of Labor Statistics [BLS], 2019). Consequently, learning institutions,

both private and public, have adopted several strategies to promote student retention in different courses in effort to prepare them for future careers (Baber, 2018). College administrators may consider innovative, alternative approaches to DE to help expedite student progress in mastering important academic competencies. Officials aimed the NCBO toward students at risk of attrition by arming them with the skills and dispositions they need to move beyond remedial mathematics (Baber, 2018). The goal is to have college administrators address the specific needs of each student based on course parameters outlined in the HECB's 2019 report. A positive change in the problem-solving skills of students in DM is a prerequisite for academic success. Through this study, I aim to contribute vital information on the positive outcomes and completion of accelerated or fast-track DM courses for underprepared students.

Rationale

Evidence of the Problem at the Local Level

The research setting where this study took place is Gulf Community College [GCC], a community college in southwestern United States. GCC is a 2-year, public institution that serves approximately 2,400 students per semester in 30 credit programs (Office of Institutional Effectiveness and Research [OIER], 2018). An additional 800 students participate in continuing adult education, workforce development, and industrial training contract courses (OIER, 2018). The study site is located in a small, diverse community with approximately 47,782 residents (U.S. Census Bureau, 2012). In 2012, the median income of this area was $31,154, and the average age was 38.8 years (U.S. Census Bureau, 2012). One public high school with an annual population of 2,500 and

one small private parochial high school with an annual population of around 80 serve the community's educational needs. Many students from the public high school go on to attend the study site, which is also a public community college (OIER, 2018). Data from OIER (2018) indicated that 45.6% of students are White, 19.8% are Black, 30.4% are Hispanic, 4.2% are Asian, and 1 % are "Other." Diversity also includes age and gender. These statistics are representative of the study site community, which is also culturally diverse. The community is one of the most diversified cities in the region (U.S. Census Bureau, 2018). One of the community's challenges may be how to address the educational needs of such a diverse population, whose motto is "Opening Doors and Changing Lives" (OIER, 2019).

Addressing students' level of preparedness in community colleges is one of the many challenges in the local state of the study site (Complete College America [CCA], 2016). The local state has provided support to its institutions of higher learning to increase programs for college readiness. This support was a portion of a program in the state, called Closing the Gaps by 2015, which launched in 2000 (HECB, 2000). The legislature designed this initiative to bring the local state to parity with other leading states regarding higher education attainment. If the local state's economy is to continue to grow and create the high-skill, high-wage jobs that will define the workforce of the future, the local state must provide high-quality postsecondary instruction, research, and student support at higher education institutions (American Association of Community Colleges [AACC], 2017). As a result, administration at the study site designed strategic programs to increase retention by 20%, through accelerated programs, a mentor program,

and a summer program (OIER, 2019). The college stakeholders' initial motivation for the programs came from a desire to bring retention rates in line with the national average (OIER, 2019). However, attrition rates increased after 2008, and have since remained high. The average annual retention rates from Fall 2008 through Spring 2011 were 65%, 63%, and 59% in each year respectively (OIER, 2019).

Positive effects from interventions have resulted from some of these strategies, affirming that changes in practices can help some students succeed. While researchers have reported on the effectiveness of DE programs by supporting student persistence in school, some have reported that the real focus of student success in the level of focus placed in support of DE and credit-bearing courses (Baber, 2018). However, some of the scholars have established that failure to focus on the design of DE coursework itself could be a major barrier to student success (Cohen & Kelly, 2020; Tinto, 2017). For instance, the study site measures retention and enrollment from fall to spring and from fall to fall. Since 2009, fall-to-spring retention averaged 73.4% and fall-to-fall retention averaged 40.3% (OIER, 2018). Researchers have estimated that student retention rate in 2009-2010 summer programs was 74.3% and 43.4% for students learning in mathematics (Cohen & Kelly, 2020). However, in 2010-2011 summer programs, retention rate was estimated to be 71.3% for overall students and 38.5%for student learning mathematics. Since this study site is a nonresidential community college with 73% part-time students, the HECB categorized rate is "average" retention (Cohen & Kelly, 2020). Therefore, retention continues to be a persistent problem at the study site.

Nationally, the local state lags other states in graduation and retention rates (HECB, 2018). Nearly 41% of students enrolling in higher education in local states need DE courses for successful graduation (HECB, 2018). Approximately 40% of the students enrolled in the required mathematics remediation programs made up almost half of the mathematical offerings at the study site (OIER, 2018). Additionally, scholars such as Cohen and Kelly (2020) have reported on the foundational role that DE programs have in prepare student for college level education as well as increasing their chances of graduating on time.

Capers (2019) explored the effect of participating in summer bridging programs and established that summer that students who took part in the programs were 9% more likely to graduate than those did not take part in the study. Similarly, Cohen and Kelly (2020) reported that students who took part in bridging summer programs had improved persistence and graduation rates than those who did not take part in the study. As such, the researchers recommended the need to improve and implement bridging programs to support those students who need them to improve their course points and graduation rates (Baber, 2018; Cohen & Kelly, 2020). To be a strong contender in the global economy, it is important to have people attain the skills necessary to finish school.

Underscoring the importance of education, in 2012 President Barack Obama implored educators of not only their moral obligation but also the immediate need and importance of providing all children with a world-class education to prepare them for a future to compete in the global economy (Capers, 2019). Educators across the county and in the local state should identify opportunities to improve the enrolment rates of students

going to college, staying in college, and graduating in both 2- and 4- year schools (Cohen & Kelly, 2019).

In the past, DM courses were not the sole factor in determining the college's status with the Southern Association of Colleges and Schools (SACS); however, during the 2014–2015 SACS process, officials used DM courses as one of the indicators to determine progress (Cohen & Kelly, 2019). If college officials do not improve the outcomes for DM, the school will not meet its academic goals (Capers, 2019). Therefore, the study site could fail to meet SACS accreditation standards, which would result in the college needing to improve to avoid being sanctioned, fined, or having have its accreditation revoked.

This study focused on the benefits of the September 2012 state-mandated intervention to address retention and persistence rates in DM at the study site. Aware of the need to meet retention and persistence challenges, scholars have concurred that learning institutions have the obligation of helping students to excel academically upon accepting them during the admission (Capers, 2019). Consequently, in Fall 2010, public places of higher learning in the local state became eligible to receive formula funding for the newly instituted DE NCBO interventions.

HECB officials realized that the duration of basic sequences could be a hindrance to completion. Therefore, they explored an increasing number of models aimed to speed up a student's entry into college-level courses (Bohlig et al., 2018). Researchers have suggested the implementation of retention programs through structural frameworks to shorten the time required to complete several classes by recommending the merging of

classes with the mainstream classes (Capers, 2019). For instance, NCBOs involve placing developmental students into college-level classes while giving them the same amount of additional support.

In this study, I explored students' perceptions about their experience in the fast-track (8-week) DM NCBO courses in a community college. The NCBO is a compressed module that covers the same amount of subject material in half the time. The NCBO provides flexibility for institutions to design more individualized interventions based on contact hours and more attuned to the students' schedules. One of the consistent measures of NCBO is the mastery of previously identified weaknesses. Since a student's instruction, practice, and feedback focuses on mastering weak skills, his or her intervention is both targeted and accelerated, leading to a quicker path toward college-credit coursework. However, some students may require extra, non-academic-credit courses to shorten this unexpected requirement. Thus, the question arises whether the length of the course or the campus environment hinder or help the students' ability to pass the course.

Evidence of the Problem from Professional Literature

Each year, places of higher education in the United States, such as community colleges, face the challenge of how to improve the academic abilities of students who come to college unprepared for college-level coursework (Doherty et al., 2017). If a student should take more basic, non-college level courses, the student will have a lower chance of earning a degree. Minority, low-income, and immigrant students are overrepresented in developmental courses (American Association of Community

Colleges [AACC], 2017; Brower et al., 2018; Davidson & Wilson, 2017; Juszkiewicz, 2017). More than one in five community college students must take remedial mathematics courses; these courses vary across basic arithmetic, prealgebra, basic algebra, and intermediate algebra (Ganga et al., 2018).

Current research suggest that students enrolled in traditional DE classes are less likely to complete their learning process compared to their counterparts enrolled into college-level classes (Bohlig et al., 2018). Indeed, lack of completion is a problem that still exists (Cohen & Kelly, 2019; Logue, 2018). To date, limited researchers have explored why some learners become successful in DE while some fail (Bohlig et al., 2018; Childers & Lu, 2017). An exploration on how the recipients of the program (i.e., students) perceive the program, and its effectiveness, may provide insight for educators creating future DM reform efforts.

Roberts (2018) analyzed student enrollment, looking for a connection between how long a course was and how well the student did in developmental English, mathematics, and reading at a community college in California. Additionally, Cohen and Kelly (2019) established that enrolled to DE courses reported higher academic performance provided the accelerated course structures. Therefore, the findings of this study could help stakeholders to identify methods that strengthen DM.

The demands of the global economy to meet job market requirements are high because there are few careers that do not require the use of basic mathematics skills (Dimosthenous et al., 2020). Moreover, the job market has seen an increasing demand for technical skills (Coleman & Smith, 2021). The ability to understand and interpret data,

formulate and solve problems, and then apply those understandings in a variety of ways is essential (AACC, 2018; BLS, 2019). The technical skills are very important for successful students to fulfill the challenges found in professional careers. The National Council of Teachers of Mathematics (NCTM; 2021), stressed the need for mathematics in education, reporting, “mathematics can and will be learned by all students” (p. 13). Typically, student who have excelled in reading and writing are likely to be successful in their career compared to those who failed in this basic subject (Childers & Lu, 2017).

In 2009, staff at the National Center for Postsecondary Research (NCPR) conducted an evaluation of the accelerated programs at eight Achieving the Dream (AtD) colleges including the study site (Scott-Clayton, 2018). AtD is a network of more than 220 community colleges in the United States dedicated to helping students achieve their goals for academic success and economic opportunity (Torres et al., 2018). The purpose of the evaluation was to assess whether the programs reduced students’ need for developmental coursework and whether the programs improved students’ completion of college-level courses.

Researchers have noted that students with learning difficulties may find valuable support in nonacademic avenues because such programs aid them to develop social relationships required for academic persistence and motivation (Torres et al., 2018). Therefore, there is need for educators to design alternative accelerated courses for students enrolled in the NCBO intervention module, who would then progress to college-level mathematics and possibly reduce attrition problems. Because the focus of these initiatives was to improve students’ persistence and completion rates, the success of

retention is dependent upon whichever strategy would be most beneficial regarding student retention. After reviewing studies on how the relationship that exists between earning a community college and student career, Childers and Lu (2017) found that students who graduate are more likely to identify and achieve a better career path compared to those who fail, to graduate or drop out of school.

Projections of future careers and job needs indicate the need for more educated workers. For instance, employment is projected to grow from 161.0 million jobs to 169.4 million jobs from 2018 to 2028. Healthcare is expected to account for a large share of the new jobs projected through 2028 (BLS, 2019). The spotlight on statistics looked at employment and wages for occupations with different education and training requirements. Few careers are available that do not require basic mathematics skills (Benson & Burnett, 2018; Carrico et al., 2019).

In recent years, the need for an educated workforce led to an increase in students seeking college enrollment. Approximately 7.2 million students enrolled in 2- year institutions; 18% of these students were ages 25 to 34 in 2016 (National Center for Education Statistics [NCES], 2017). Using the statistics above, it can be estimated that the enrollment of students to undergraduate courses increased by 14% between 2016 and to 2017 (Childers & Lu, 2017). Although enrollment has increased over time, success rates have lagged. For instance, researchers have found that nearly one-third of students who join community college takes at least 6 years to graduate after transferring to a 4-year college (Schak et al., 2017). Among first-time college students who went into a community college during the 2003–2004 academic year, 45% dropped out of college

(Schak et al., 2017). Only around 6% of students earned a credential throughout the same calendar year. Less than 40% of students who were in community college got a credential, and only 30% of people successfully remediated in mathematics (Schak et al., 2017). Consequently, the number of students requiring remedial teaching to graduate has exponentially grown since 2010, especially those who require remedial classes to pass mathematics (Bohlig et al., 2018).

Challenges facing underprepared students, such as academic and social issues, necessitates the implantation of alternative to help them improve their academic success in colleges (Baber, 2018, Bahr et al., 2019). Mathematics in the United States is assumed to be mediocre in comparison to other industrialized nations (OECD, 2020). Research evidence demonstrate that majority of the college students in the United States find it difficult to perform basic arithmetic, prealgebra, and algebra, suggesting a lack of adequate mathematical teaching during elementary, middle, and high school (Cohen & Kelly, 2019).

In the past, DE programs have been used to have addressed student related challenges in high schools, including reading and writing (Cohen & Kelly, 2020). For instance, Coleman and Smith (2021) found that nearly one-quarter of high school students in United States are not ready to join colleges attributed to difficulties in reading and writing, especially among the students of color. President Obama launched the Make College a Reality initiative to increase student enrollment in college-level courses by 50% by 2016, though this goal was not fully realized (Coleman, & Smith, 2021).

Some instructors have failed to establish substantive evidence to link K-12 education to performance in higher learning institutions (Cohen & Kelly, 2019). According to Coleman and Smith (2021), there is limited information to parents and students regarding the level of preparedness need by student to be ready and successful in colleges (Dimosthenous et al., 2020). Students and their families often believe that earning a degree from high school prepares students for college (Cohen & Kelly, 2019). To be ready for college education, researchers have recommended that students need to exceed the minimum requirements required to graduate from high school to higher learning institutions (Edgecombe & Bickerstaff, 2018). For example, advanced placement (AP) mathematics in high school is not like a dual-credit course in mathematics, which is a college-level class taken by a high school senior or sophomore. Therefore, students should not assume that they are ready for college just because they passed an AP mathematics class in high school.

To increase student readiness for higher education, local learning institutions have implemented several developmental programs for students during the summer (Dimosthenous et al., 2020). The implementation of the summer programs represents coordinated efforts by education stakeholders to support the underrepresented students and reduce the time required to graduate through alternative programs during summertime (Edgecombe & Bickerstaff, 2018). In 2013, the study state ranked 25th, nationally, in attainment of bachelor's degrees. Students typically take 142 hours to complete an associate degree, which is 22 hours above the 120 credit-hour degree (HECB, 2018).

In the southwest region of the United States, community college credentials are regarded as a key to economic independence in the long-term, and as a crucial path to being part of the middle class (AACC, 2018; Smidova, 2019). From a global viewpoint, making sure that very large numbers of people acquire postsecondary credentials has important implications in terms of tax revenues (Francis et al., 2019). Having postsecondary credentials correlates with decreased unemployment, lower rates of lawlessness, and less welfare dependency (Edgecombe & Bickerstaff, 2018). The BLS (2019) projected the labor force would grow 0.5% per year from 2012 to 2022, which means there will be an increased need for an educated workforce that has related work experience and on-the-job training. Over 64% of 2-year public college respondents reported using practices that other sectors judged as minimally effective (Francis et al., 2019).

The debate of DE's effectiveness continues among policymakers. Proponents of DE argue that remedial courses could help people get into academic environments, leading to higher rates of retention and degree completion (Complete College America [CCA], 2016). Theorists of student integration and engagement posit that those students who feel affiliated with their institutions academically and socially tend to stay enrolled more than students who do not have this connection (Astin, 1984, 1993; Tinto, 1975, 1997, 1998, 2010). Other advocates of program acceleration have noted that with good programs and persistence, students can graduate at higher rates (Bishop et al, 2018; Brower et al., 2018). However, Coleman and Smith (2021) underscored that some of the students in the remedial classes could be academically weak and developmental programs

may be less effective in helping them improve their academic performance in colleges. Still others believe that although extremely costly, developmental courses are not producing desired outcomes, it is estimated the cost per year of remediation to be more than $1 billion for public colleges (Barnett et al., 2018).

Cost analysis from the local state indicates that developmental bridge programs do not have a major influence on college student success, defined as gaining credits and staying in school (Dunigan et al., 2018). Jenkins et al. (2018) noted that students in developmental courses "may give up because they become discouraged with the drudgery of remedial instruction and do not see a clear pathway to success in college" (p. 11). In response, policymakers such as the HECB and philanthropist organizations such as the Bill and Melinda Gates Foundation have launched efforts to help improve academic outcomes (HECB, 2018).

College officials place students in DE courses because of institutional or standardized assessments, such as the COMPASS test, ACT, College-Level Examination Program, or Texas Higher Education Assessment (NCES, 2012). Placing students in non-credit-bearing remedial courses results in lower course completion, due to high attrition rates. Bahr et al., (2019) emphasized the contrasts in course completion rates at differing levels of initial mathematics skills. Research suggested that student persistence behavior is critical when attempting to understand course completion and success in the acquisition of mathematical skills (Bahr et al., 2019). Many support services are available to help with the transition, both in an academic and social sense, which benefits people.

According to Ngo et al. (2018), recommendations for quality assessment and placement practices is necessary.

Community colleges are nonresidential institutions that require students to commute to college (Tinto, 1993). Some students work while attending college. Often, these students work full time (Tinto, 2017). For these students, the classroom is, perhaps, the only time they are on a college campus where students meet each other and faculty. As such, if students fail in the classroom, they fail in college. For educational institutions to take course completion seriously, institutions must increase student classroom success by focusing on learning.

Stakeholders should look to improve the nature of the classroom experience producing the educational experience, so that students desire to continue, to complete, and to graduate. DE in community college encompasses various forms of learning assistance critical for student success. Tinto (1993) identified the following supportive conditions of students' classroom success: (a) expectations, (b) support, (c) assessment, (d) feedback, and (e) involvement. In general, colleges must empower learners so that they are accountable for their own learning and doing so could relieve their fears of mathematics.

Although DE provides a solid foundation for success in students' subsequent classes, research has not confirmed whether the community college fixes academic deficiencies in mathematics. Current corrective or remedial strategies have proven to be less than effective (American Association of Community Colleges, [AACC], 2018). Thus, a reexamination of the achievement problem in mathematics, and the institution's

response to remedial students, is in order. Quantitative analysis alone may not identify what is occurring in the DE classroom. Therefore, it is necessary to answer why it is happening through qualitative research methods.

Definition of Terms

The following terms and definitions are used throughout this study:

Achieving the Dream (AtD): an initiative that involves numerous institutions and was devised to increase outcomes for community college students (Torres et al., 2018).

At-risk student: a population of students that includes adults, reentry students, first-generation students, low socioeconomic status students, people of color, multicultural students, people who have disabilities, students who do athletics, students in their first year of school, and/or transfer students (American Association of Community Colleges, 2018).

Basic math skills: concepts and skills in the study of mathematics that students need so that they can take college-level mathematics in a postsecondary institution (Clarke & Roche, 2018).

College-ready: the degree of readiness a person must achieve to enroll in a community college and then succeed; the student would not need remediation in a class that gives credits in general education (Francis et al., 2018).

Compressed course: a developmental course that has the same number of contact hours and addresses the same learning outcomes as a traditional course but meets within a shortened overall period (for example, 8 weeks at 6 contact hours per week (Cohen & Kelly, 2019).

Developmental and *remediation*: used interchangeably in this study to define a sequence of semester-long courses in mathematics that learners complete before enrolling in college-level gateway courses (Hodara, 2019). Developmental/remediation courses are not usually credit bearing. They can be costly and discouraging (AACC, 2018).

Dual credit: a college course in which a high school student enrolls, and is given, academic credit as a high school course, as well as a college-level course (Clarke & Roche, 2018).

Entry-level course: any course taken for academic credit. Typically, this is a course a freshman student enrolls in; sometimes called *entry-level freshman coursework* (HECB, 2018).

Gateway courses: beginning college courses in an area of study. Students take gateway classes for college credit, and these credits count toward degree requirements (Goldwassser et al., 2017).

Intervention strategies: Programs designed to enhance to student academic outcomes, especially for learners with limited academic skills in different subjects (Clarke & Roche, 2018)

Learning experiences: student experiences in an educational setting; assumes that a mathematics understanding takes place (Coleman et al., 2017).

Mathematics anxiety: an intense feeling that an individual cannot perform efficiently in situations that involve the use of mathematics (Hatch, 2017).

Non-course competency-based options (NCBO): interventions that use approaches in the classroom to handle a student's weaknesses and prepare the student for college-

level work. This option works from the premise that a student would be better suited taking a developmental intervention of 8 weeks, rather than a semester-length class of 16 weeks (HECB, 2018)

Sequence: According to Capers (2019), sequence begins with the initial assessment of students and then referral to remediation if necessary; the process ends when students complete the highest-level developmental course (Ferrare & Miller, 2020). Doing so ends the students' developmental needs (Clarke & Roche, 2018).

Technology: The application of scientific knowledge for practical purposes in education to support instruction methods and offer student greater agility in their learning (Ferrare & Miller, 2020).

Significance of the Study

Higher education institutions, including the study site, strive to give the correct amount of effective instructional practices to help underprepared students in DM on their journey to college success. Academic persistence and graduation rates for DM students have been low, demonstrated by a 40% withdrawal rate in DM (Ngo & Yun, 2018). The study site strives for a fall-to-spring (F-S) retention rate of 70% or more, and a fall-to-fall (F-F) rate of 80% or higher (OIER, 2018). However, the average F-F retention rate has been 39.6% or 52.2% of the spring success rate; and F-S retention was within a few percentage points of the fall success rate (OIER, 2018). Of the 2,400 students entering the research site annually, over 50% must enroll in one or more developmental studies courses, because of their low scores on COMPASS and TSI placement tests. Despite efforts to remediate mathematics skills, from 2000 through 2012, 40% of students did not

make the successful transition to the next gateway DM course (OIER, 2018). The numbers in DE increased every year, because the methodology for interventions were ineffective, as indicated by the retention data obtained from the Office of Institutional Effectiveness and Research (OIER).

The cost of college education is another economic rationale for shortening the time required to complete each course (Francis et al., 2019). College educators need to develop and refine essential skills that students need, personally and academically to prepare them for new employment opportunities, job security, and career promotions (Coleman et al., 2017). Of significance is the national challenge of bringing a greater percentage of the population into college-level mathematics, which affects many degree programs including workforce training. College enrollment issues are beyond the scope of this study. However, the problem of identifying opportunities, strategies, and techniques for offering college-level mathematics courses for underprepared mathematics students was explored, as well as proper placements of students in mathematics courses.

Accelerated programs are more helpful than conventional models of DE in assisting students who have lower than average skillsets (Fay, 2017). Accelerated programs help students build competencies and succeed in college. College educators developed the non-semester-based, non-course-length option to make the goal of college more attainable, for those students who may be part of a marginalized group. High attrition rates in developmental sequences can be explained by length of the sequences, as students fail at each level until only a small number of students remain to finish the sequence (HECB, 2018). However, these students need to believe they can attend and

successfully complete college-level work. The accelerated model, such as NCBO, due to its structure and design, presents opportunities for educators to help support the development of self-efficacy in underprepared students (Weiss et al., 2019). The accelerated model serves as a catalyst toward this realization, since it provides necessary skills, rigorous coursework in mathematics, and support. Students can transform into confident learners and improve outcomes by lowering the time it takes to get a degree (Hatch, 2017). In this study, I explored the lived experiences of community college students who successfully completed DM NCBO. Some faculty members at GCC theorized the main causes of students dropping out were lack of ability and motivation. However, successfully keeping students in school fundamentally indicates successful education (Wlodkowski & Ginsberg, 2017). Therefore, faculty should focus on adopting strategies that enhance greater student learning, which could then improve student retention.

The effectiveness of teaching is not only determined by the type of pedagogical techniques used but also by actual strategies used to teach learners (Coleman et al., 2017). Examples of effective teaching strategies include promoting engagement in the curriculum to increase support and an opportunity to redesign their learning approach for better performance (Cohen & Kelly, 2019). Thus, teachers or instructors who incorporate a variety of teaching strategies will be more successful in addressing the varying requirements of students (Denning et al., 2021). The perspectives and attitudes of the students themselves must guide the development and implementation of new strategies on remedial mathematics courses. By better understanding student perceptions, teachers

of developmental classes may use this study to distinguish instruction by using correct strategies and resources (Ferrare & Miller, 2020). Additionally, the people making course materials in mathematics may better understand how students see their products (Cox & Dougherty, 2019). This could lead to an improvement of the courseware itself, which could increase student motivation, persistence, and retention.

This study provides a lens for readers to see higher education reform as an organizational change. Literature indicates that between 2012 and 2022, the nation will experience technological advances in science and technology (Ferrare & Miller, 2020). Francis et al. (2019) projected a surge in demand for teachers and employees with skills in mathematical, science, technology, and engineering (Denning et al., 2021). Locally, nationally, and globally, technology improves our way of life, promotes growth in the economy, and protects national security. The BLS (2019) projected that 19 of the 30 occupations that will grow rapidly from 2012 to 2022 will require some form of postsecondary education. Hence, to remain globally competitive, there is a necessity to respond to this need. Improving academic performance, and reducing failure and dropout rates, requires more than traditional teaching strategies (Education Commission of the States [ECS], 2019). In addition, a college degree is becoming the minimum requirement for upward mobility and economic progress in the United States (Ferrare & Miller, 2020). Better mathematics education may provide a critical competitive advantage to the state's economic future. With an aspiration to increase the number of graduates with math, science, engineering, and technology skills by 1 million in the next 10 years, more

research is needed to understand the role of community colleges in achieving this national goal (Agasisti & Belfield, 2017).

Developing an understanding of how students view mathematics is a crucial step in helping students experience quality mathematics education. To gain a nuanced perspective of students in DM courses, educators must understand the specific influences on student persistence or attrition. Students' views about mathematics and teaching may be considered when designing a mathematics curriculum that addresses their concerns about mathematics learning. Moreover, understanding students' concerns also may influence the use of a variety of instructional practices in mathematics classes. The findings in this study revealed the impact mathematics has on the future success of the students. The study site, and other institutions, may implement campus programming or support student organizations to address learners' needs (Weiss et al., 2019). The findings also provide an opportunity for other colleges to learn how small learning institutions implement successful remedial programs. In addition, scholars and practitioners in the field want to know that what they are asked to do is sound and evidence based (HECB, 2018). Although experiences of students in this study may not represent the universal story of achievement of all DM students, their stories may help to inform conversations built on the strength and persistence of DM students, stakeholders, their families, and communities. I intend to disseminate this information among practitioners, learners, and stakeholders to create a life-long learning experience for others.

Reform of the educational system could serve, among other things, to create social and psychological conditions for students to be successful in their academic

pursuits. The success of initiatives such as DM NCBO should be assessed not only by the operational changes achieved, but also by cultural change and learning that takes place within the institution (organization). The deeper the level of cultural awareness and learning, the richer the change process, and the more likely the institution will continue learning.

Research Questions

Most research that examined educational expectations and experiences has centered on students at the secondary level. Limited studies exist that focus on community college students who aim to earn a bachelor's degree or higher credential. Given that educational expectations change, and community colleges increasingly serve as another route to a bachelor's degree, it is crucial to understand what affects the stability of educational experiences among students in community colleges. In this study, I explored the lived educational experiences among recent baccalaureate-aspiring college students who attended a community college and completed DM sequences. By focusing on participants' perceptions and experiences, I identified common factors that appeared to have contributed to the students' success within the qualitative data collected. I addressed the following research questions:

RQ1. What are the perceptions of the participants concerning DM NCBO intervention program?

RQ2. What conditions do participants identify as influencing success of DM NCBO courses?

RQ3. What are the perceptions of participants on math education regarding their future success in college-level courses?

Review of the Literature

Previous studies suggest that student success can be facilitated through a variety of interventions when students fail classes early in their academic careers (Machera, 2017). Students who test into DM often lack content knowledge, appropriate learning strategies, and support systems to succeed (Saxon & Martirosyan, 2017). This section contains a review of literature on topics specific to this study. I based the literature review on scholarship from different fields and disciplines, including mathematics, education, sociology, higher education, and education policy. I explored divergent viewpoints on developmental education in supporting underprepared students, including issues pertaining to student persistence, retention, and completion. Vincent Tinto's student integration model (SIM) provided a foundation as it formed a theoretical framework for this study. Tinto (1975, 1988, 1993, 1997) is well known theorist in higher education due to his work related to retention, persistence, and student success. I discuss a few of the reform initiatives that take place locally and nationwide to improve the outcomes of developmental education. To give a global perspective, I provide some insight into alternative pathways to DM that have been explored and implemented by other states. The literature search continued throughout the entire research project. I executed an exhaustive search of the literature by delving into various books, visiting local libraries, searching Internet sites, and using Walden University Library's multidisciplinary databases. These databases included Academic Search Complete, Ebrary, Education

Search Complete, Sage Research Methods, Education Research Starter, ERIC, dissertation databases, and Education and Theory Guide. In the online searches, I used the following keywords as search terms: *developmental education, college students, higher education readiness, math college readiness, placement, postsecondary education, higher learning, attrition and retention, remediation in higher education, acceleration in community colleges,* and *education theories*. I then conducted a thematic search of the literature on developmental mathematics, with the following search terms: *developmental mathematics, student success, colleges, learning environment, learning strategies, student perceptions, student experiences, student attitudes, student motivation,* and *self-efficacy*. I found qualitative studies that included students' perceptions of learning in several disciplines, including medicine, nursing, and psychology. The literature review situated this study in the knowledge base concerning developmental students in mathematics in a community college environment.

Persistence Theory

Tinto's model of student departure (1975, 1993) and Astin's (1984) theory of involvement both dealt with the issue of students' persistence in college. The theory of involvement is rooted in a longitudinal study of college persistence. The data of student persistence was used to test a conceptual model of student persistence, which integrated behavioral constructs from Astin's work to further specify Tinto's model. Astin (1984) concluded that factors contributing to persistence were associated with students' involvement in college life, while factors contributing to departure from college were associated with students' noninvolvement (Astin, 1984). Likewise, Tinto (1993)

emphasized the need for student involvement in learning, and the impact involvement has on student persistence (1993). Tinto argued that learning is linked to persistence, given that "the more students learn, the more likely they persist" (Tinto, 1993, p. 131). Tinto incorporated the concept of student integration into the model of student persistence and departure, which increases our understanding of persistence by cross-referencing approaches from both perspectives. Furthermore, the study of persistence is not limited to theoretical interest, but also has practical implications. Institutions of higher learning should provide facts on educational programs regarding student persistence to educational administration (HECB, 2018).

Notwithstanding Tinto and Astin's theoretical perspectives, to date, there have not been any theories that specifically address 2-year institutions. Tinto's (1975) theory of institutional departure posited that academic and social integration into the college, most directly influences the student's dedication to the institution, and persistence in that college. Addressing this gap in literature is critical for community colleges as it is important to understand the characteristics of this student population. Community colleges serve high numbers of low-income and first- generation students compared to traditional 4-year colleges (Dunigan et al., 2018). Additionally, community colleges have lower completion rates than their 4-year counterparts (Dunigan et al., 2018; Li, 2017). Warden and Myers (2017) broadened the definition of nontraditional student to include part-time students, veterans, and those who are employed. Although existing theoretical models of student success emphasize the importance of institutional factors in college success, there is no one theory of action that provides institutions and states guidelines

for the development of policies, programs, and practice to enhance the persistence of the students they serve (Whinnery & Pompelia, 2018).

Student Integration and Retention Model

The essence of Vincent Tinto's model of student integration and retention is that academic integration, academic performance, and satisfaction have all influenced student retention (Tinto, 1975, 1988, 1993). Tinto (1993) explained that educators could assess attitudes, and intentions to predict a student's commitment to the institution and to the student's own success. Tinto's (1975) holistic approach framed the current project as the primary choice. Tinto's student integration and retention model illustrates how academic integration and social integration can be used increase persistence, retention, and graduation.

Three main reasons for student departure are: (a) academic difficulties, (b) failure to resolve educational and career goals, and (c) uninvolved in the college community (Tinto, 1975, 1988, 1993). Students' progress through stages, transitioning from a high school student to a mature college graduate, as students interact with the college community. Integration of the social and academic kind, into the institution of the student's choice, influences these stages (Tinto, 1993). Tinto believed that persistence is a function of having a good match between the person and the school. A good match leads to goal commitment, where the student is committed to completing the degree. In addition, the student also benefits from interactions with peers and faculty. Eventually, the student becomes a part of the institutional culture.

When comparing Tinto's student integration theory with Bean's (1980) theory of student departure, Cabrera et al., (1992) identified some overlapping concepts. Cabrera et al. and Tinto's theories favor a good match between the student and the school, crediting the environment, interactions with faculty and peers, and support services for establishing a good match. Cabrera et al. and Tinto emphasized student experiences related to academic preparedness and commitment prior to entering college. Students with a history of success in high school arrive at college with expectations of continued success. Conversely, students with a history of difficulty in school feel less confident about their ability to succeed and are at a higher risk of dropping out.

Almost 70% of the hypotheses in Tinto's student integration model, compared to 40% of the hypotheses in Bean's theory, were valid predictors of a student staying in college (Cabrera et al., 1992). Therefore, Tinto's model better represented the college persistence process. Tinto (1988) recommended educators conduct more research with community colleges, because researchers have primarily tested the model on university students of the traditional age. Tinto (1997) observed that limited opportunities for social interaction on the community college campus yield different results on institutional commitment.

External forces, such as family, community, and employment, influence people in community college more than people who are at four-year colleges (Tinto, 1975, 1988). For example, community college students are more likely to live with others and work part-time while attending college. Four-year students are more likely to live away from home and have more opportunities to become involved in the campus culture, than

community college students. Tinto (2001) noted that campus involvement is the most crucial factor during a student's first and most critical year of college. Departure rates at community colleges are high because of the academic demands of college-level work (Tinto, 1993). Community college students have less preparation for the rigors of college when compared to four- year university students. Moreover, age, ethnicity, part-time enrollment, and low income contribute to the attrition rates of community college students (Tinto, 1993).

Although Tinto (1975) based early studies on university students, later studies expanded to community colleges because of changes in demographics, and the increased enrollment in community colleges (Tinto, 1993, 1997, 1998). While Tinto equated the *open door* policy with a *revolving door*, the importance of closing the achievement gap in community colleges was also stressed. Tinto (1993) argued that minority and low-income students are largely underprepared as a group. Therefore, Tinto challenged institutions to develop programs to support these students. Tinto (1993) observed that educators have made improvements in providing access and increasing persistence; however, educators need to do more. Drawing from the work of Tinto (1993), Williams and Siwatu (2017) examined the predictors of staying committed to two and four-year institutions to test the presumed differences in student intentions and commitment, finding that student departure rates at community colleges were twice as high as four-year schools. Williams and Siwatu (2017) concluded that what happens in the classroom influences community college students more; campus activities make four-year students committed.

Student Persistence

Student persistence and completion rates at community colleges are particularly low, especially in mathematics. For instance, Francis et al. (2019) reported that student academic problems have a direct impact on their graduation rates because it negatively affects their persistence in core subjects, including mathematics. Students with low academic progress may take more time to graduate that those who quickly progress from one level to another (Denning et al., 2021). According to Ferrare and Miller (2020), leaders in learning institutions such as colleges must be ready to help students seek alternative means to study and graduate if they are persistent with their studies. A thorough knowledge of students' behaviors regarding taking courses may lead to improved persistence and retention (Bahr, 2013). Additionally, according to Knaggs, et al. (2015) and the USDOE (2015), several factors are important in the retention and persistence of students.

Researchers who explored community college students who transferred to four-year institutions reported that further research was necessary to understand why many of the students remained at community college after they exited the remedial mathematics sequence (Dache-Gerbino, 2018). Students' who withdraw from remedial mathematics courses without attaining college-level math abilities (Ferrare & Miller, 2020), usually remained in the community college long after taking the last mathematics class (Dache-Gerbino, 2018). Through quantitative research, educators can understand how to effectively increase credits earned in the community college system, between when students enter the college and when they finish remedial mathematics (CCCSE, 2016).

Quantitative research might be effective answering questions about *how* students' progress and persist through developmental mathematics courses. For example, in a quantitative study conducted with students in developmental mathematics courses at the City University of New York, Hodara and Jaggars (2014) discussed how students navigated developmental education courses. Additionally, Hodara and Jaggars (2014) investigated why students with a potential end-of-course passing grade of an A or a B dropped out of developmental sequences when they earned a single non-passing assignment grade. The study results indicated that students took courses that led to the fastest route to college completion and students would drop a course if they felt they would have to retake content to progress through the DE course (Hodara & Jaggars, 2014).

However, since the question of *why* students persist is just as important as *how* they progress and persist through DM classes, the qualitative research methodology offers different insights into instructional approaches. Grubb and Gabriner (2013) examined the remedial community college classroom from the perspective of utilizing contextualized tasks to improve persistence from students' perceptions. Contextualized tasks demonstrate how math can be used to solve real world problems while encouraging students to solve the problem (Grubb & Gabriner, 2013). However, despite contextualizing tasks for the students, Grubb and Gabriner (2013) found that relatively few students completed the remedial mathematics sequence and transitioned to college-level math courses.

In another qualitative study identifying students' perceptions about solving math problems that make sense to them, Clarke and Roche (2018) offered recommendations for teachers to use contextualized tasks to support and explain the way students think about math. When students are given the opportunity to solve tasks in a manner that makes sense to them, improved student learning outcomes occur, leading to improved persistence in DM. Therefore, Clarke and Roche (2018) found that teachers may inform an understanding of the teacher's role in providing engaging mathematics tasks for the students to increase course completion.

In developmental literature, many predictors of persistence include: (a) passing developmental courses, (b) participating in student support programs, (c) receiving financial aid, (d) student self-perception, (e) confidence, and (f) attitudes and beliefs (Benken, 2015). Along the same vein, a study conducted by Cohen and Kelly (2020) explored science, mathematics and general academic factors that predicted outcomes for community college students (N=3052). The findings determined that remediation in coursework was a significant predictor of graduation and transfer (Cohen & Kelly, 2020). Benken (2015) explored the success students had in DM courses by comparing the outcomes of college-level mathematics courses of students who required at least one DM course compared to students who did not require DM.

According to Chen (2016), students who had completed DM classes were more likely to enroll and earn credit in college-level mathematics classes (72% and 68% respectively), than students who did not take DM classes. Chen (2016) used data from 2004/2009 Beginning Postsecondary Students' Longitudinal Study, and the 2009

Postsecondary Education Transcript Study to analyze postsecondary outcomes for developmental students. However, a recent study by Schudde and Keisler (2019) confirmed Chen's (2016) findings that students who completed DM courses were likely to enroll in college-level courses. Using data from the Texas community college system and a propensity matching score approach, the results suggested that students in the accelerated model were more likely to persist and accumulate college credits.

Course Placement Requirements at the local State

To identify readiness, all students entering local colleges or universities were required to take assessment tests designed by each institution to assess reading, mathematics, and writing skills (Higher Education Coordinating Board [HECB] HECB, 2015, 2018). However, the study state HECB recommended the nationally developed standardized tests for course placement. Educators placed students in remedial courses, according to scores earned on institutional or standardized assessments such as Accurate Placement [ACCUPLACER] test or Scholastic Aptitude Test [SAT] (HECB, 2009).

Researchers, including Ngo & Melguizo (2016), argued that placement tests resulted in the placement of about 25% of students in incorrect mathematics course levels. Consequently, the local state-initiated Test State Initiative [TSI] assessment test was developed in 2012 to address the problem of the misplacement of students (HECB, 2012b). Several local colleges and universities used the TSI as a predictor of students' proficiency in mathematics following changes in the local state's educational policy (HECB, 2018). The study site employed the assessment method initiated by the local state; hence students were placed in DM 0300, 0303, 0304 according to the results

obtained from TSI assessment scores (see Appendix C). However, advisors moved students who received a passing grade into college-level algebra where they could be motivated to be successful (OIER, 2019). Therefore, advisors remained influential in students' enrollment experience, which was encouraged by Woods et al. (2017). However, improper placement could result in students failing their courses, which could negatively affect student retention, completion, and graduation (Ngo & Melguizo, 2016). Additionally, an error may occur where an over-placed student (placed in a higher-level course than they can successfully compete), or under-placed into the level of coursework where a DM student is expected to be most successful (Logue et al., 2016). Consequently, some states have implemented hierarchical placement policies, while others have instituted decision-style policies to redesign their placement policies (Barnett & Reddy, 2017).

Placing students in non-credit earning remedial courses has resulted in reduced program completion because of high attrition rates (AACC, 2018; Fry & Cilluffo, 2019). Disparities exist in course completion rates at differing levels of initial mathematics skills. Thus, course completion and success lie in the proper placement of college students into courses (AACC, 2018). Nevertheless, Ngo and Melguizo (2016) argued that placement of students in mathematics related course is a complex matter that should not be left on test score alone. Instead, recommendations have been made toward the implementation of a universally approach to the placement of students into mathematics courses. Besides the standardized test scores often used as key indicators of which math would be appropriate for each student, are often unreliable. Hodara (2019) proposed that

overdependence on test-based approach for deciding the possible benefits that students could obtain from a DM course should be discouraged in favor of high school grade point average (GPA).

Mathematics Readiness

This section examines literature on DE freshman readiness in college readiness. Mathematics plays a significant role in college readiness and remediation. Students placed in developmental courses often drop out or take a long time to complete the sequences (Xu & Dadgar, 2018). According to Coleman and Smith (2021), the Organization for Economic Co-operation and Development [OECD], documented that the United States ranked 45th in reading and 30th in mathematics, among 64 countries, with mathematics scores being statistically significantly below the OECD average. This low ranking suggests that most of the graduate students in the United States are not adequately prepared to succeed in their higher education college as well remaining competitive in the workplace (Coleman & Smith, 2021).

Equally, Huang (2018) used government archival data to project that nearly 31% of the 2.3 million high school graduates who took ACT tests reached college readiness benchmarks in all subjects Furthermore, Huang (2018) also reported that at least 28% the learners a minimum of two or three of the benchmarks, and 17% satisfied a single requirement. According to Hatch and Garcia (2017), regarding mathematics readiness, statistics paint a gloomy picture of American students' preparedness for the 21st century workforce. For example, a report from NCES (2016) indicated that approximately 16% of all 19-year-olds in the United States are considered functionally illiterate and only one-

third can solve mathematics problems requiring many steps. Therefore, higher education institutions should identify different models for educating underprepared students to succeed in the workforce.

Students who enroll in public higher educational institutions at the local state are required to comply with TSI assessment or qualify for a TSI exemption. However, Xu and Dagar (2018) noted the existence of a gap between the passing score for mathematics for high school graduation, and the minimum score required for a student to be college ready in mathematics. The score needed in mathematics, on the local State Assessment for Academic Readiness [STAAR] exit exam for high school graduation is 2100, compared to a STAAR mathematics score of at least 2200 acceptable for college admission readiness (HECB, 2015). Additionally, Hodara (2019) reported similar findings about college student readiness for mathematics. Identifying a nationally representative sample of first-time college entrants, Hodara (2019) found that offering an initial workshop for underprepared mathematics students was beneficial to increase student success in developmental mathematics courses. Thus, the local state is lagging other states in preparing students for postsecondary education (Rutschow et al., 2019). Identifying opportunities to support students before they enter DM courses could improve student success in the course.

Institutions and nonprofit organizations across the country have begun to examine the issue of college readiness (Barnett et al., 2018). Several states, such as California, the District of Columbia, and Florida, have increased the minimum number of mathematics credits required for a student to graduate from high school, including specific

mathematics courses that must be completed. Positive college outcomes are associated with taking advanced mathematics courses in high school (Hu et al., 2017). Exacting standards and rigorous preparations for all students will lead to greater success and completion (Logue et al., 2017). In Minnesota and Wisconsin, high school graduates met three or more of the ACT benchmarks (ACT, 2015). Community college students with fewer years of mathematics coursework had higher rates of remediation compared to students who were more prepared (Schak et al., 2017).

Within the umbrella of college readiness, U.S. Virgin Islands Department of Education, used the College Readiness Data Catalog Tool [CRDCT] to identify data that revealed a student's college readiness which is related to courses that could identify gaps in skills (Rodriguez, 2018). This was also a feasibility study to develop framework to measure performance skills in the U.S. Virgin Islands (Rodriguez, 2018). An examination of factors that influence college and career readiness determined that high-level mathematics curricula lead to positive outcomes in persistence, graduation, and job placement (Rodriguez, 2018). The evidence reviewed demonstrate that the present academic reforms to support the learning of mathematics are likely to continue as more and more students are encouraged to be persistent and remain motivated with their studies (Rodriquez, 2018).

In both Grades K-12, and post-secondary institutions, college readiness and mathematic performance is intricately linked with student outcome. For instance, Maine Educational Policy Research Institute (MEPRI) researchers examined college readiness in mathematics at the high school level (Jessen & Johnson, 2020). The researchers found

that high school math pathway of Algebra I, Geometry, and Algebra II as outlined by the Common Core State Standards Initiative in 2012 did not guarantee preparation for college (Jessen & Johnson, 2020). Students had to complete pre-calculus or calculus course in high school to be college ready (Jessen & Johnson, 2020). Research conducted by MEPRI at post-secondary level on remediation showed that Across Maine's community college system, the rate of remediation in math was consistently higher than in English (Jessen & Johnson, 2020). Hence, Jessen and Johnson confirmed Johnson's (2016) earlier reports that many students arrive at public higher education with inadequate preparation for college work, especially in mathematics. Based on report finings, one could conclude that that there is a strong correlation between mathematic remediation, and remediation overall.

Achieve, Inc. (2016) conducted a study on students' college readiness and established that 47 states had created and implemented statewide minimum requirements for graduation while 28 states had system-wide or statewide admission policies. In addition, only 25 states required students to graduate after passing Algebra 2 coursework, a common standard for 4-year college admission (Achieve, Inc., 2016). To include students with disabilities, and to understand how to effectively prepare them, Francis, et al., (2018) carried out a study on students with disabilities' perception of college readiness, college services, supports and family involvement in college. Francis et al, (2018) reported mixed-method findings from participants attending college. Edgecombe and Bickerstaff (2018) reiterated that addressing under preparedness will require an examination of and potential redesign of curricula, pedagogy, academic and nonacademic

supports across all departments and course levels. State policy can intervene to ensure equitable access to college preparatory math, which could improve student enrollment.

The State of Developmental Mathematics

Completing developmental math courses early may relate to more success in subsequent courses (Wang et al., 2017). Nevertheless, more than half of community college students fail to meet college-readiness in mathematics (Karp et al., 2017). To mitigate the problem of students failing to meet college-readiness levels, the focus has shifted to both math preparedness, and to redefining curricular pathways that lead to post-secondary and to career success. There has been an interest at the federal level of education to push for more vocational training (Hackman, 2019). Although mathematics pathways reforms are not necessarily vocationally oriented in theory, they align with a more career-focused mission in post-secondary learning (Hackman, 2019). Trends in the local state reflect those across the nation in terms of working to improve DE (Roberts, 2018). For instance, Rutherford et al. (2017) reported than nearly half of first-time college students at the local state public 2-year institutions fail to meet college readiness standards for mathematics. To achieve improved outcomes for students, Rutherford et al. (2017) reported that 20 community colleges in the local state implemented Dana Center Mathematics Pathways [DCMP] to support learners who could not meet the required point to graduate.

Currently, Dana Center is working with multiple states, and beginning to pilot supporting Grades K-12 systems aligning with the DE pathways in several areas. As stated by Hodara (2019), the Dana Center work is grounded in the premise that calculus is not needed for success in many programs of study. To reach this conclusion, Hodara (2019)

used administrative data and the propensity score to compare students enrolled in DCMP's DE pathway, with those enrolled in traditional DE math sequences, examining the impact of DCMP on college outcomes like persistence, enrollment, and success in college mathematics. In the semester after enrolling in the DCMP, students showed greater motivation in college, accumulating more college-level credits, and persisting at higher rates than their peers in traditional DE coursework (Hodara, 2019). Therefore, DCMP students were more likely to pass college mathematics and accumulate college-level credits than those in traditional DE three years later (Hodara, 2019). Hodara (2019) established that 80% of programs at 2-year community colleges, and 72% at four-year universities do not require calculus. Stakeholders in higher education acknowledge the challenges posed by traditional DE, and in response, several states have initiated a variety of DE reforms (Brower et al., 2017).

Needs of Students

Participation in retention efforts on campus can occur when institutions raise awareness of the importance of staying in school. Efforts need to evolve into a central focus and not exist on the periphery (Tinto, 1993). Additionally, Tinto (1999) reported that institutions should "make enhancing student retention the linchpin about which they organize their activities" (p. 7). There is a need for learning institutions to take up the responsibility of ensuring all student admitted to different colleges have excelled and avoid focusing on the diverse needs that student have as an excuse to increased drop out or reduced persistence and academic motivation among learners (Hobson et al., 2021). While transitions and adjustments may differ from student to student, it is possible that

each student experiences different challenges in their first year of college (Doherty et al., 2017). Student adjustments go beyond academics to include financial, motivational, social, and emotional issues, identifying supports to address the issues first year college students experience could significantly reduce attrition among learners if well addressed (Doherty et al., 2017).

Further, a 2016 report from CCCSE (2016) indicated that key external factors such as employment or family responsibilities may interfere with students' academic progress in college. For example, approximately 76% of community college students are employed and 37% care for dependents (CCCSE, 2016). To explore student needs, Xu and Trimble (2016) conducted a pilot study investigating earning outcomes of short and long-term college graduates in Virginia and North Carolina. This pilot study revealed positive economic outcomes. However, there were variations within the fields of student graduation, such as healthcare. Students graduating from healthcare programs generally earned more than students from general studies programs. Equally, Hodara and Xu (2016) used student unit-record data from two college systems to estimate labor marker returns. Hodara and Xu (2016) reported that DE programs aligned to the labor market could be more effective in increasing persistence among learners and the need to graduate for future career. The findings demonstrate how factors unrelated to degree programs can affect graduate earnings.

Faculty and staff are more inclined to believe student characteristics are more influential in attrition than are the characteristics of the institution (CCCSE, 2016; Chen, 2016). Some faculty believe that if an institution recruits motivated students, then the

students will succeed (Tinto, 2005). However, instruction is not an activity that occurs in isolation (Tinto, 2012). Thus, faculty and staff must be aware of the needs of students, and the strategies that will keep the students' enrolled in the institutions. Findings from ACT's (2010) longitudinal study on all types of institutions revealed three action program areas critical to student retention: (a) stimulation in an academic setting, along with assistance; (b) building a future; and (c) experiences involving the college. In the most recent work along this line of research, Ganga et al. (2018) presented a mini study to document the status of reforms in progress. The examples of these reforms include Dana Center Mathematics Pathways (DCMP), Carnegie Math Pathways developed by Carnegie Foundation, and Math Pathways developed by California Acceleration Project (CAP). Overall, students reported greater need for services that would promote interest in learning. Thus, promoting interest can contribute to a more engaged, and motivated learning experience (Ganga et al., 2018).

Academic Stimulation and Assistance

According to the ACT, academic challenge and stimulation refer to a "challenge in and support for academic performance" (ACT, I, 2010, p. 3), which was demonstrated by Foshee et al. (2016) longitudinal study on a self-efficacy [SE] intervention program. Foshee et al. (2016) investigated growth in SE skills in a cohort of 15,260 first-generation high-poverty students. Within a three-year period, students were offered services designed to increase college readiness. Additionally, support services included free tutoring, financial assistance, and extra coaching in subject areas. The findings from were consistent with the previous research showing that school-based learning programs can

be effective in improving SE skills (Foshee et al., 2016). Furthermore, a pretest-posttest design was offered and found to be statistically significant, demonstrating increased academic competence in mathematical ability, reading and critical skills. Additionally, the findings indicated the potential benefits interventions could have for enhancing skills that may lead to improving academic performance (Foshee et al., 2016). Therefore, identifying supportive interventions offer opportunities to not only increase student retention but also improve graduation rates.

Students succeed in institutions that set high expectations for their student population (Lee & Matusovich, 2016). Drawing on empirical data from the CCRC's scaling innovation, Barragan and Cormier (2013) examined trends in developmental education instruction reforms that involved changes in curricula, course structure and pedagogy in 11 colleges. Analysis of quantitative data suggested that colleges tend to enact developmental reforms in ways that may unintentionally undermine their benefits (Barrgan & Cormier, 2013). To further Barragan and Cormier's findings, Bickerstaff (2018) conducted a qualitative research study on DE reform, teaching and learning, and student experiences at community colleges; with the focus on how colleges have implemented instructional reforms in DM, and developmental English. Some acceleration programs have improved the rigor of the DE learning experience by pairing college-level work with tailored supports to help DE students succeed with such rigorous tasks. Bickerstaff (2018) found that if faculty center efforts on student learning, students are more likely to stay in school. Bickerstaff (2018) also stated that students should feel challenged in higher education. Therefore, administrators should consider how faculty

actions enhance student learning by allowing students to monitor their own learning, which could lead to changes in instructional delivery and course development.

Tinto (2002) purported, “no one rises to low expectations” (p. 3). Some faculty members have low expectations of some of their students and expect that the students will not learn. Conversely, Machera (2017) determined that faculty members believe all students can achieve high-level learning. Some students may not feel challenged if officials push them through the courses. Consequently, these students may become bored and leave the institution to fulfill their educational goals elsewhere (Park et al., 2017).

Learning is a crucial factor in retention. Students who are more engaged in education have a better chance of graduating, especially those who collaborate in learning with other students, and with technology (Bond & Bedenlier, 2019). Bond and Bedenlier (2019) synthesized a range of student engagement, and educational technology literature, and presented an in-depth analysis of bio-ecological student engagement framework. Through engagement with technology, and by providing students with opportunities for active participation, student engagement can be nurtured at the macro, exo, meso, and micro levels with students’ immediate environment (Bond & Bedenlier, 2019). Equally important are demonstration lessons used to stimulate on student students’ learning, and strategies for encouraging students to persist with challenging mathematics tasks (Hlinka, 2017).

Students have better odds at staying in school and obtaining a degree in institutional environments that involve students; value students; provide effective advising; and offer academic, social, and personal support (Hlinka, 2017). Support is best

when it is "connected to 2the student's daily learning needs" (Tinto, 1999, p. 3), and when students can use support within their classes. Some institutions do not integrate students with the curriculum. Many institutions ostracize students who have developmental needs (Ngo & Melguizo, 2016). College officials often place developmental needs students in classes away from other students (Tinto, 2001). Therefore, such courses do little to enhance persistence. According to Tinto (2001), students need to be included, not excluded, in the curriculum as successful DE programs "unite students with the intellectual life of the college" (p. 7). Therefore, challenging and engaging coursework with the focus on real-world problem solving may enable students to finish their college math requirement at a faster rate.

A guided pathway model to support students and advisors has been recommended by Bailey et al., (2015), Jenkins & Bailey, (2017), and Jenkins et al., (2018). The guided pathway enables students to take courses they need to achieve their educational goals in a brief period. Often students face challenges in finding the right information to answer their questions about their college experience and having a clear direction that show their academic and career path encourages success (Jaggars & Fletcher, 2014). Many students are undecided when they begin college, or they change their minds during their college careers. Therefore, advisors and counselors are important in the process of helping students understand academic programs or other available possibilities. Without the help of advisors or academic counselors, students may not be able to navigate their way through college (CCCSE, 2016).

Involvement and Experience

Community colleges have unrestricted access policies that serve many types of students (Boatman & Long, 2017). To increase involvement, community college educators should focus on the types of activities that typically have high student participation. Astin (1984) defined involvement as a "construct referring to investment of physical and psychological energy in various objects" (p. 159). During the first year, student involvement is very important (Astin, 1984; Yan & Sendall, 2016). The more involved students are with an institution, the more likely they are to stay in that institution (Tinto, 2010). Involvement includes students' time and psychological energy devoted to becoming integrated socially, academically, and career-wise (Tinto, 2010). Students who do not connect academically with an institution are less satisfied than students who do connect, with the result being longevity and success at that institution (Wong, 2015).

Astin's (1984) model of involvement explains that the more involved people become with the social and academic systems of an institution, the more likely they will stay focused on finishing college through opportunities to integrate and apply knowledge (Wong, 2015). Courses that involve students should be available, and institutions should provide opportunities for casual relationships, which can make a difference to students (Tinto, 2010; Yan & Sendall, 2016). Hyatt (2019) conducted a qualitative study to seek students' perspectives on their academic experience at small private colleges. The findings supported with the results from Hyatt's (2019) study about structured engagement. Structured engagements, such as mentoring programs, student clubs, or bridge programs, can help students feel more connected to the institution (Hyatt, 2019).

Unstructured occurrences, such as interactions with faculty, staff, and advisors, also help to retain and support students (Hyatt, 2019). College administrators should give enough attention to the development of group-specific models, or methods to study student attrition to make the research more policy relevant (Tinto, 1993). However, previous research on student attrition has not described the differences between students of different subject areas and year of study with respect to the variables influencing student persistence or dropout rates (Bailey, 2015). Therefore, additional research about student persistent would be valuable for colleges and students.

Learning Environment

The learning environment is important for student success. Educators should adapt techniques and learning environments to increase success and continued improvement. Tinto (2010) identified environmental conditions that influence student retention, namely students' experiences regarding social networks, orientations, interactions with faculty, examinations, peer interactions, informal feedback from faculty, tutoring, learning communities, mentoring, advising, grants, loans, fellowships, and waivers. The role of interaction with institutional agents may be a major factor in student cognitive development (Astin, 1993; Tinto, 2010, 2012a). Empirical studies confirmed how different forms of interactions are related to positive academic outcomes (McCormick & Kinzie, 2014). Hodara (2019) conducted a national quantitative survey with 1,500 degree granting undergraduate colleges and universities. Hodara (2019, assessed effective educational practices. Participants reiterated that institutional support was necessary in meeting academic needs of students, through quality relationships with

faculty, staff, and administrators. Additionally, incorporating digital tools in the classroom, building relationships with students, and restructuring delivery methods can enhance student learning (Johnson & O'Keeffe, 2016). Therefore, educational leaders must be aware that environments also affect student learning. Tinto (2012) stressed the importance of structuring patterns of student engagement in the curriculum and in the classroom as one way to provide support and improve student learning.

Students have a great propensity to learn in classrooms where there is manipulation of material and where there is active discourse among students and the instructor (Karp, 2016). In this case, an interactive, social learning environment that has strong teacher-student relationships and where students are creators as well as participants in the process is necessary to encourage learning (Karp, 2016). The learning environment involves the interaction of students, educational professionals, materials, facilities, and subject matter as the students form experiences through the pedagogy of the professional. Success in many community colleges is dependent upon individual classroom success (Hatch et al., 2018; Tinto, 2014). Students may be prone to derailment, or failure, if efforts do not reach into the classroom to enhance student success.

The social and effective elements of the classroom have approximately the same level of influence on student learning as do traditional characteristics (Acevedo-Gil & Zerqura, 2016). This level of influence is possibly due to the degree of student interaction and participation in the learning process, which likely supports achievement (Acevedo-Gil & Zerquera, 2016). Tinto (1993) emphasized that emotional and social involvement

of a student can make a difference; self-efficacy, autonomy, and confidence are strong influences on student success, with a large contributor being the learning environment.

The key variable of academic success seems to be the willingness to persist, which in turn is related to the appropriateness of the instruction (Gardenshire et al., 2016). Students' ability to succeed is influenced by the attitudes and values of others in the classroom, especially those of faculty (Trolian et al., 2016). Trolian et al., (2016), found that there is unmistakable evidence of the influence of the effective environment on student success. Typically, exemplary instructors are those who have a clear passion for knowing their students, and the content they teach (Trolian et al., 2016). Thus, there is a need for a strong relationship between an instructor and a student in the learning environment. In response, institutions need to invest in faculty development for faculty to acquire adequate skills to help all students learn and succeed in the classroom (Tinto, 2010, 2017). The learning environment encompasses both precollege and postsecondary environments.

Partnerships enable students to work collaboratively on team-based projects while developing a sense of community and environmental condition (Tinto, 2010). Being part of a group with a common goal gives students a sense of being an integral, valued member (Haleva et al., 2021). Principles for effective learning environments include recognizing students as important participants, providing differentiated challenges, having clear expectations, promoting students' connectedness prior to learning, and being information-rich with a heavy emphasis on formative feedback (Aluri and Fraser, 2019). According to Chen (2017), the purpose for designing instruction for students is to

develop an effective learning environment to support new experiences that lead to new knowledge and self-efficacy. Students who feel connected to the institution and have a positive educational experience, may feel dedicated to completing their program of study.

Academic performance of students at a community college during their first semester has been found to be the greatest indicator of whether students persist or drop out (CCCSE, 2016; Tinto, 1997). Students who have at least two remedial classes are much more inclined to leave than students who do not need to take remedial classes. Examining the emotional and social features of college readiness helps to unearth affective aspects that influence a learner's academic progress, including self-efficacy and motivation (Jameson, 2020).

Using Bandura's (1978, 1989) triarchic reciprocal casualty model, and human agency in social cognitive theory, Jameson's (2020) qualitative study sought to understand the psychological barrier of mathematic anxiety in female adult learners who self-reported high mathematics anxiety. Thematic interpretation revealed personal and environmental factors (Jameson, 2020). Students' academic beliefs often include expectations about the importance of grades, learning, and self-efficacy regarding classroom abilities (Jameson, 2020). The importance of building strong relationships among teachers and students, building a sense of community, improving student self-efficacy, and motivation for college readiness were not included as factors in the traditional high school model (Jameson, 2020). Given the current pressure to strengthen DE in community colleges, understanding what students encounter in the learning environment is how and why students" a necessary first step. Developing effective

interventions depends on research that illuminates "the learning pathways in community colleges is challenging" (Bahr, 2013, p. 50). While early evidence on learning environment is promising, new research may include practical lessons that include interaction of students, faculty, materials, facilities, technology and subject matter that can help policy makers make sound judgements.

Acceleration and Developmental Education

Acceleration is defined as the organization of teaching methods and materials in ways that speed up the requirements needed to pass a course, allowing students to spend a reduced amount of time in the classroom (HECB, 2015; Saxon & Martirosyan, 2017). In colleges and universities, many courses have a required number of hours, like non-remedial courses, with the main difference being that remediated courses are completed in a faster amount of time and in a shorter window. According to Nix et al. (2020), accelerated educational programs are designed to ensure that students take less time than the traditional programs to graduate. Normally, accelerated educational courses give a faster path to gaining credits and a clearer path for completing college (Nix et al., 2020). Acceleration is therefore intended to limit the tracking of community college students while still helping them to develop the skills necessary for success in introductory college English and mathematics (Manning & Frye, 2017; Pallegrino & Jaeger, 2017). To date, there is limited empirical research on the effects of accelerating students' progression through their developmental requirements.

Evaluation results from the initiatives on DE projects continue to inform the institutional practices that positively affect students' outcomes (CCA, 2016). The Fast-

Start program at Denver Community College is an example of the "compression" model of acceleration (Cafarella, 2016). The college combined a two-semester DM course into a single course. Students in the compressed sequence were more likely to complete the highest DM course and pass college-level mathematics (Cafarella, 2016). Acceleration may improve student access to college-level courses (CCA, 2016; Manning & Frye, 2017; Pallegrino & Jaeger, 2017). The Fast-Start program provides a positive example of an evaluation of acceleration, which could be used as a format by GCC.

Scheduling and Student Achievement

A quantitative study conducted by Center for the Analysis of Postsecondary Readiness [CAPR] in 2016 documented DE college readiness practices. The findings were based on a nationally representative survey, and qualitative interviews with administrators at two and four-year colleges. The study found that many colleges continued to use multi-semester, prerequisite developmental course sequences. In addition, some of the colleges implemented instructional reforms including offering diverse math courses that aligned with students' careers (CAPR, 2016). However, state policies, and how colleges implemented these policies, had a strong influence on the colleges' practices and the number of institutions that implemented these reforms (CAPR, 2016). Therefore, the CAPR results indicated that state policy often takes precedence over the colleges' DE practices.

Discovering effective ways to increase the students' progress through DE sequences may be a key to broadening access to and student success in remedial mathematics courses (Barnett et al., 2018). Some colleges in the local state, including the

study site, implemented a compressed schedule during the summer semesters (Cafarella, 2016). For example, 6, 8, and/or 3-week mini-mesters were held between the fall and spring terms (Hagedorn & Kuznetsova, 2016). The practice of offering DM courses in intensive or compressed formats addressed factors such as student demands, funding, and competition (CCCSE, 2016). Recent student surveys conducted by college institutional research offices across the country have found that many students, particularly nontraditional students, prefer more intensive courses (CCA, 2016; CCCSE, 2016).

Other scheduling strategies included summer bridge programs with a nontraditional term length, which were designed to help students who could not take courses of traditional time and lengths (AACC, 2018). For instance, Gallo and Odu (2009) investigated the impact shorter classes, taken multiple times over a week or one long class a week, have in relation to how well a student does in community college. Students who had an algebra class one day a week scored much lower on the final examinations than those who had the same course two or three times a week (Gallo & Odu, 2009). The findings of the study on the relationship between scheduling and achievement in college algebra suggested that these differences were due to the spacing effect theory. Due to the spacing effect theory, Young & Keup (2016) suggested there is an optimal amount of time that should come between learning new concepts to integrate them with old concepts.

Within this optimal period, students are better able to remember and retrieve these concepts from their memories. When educators present information to students in the one-day-per-week class, students may think the material is too much for them to handle

(Young & Keup, 2016) Taking college algebra once a week is not in a student's best interest with respect to achievement (Gallo & Odu, 2009). In addition, educators did not provide college-level algebraic concepts alone; therefore, students could have relied on rote learning. In contrast, educators presented ideas in the two- and three-days-per-week classes in scaled-down segments that were sufficiently spaced. Hence, the students could make meaningful connections as evidenced in the final examinations (Gallo & Odu, 2009).

Separating content and teaching over multiple classes influences a student's ability to learn as much as having a correct amount of time between classes (Hatch & Bohling, 2016). An alternative reason shortened courses are helpful is that they aid in student success by giving a smaller window of time, leaving-outside factors less of a chance to negatively impact the student's performance abilities (Hatch & Bohling, 2016). In many cases, students who could have finished the course successfully stop coming to class during the semester because of issues that arise outside of the classroom. External factors negatively affecting student performance in the classroom cannot always be planned for with curriculum decisions, leading to higher attrition rates for DE students.

Developmental Education Strategies

Across the country, many states are working with community colleges on reforms to improve DE. Reforms include some of the following approaches to acceleration: (a) compression, (b) modularization, (c) curricular reforms, (d) mainstreaming, and (e) paired courses (Dana Center, 2017). In a state in the southwestern United States seeking improved student learning outcomes, 20 community colleges in the state system

implemented Dana Center Mathematics Pathways [DCMP] in the fall 2014 to help students attain math skills applicable to their area of interest (Dana Center, 2017). After three semesters, students assigned to DCMP Developmental Math (DM), 56 percent passed college-level math than those assigned to traditional developmental sequence DM, 48 percent. In College-Level math, 25 percent assigned to DCMP passed, while in Traditional Developmental math, 17 percent passed. Researchers were confident that the higher pass rates were due to DCMP, and not to differences in students' prior education, motivation of other factors

As college educators' structure accelerated learning programs to enable students to take courses and earn credits in less time than a traditional 16-week semester; how educators teach adults in an accelerated program must therefore differ from a traditional semester format (Karp et al., 2017). Successful programs use multiple teaching strategies to improve student success in DM. Previous research findings indicate that the best strategy can regulate student's learning process; building on that, there is a relationship between students' prior knowledge and learning outcomes when using accelerated instruction (Logue et al., 2017).

The correct application of a variety teaching techniques aid in a student's ability to be successful and stay in DM. Examples of teaching strategies and techniques include mastery learning, mentoring programs, supplemental instruction, integrated lessons, and learning places (Park, et al., 2017). However, despite new teaching technologies available, most instructors in face-to-face courses rely on traditional teaching strategies and techniques such as giving lectures or starting a classroom discussion, both of which

rely on students' ability to actively listen. While differences in pedagogical approaches may affect how the content is taught, there is little difference in the academic success of students (Okimoto & Heck, 2015). According to Ngo, Chi, & Park (2018), the best indicator of student success in DE mathematics is not course strategy but rather correct student course placement. Some community colleges are considering using a holistic approach (Ngo et al., 2018). The holistic approach considers academic performance, such as high school GPA and mathematics courses taken, and indicators of non-cognitive constructs, such as motivation, time use, social support, and setting (Ngo et al., 2018). Adopting a holistic approach to DE mathematics course placement may improve student placement accuracy. The overall goal of appropriate course placement is to ensure student success in their placements and to provide access to higher-level mathematics courses (Ngo et al, 2018). Postsecondary institutions are redesigning course formats to help developmental learners acquire mathematics skills and transition into credit-bearing programs (Jaafar et al., 2017).

In comparison to students in traditional DM classes, students in accelerated models spent considerable time solving problems rather than simply listening to lectures. Visher et al., (2010) theorized that this active learning environment supported student engagement and memory. For example, Wang et al., (2017), building on Visher's theory, found that in other college campuses, ModMath students worked on mathematics problems, and applied skills learned from the previous mathematics class (Wang et al., 2017). The self-paced method improves student motivation levels, leading to students mastering various mathematics concepts (Wang et al., 2017). Students could move faster

through items they learned easily, which gave them time to work on difficult concepts. However, there is need for additional research on the programs' effectiveness. Such data could help to determine how best to use various strategies and implement new policies to help students in DM (Wang et al., 2017). Therefore, state and policy makers can ensure that colleges, faculty members, advisors and transfer partners have the support they need to implement changes that are needed in delivery for student success.

Delivery Models

Successfully engaging students in online and traditional mathematics classes can be challenging for instructors. However, instead of delivery mode, students tend to be practical because they care more about individual assignments that affect their final grade or content that is relevant for their future career (Melguizo et al., 2016). Melguizo et al. (2016) found that if students have had negative experiences in high school mathematics, they will associate mathematics at a community college with anxiety, which can negatively influence student engagement with the course content. However, alternative models to deliver DM may address student anxiety and improve learning outcomes (Park et al., 2017). To encourage problem-based learning, the National Science Foundation started The Math You Need [TMYN] website, which is an online, student-centered resource to help introductory geoscience students with mathematical skills and abilities (Wenner et al., 2018). TMYN provided a set of steps to solve mathematical problems and explained why it was important and where it was applied. Thus, TMYN represented a promising solution in that the achievements of TMYN were reliant on teaching methods that encouraged students to value learning (Benson & Burnett, 2018), while Modular

Math emphasized mastery during self-paced delivery with technology (Wenner et al., 2018). Studies from some of the colleges and universities showed an increase in engagement in learning mathematics in instances where instructors focused on student abilities (Pallegrino & Jaegar, 2017). DM courses enable students to take different paths through the math curriculum, depending on their course of study. Some of the modules allow students to complete the math requirements in one semester. The main focus being to accelerate the pass rates and the completion rates.

Effects of Acceleration on Student Outcomes

Despite an increase in the use of acceleration strategies to enhance the academic outcomes of students referred to DE, a limited number of researchers have evaluated how well these interventions work (Park et al., 2021; Rodriguez et al., 2018; Saxon & Martirosyan, 2017). To date, there is a lack of using control groups, which hampers the inferences future researchers can make from the findings. Nevertheless, Saxon and Martirosyan (2017) provide one example of a successful student intervention program. Saxon and Martirosyan (2017) discuss a college in the southwestern region of the U.S. conducting many interventions across DE, English, and reading to reduce obstacles preventing students from completing courses at various levels of the classes. College educators gave students who were trying to repeat the mid-level DE course for the third time, the chance to enroll in a course that was modularized and at the student's pace. The outcome indicated that approximately 69% of students in the module's pilot course completed the class with a passing grade, while only 41% of students completed the mid-level mathematics course (Saxon & Martirosyan, 2017). Therefore, the pilot course

offered students greater chance for success. Acceleration models show promise in improving students' progression through DE and into college-level coursework (Saxon & Martirosyan, 2017).

Accelerated modules purposefully reduce the likelihood of students leaving developmental courses, and the use of more student-centered teaching methods factor into why more of these students complete the courses (Li, 2017). Despite the opposition, arguments to continue DE exist. Boylan et al., (2019) responded to criticism that DE was not a waste of time by pointing out the alternative for many students would be to forgo college. Although DE did add to the time it took for students to graduate, Boylan et al., (2019) asked that college officials consider extra time as an investment in the students' future success. Therefore, completing the developmental courses increased the students' chances of successfully completing their desired program; therefore, it was better to delay graduation than risk never having one. Seventy-eight percent of all institutions that handle higher learning, including 100% of community colleges, now give students the chance to take remedial courses; Boylan et al., (2017) argued that remedial courses end up paying for themselves. Educators need to utilize and improve remedial courses because they are wise societal investments (Boylan, et al., 2017). The acceleration movement continues remains popular, even though nearly every community college, along with every four-year university in the United States, admits students who are underprepared for college-level classes and work (Brower et al., 2018). DE programs should continue to explore additional strategies to assist students to complete their program of study and reach graduation.

Implications

The purpose of this basic qualitative study was to explore the lived experiences of community college students who successfully completed DM NCBO. Gulf Community College (GCC) was experiencing low retention rates of students in the developmental education (DE) program, specifically in developmental English (DEE) and developmental mathematics (DM). Students failing to pass DE courses were unable to enroll in college-level courses in a program of study. Therefore, to improve retention in DE courses in 2012, GCC instituted a corequisite model of non-semester-length and non-course-based options (NCBO) in DM. To date, GCC has not completed research about DM NCBO sequence, nor has a policy supporting the corequisite model been developed. This study is part of a project at GCC exploring a corequisite model policy for DM students. Therefore, this study may provide a foundation for the new statewide corequisite initiatives directed toward increasing retention and graduation rates (HECB, 2018). The new corequisite initiatives focused on reducing the amount of time students enrolled in developmental education (HECB, 2018). Since the initiatives are relatively new, no widely published research has addressed the impact of NCBO accelerated on students' successes. Hence, this study may result in the enrichment of the educational experience for DE mathematics students in 2-year colleges.

Considering the proposed corequisite policy, state legislators, external stakeholders, and institutions may employ methods that will move students through DM requirements at a quicker rate while improving the students' pass rate in DE courses allowing them to move on to college level courses. Redesigning the curriculum to support

a corequisite model has already been implemented in many community colleges in the nation (AACC, 2018; Manning & Frye, 2017). The state higher education strategic initiative issued recommendations of policies and practices that sought to accelerate the progress of DE students to college-level courses (HECB, 2018). Since no current policy exists at the study site, based on the findings from data collected and analyzed, I developed a policy recommendation titled, *A Corequisite Model of Instruction for Community College Students in Developmental Mathematics Non-Course Based Option*, supporting the corequisite model to align with the state policy to support developmental education students (see Appendix A). The corequisite model was one of the state-mandated policies required of all public 2-year colleges and universities in the state, to be implemented by the year 2022. Research indicated that corequisite courses allow students to maintain pace toward a degree by enabling them to receive simultaneous supportive, supplemental instruction, and college-level credit (Manning & Frye, 2017). Evidence suggests that a corequisite model may help more students pass college math.

To develop the policy recommendation, I collected data based on the research questions to explore the perceptions of participants concerning the DM NCBO intervention program, conditions participants identified as influencing success of DM NCBO, and participants' perceptions about future success in college-level courses. The findings showed that the corequisite acceleration intervention may help improve the skills of struggling students in mathematics by raising their pass rate, although these results do not directly replicate prior findings. However, the study results may help the study site with the implementation of the state-mandated corequisite acceleration module in future.

The study site's DE courses were developed based on HECB's tenets, which was based on successful corequisite course models throughout the country.

The study results have implications for community college practitioners regarding the effectiveness of accelerated DM programs. The state's primary policy agenda is to ensure that more students are persisting through to program completion to graduation (HECB, 2018). The findings underscored the importance of clear evidence of effectiveness to ensure that the new corequisite model and instructional practices have the As new research is conducted and additional data disseminated, it would be important for practitioners and policymakers to remain open to shifting practices to identify best practices to improve student outcomes.

At the institutional level, there should be an understanding of the best practices for DM. Since there are mixed results from other community colleges to draw from; each of the community colleges at the local state may need to find ways to accommodate student learning. However, the state initiative may limit the flexibility the colleges have in delivering new course content; however, colleges can incorporate additional instructional recommendations such as support services that may help underprepared students. Based on study findings the goal of providing the policy recommendation to administrators and stakeholders is to support the adoption of a redesigned accelerated DE policy and course requirements by implementing the new state initiative to address persistence and degree completion issues. The corequisite courses may eliminate traditional developmental courses, but allow supplemental instruction in conjunction with the college-level courses, to provide students with the foundational skills needed to

successfully complete both. This study shows the positive impact that interventions can have on programs such as DM, although additional financial resources may be needed. The local state may investigate successful programs and consider funding them at the levels that enable programs to scale up (Jenkins et al., 2018). In the case of practice, the findings of the current study indicated that teaching in these programs may require a big investment in time for faculty see (Figure 1).

At the local level, the current study, like other studies in accelerated models may inform, and mitigate the underprepared students' challenges, as they explore and confirm best practices in the use of accelerated strategies such as NCBO in each content area. Accelerated models that address mathematics remediation have a key role in increasing the likelihood that students previously dropping out due to anxiety and inadequate preparation will instead be prepared for college-level mathematics requirements (Juszkiewicz, 2017). Beyond the local level, to promote positive social change at the study site, a team of educators and stakeholders should identify how the community college can better prepare developmental education students to succeed in college through graduation to enter the workforce fulfilling gaps in the labor market.

Summary

DE programs at the study state have undergone several changes within the last decade, yet little research has been published to address the effectiveness of these changes. Therefore, this study sought to determine whether accelerated DM NCBO program led to improved persistence and passing rates. The results of this study indicated that students who enrolled in DM NCBO courses were successful in gateway math

courses. The students successfully completed DM sequences through NCBO intervention modules. In response to the study state mandate, the study site officials designed the NCBO intervention modules, to provide a method for enhancing the role of DM students in the program, and to enhance students' mathematical skills (HECB, 2018; Saxon & Martiroysyan, 2017). The reasons why students were not achieving academic success in DM sequences is unclear, as there is a lack of published research, examining the success and perceptions of students in NCBO DM experience. However, the future anticipation is that when students enroll in a corequisite course at the study site, the NCBO program will have an effect on student success and persistence. Therefore, the present study contributes to the teaching practice by looking at how exposure to the accelerated module may help guide students through these transformations, effecting the future success of DM students.

In Section 1 of this project study, I discussed the background, the rationale, and the significance of the study. In response to high attrition rates, low graduation rates, and competitive workforce, a variety of state and federal initiatives and programs were implemented to target students in higher education (Allen et al, 2018; Price, 2019). Review of empirical literature provided both positive and negative outcomes for developmental education initiatives (Boatman & Long, 2017). The conceptual framework grounded on Tinto's (1975) theory of persistence and departure provided insight into strategies to improve retention and increase graduation rates. Tinto's (1975) theory provided a lens through which this study sought to answer the research questions.

The research questions focused on the perceptions of participants concerning the DM NCBO intervention program, conditions participants identified as influencing success of DM NCBO, and participants' perceptions about future success in college-level courses. The findings indicated that participants felt that the convenience of location made it possible for them to attend and schedule classes; small classroom size supported peer and one-on-one interaction with instructors and prepared them for college-level courses. Therefore, the development of a policy recommendation about a corequisite model to support GCC DE program would be beneficial. Although theorists offer viable explanations regarding persistence and attrition, gaps exist in the literature as to how administrators, educators, state policymakers, and other stakeholders can remedy the problem of attrition in higher educational institutions. Furthermore, researchers discussed that underprepared community college students have higher rates of remediation compared to students who are more prepared. Therefore, there is currently a gap in the literature and a need for additional research that explores the non-cognitive characteristics that influence persistence among academically underprepared students.

In Section 2, I describe the methodology of the research project, including the research design, setting, participants, data collection and analysis employed for this investigation. I discuss a basic qualitative study approach to answer research questions. The selected methodology enabled me access to the thoughts and feelings of participants under the study, to understand how and why certain behaviors take place, and to identify similarities in the meanings. I discuss data collection procedures, the data analysis process, the development of codes and emergent themes, along with research findings.

Section 3 presents a brief description of the proposed project based on the findings from the study. The genre of this project is a Policy Recommendation with detail to support XYZ. The project includes background of existing policy problem, summary and analysis of the findings, evidence from literature, project evaluation plan and implication, outline of recommendations connected to the evidence and to the audience.

Section 4 discusses my reflections and conclusions for the final study. This section includes project strengths and limitations, recommendations for alternative approaches such as varied solutions to the local problem; scholarship, project development, leadership change specific to the study, and development of the project; reflections on the importance of the work; implications, applications, and direction for future research such as recommendations for practice and/or for future research as appropriate. Finally, I include a reflective analysis of myself as a practitioner, scholar, and project developer.

Section 2: The Methodology

The purpose of this study was to explore the lived experiences of community college students who successfully completed DM NCBO. A wide body of literature explore the impact and effect of student success interventions during the first year in college (Dunigan et al., 2018). While DM NCBO programs in other states have been evaluated, the results have been mixed whether the program improves student persistence or improves graduation rates (Carrico et al., 2019). To date, there has been limited research on the success of the DM NCBO program and persistence rates of students at GCC. Additionally, there has not been any research on students' perceptions about the DM NCBO program.

I used a basic qualitative approach to answer the research questions, which explored 11 community college students' perceptions concerning the DM NCBO, conditions participants identified as influencing success of DM NCBO courses, and their perceptions of math education regarding their future success in college-level courses. In Section 2, I describe the research design and approach, research study setting, and the selection of participants. I discuss the data collection methods, the data analysis process utilized, and study findings are then explained. I conclude this section with a summary supporting the policy recommendation paper.

Research Design and Approach

A basic qualitative study approach is an encompassing method utilized to examine in-depth understanding of experiences that can yield thorough knowledge of the subject (Merriam & Tisdell, 2016; Yin, 2015). Basic qualitative inquiry helps the

researcher to understand how people interpret their worlds and make meaning of their experiences (Merriam & Tisdell, 2016). The overarching purpose of a basic qualitative inquiry is to understand how individual make sense of their lived experiences (Merriam & Tisdell, 2016). A basic qualitative inquiry was appropriate for this study since it aimed to acquire a deep understanding of how the college experience transformed the lives participants as interpreted through the lens of each participant. Thus, a basic qualitative study methodology was an appropriate method utilized to examine how and why changes in students' behavior led them to complete DM sequences successfully at GCC. A basic qualitative study was a natural approach, since the solution to the problem could be found through "experience, interview, and review of the related research" (Lodico et al, 2010, p. 269). Given the limited research on the context of success on DM NCBO sequences, I conducted a qualitative exploratory study using interviews as the primary data source to achieve a holistic understanding of a single case (Creswell, 2017; Creswell & Creswell, 2018; Merriam, 2019). Since this study is part of a larger project exploring corequisite acceleration policy as potential DE model of choice for the local state, the study is limited to primarily students in the DM division. The following research questions were used to guide the study:

RQ1: What are the perceptions of the participants concerning DM NCBO intervention program?

RQ2: What conditions do participants identify as influencing success of DM NCBO courses?

RQ3: What are the perceptions of participants on math education regarding their future success in college-level courses?

Qualitative research refers to several methodologies with diverse aims, data collection methods, and analysis techniques (Merriam, 2019). Through these designs, researchers seek to understand a wide range of human experiences, perspectives, and activities (Merriam 2019). This study focused on individual interviews, as the primary source of data to achieve holistic understanding of a single case (Creswell & Creswell, 2018; Merriam & Tisdell, 2016). The following are other qualitative traditions that were considered inapplicable for this study: (a) biographical designs exploring a person's life history data collected from personal documents, speeches, archival letters, etc. (Merriam, 2014); (b) ethnographic designs investigating experiences and practices of cultural or social groups and data is obtained from observation and some documents (Creswell & Creswell, 2018); (c) grounded theory explaining issues of a particular group and data collected through interviews and focus groups (Lodico et al., 2010); and (d) data collected through the phenomenon method for extended periods of time (Maxwell, 2020).

The basic qualitative study was the method of choice for this study, as its unique characteristics made it suitable to answer the research questions in this study. The basic qualitative study approach was particularly well suited for this study as it enabled me to focus deeply on a single context, and to explore influential factors that contributed to the success in completing DM math sequences. Within this context, I relied on participants' interviews to effectively capture variation, and to develop a rich "understanding of the lived experiences of other people, and the meaning they make of the experiences"

(Seidman, 2006, p. 9). Since the study is exploratory, I focused on Gulf Community College [GCC] because it is one of the community colleges in the local state that has DM NCBO accelerated model in place; but is lagging behind in adopting the state mandated policy of corequisite accelerated model. Given that qualitative studies focus on the holistic through the description and explanation of a situation, this study had a goal of seeking to understand the students' perceptions in their natural environment. Therefore, I used a basic qualitative study with in-depth, open-ended questioning, to bring out personal perceptions from those who had experienced the problem firsthand (Merriam, 2019).

The major question of the study explored the community college students' experiences of successfully completing mathematics with remedial options. A basic qualitative study was suitable for studying the phenomenon because it answered the "how" or "why" of the research questions. Furthermore, a basic qualitative study approach is intended to be beneficial for institutional practice and may illuminate institutional policy issues in postsecondary education. As data from the U.S. Census Bureau (2018) demonstrate, the local state lags, not only in the United States as whole, but also in most other areas of the world in educational attainment, employment, and in economic wealth (U.S. Census Bureau, 2018). This basic qualitative study had the potential to add depth, and better understanding of how and why local colleges can help students make informed decisions about educational goals, and potentially improve regional educational and economic attainment.

This study was about personal experiences that are difficult to capture through quantitative methods; but qualitative study provided a means to judge the effectiveness of the NCBO intervention model. The study aimed to capture students' voices on how the NCBO program influenced their perceptions as learners, and their views on progress toward college-level courses. Individual accounts, through narrative, provided me as the researcher with an in-depth narrative, and a thorough understanding of the subject from individual interpretations of the phenomena (Creswell & Creswell, 2018). This study extends prior studies by examining academic pathways using students' own words as data. Moreover, the qualitative data may offer insights educators can use in supporting students' post-high school educational goals.

The flexibility of a qualitative study was one of the reasons for the choice of this inquiry (Creswell, 2017). For instance, exploratory questions differed due to the participants' responses, but in quantitative research, questions and the hypotheses would remain constant (Creswell, 2017; Janesick, 2015). Through data analysis, the qualitative approach was effective in identifying intangible factors, such as perceptions, expectations, and emotions, which provide a voice to the participants' experiences. Qualitative approach used along with the quantitative method may help the researcher examine the context and underlying meaning of the quantitative data (Creswell & Creswell, 2018). Nonetheless, the statement of purpose and the research questions in qualitative research are the central phenomena. Creswell (2014) defined the central phenomenon as "the concept or a process explored in qualitative research" (p. 129).

The context dependency of the study required local knowledge to ensure that participant sampling reflected the context, such as the study site, a natural setting with which I was familiar. The unit of analysis provided information on exceptional DM NCBO participants, rather than representative individuals (Creswell & Creswell, 2018; Patten, 2017). The goal of the study was to make a description of the study that was as accurate and complete as possible (Merriam & Tisdell, 2016). The unit of analysis was students who participated in the DM NCBO program. The phenomenon under investigation was embedded in their everyday, real-life learning (Merriam & Tisdell, 2016). The setting was important, as it enabled me to explore the details and meanings of DM students' perceptions, and to analyze the information in the context of DM courses. I did not manipulate variables or administer treatment as in experimental research, since the study focused on a unique setting, whose characteristics were not well understood. Employing a qualitative study approach enabled me to obtain an in-depth appreciation of a specific program's structure, and how certain characteristics of the program affected DM NCBO students' perceptions.

The advantage of employing a basic qualitative approach to this research was that this method allowed an exploration of a phenomenon that was not well understood. Interactions with the participants enabled them to tell their accounts of events. Through their accounts, the participants detailed how they viewed their worlds, so I could understand their actions. Understanding the context and the environment made it possible to collect rich qualitative data. The inductive method forced me to become a "passionate participant" by probing the source of the information (Guba & Lincoln, 1994, p. 112). As

the researcher, I had to be subjective to acquire knowledge (Guba & Lincoln, 1994). Thus, the value of this approach to empirical research is that it provides a richer, deeper understanding of the meanings that people place on actions, events, and relationships in a real-life context.

Participants

Population and Setting

For this study, I chose a single community college in the southwestern United States as the sampling site. The study site is a suburban 2-year public community college that has a diverse enrollment of approximately 2,300 students per semester. GCC is designated as one of the AtD community colleges, which promotes access to all through a bold vision for student success through improved student learning outcomes (Jaggars & Bickerstaff, 2018). GCC has one main campus site with an adjacent technology center, where students have full access to the community college campus library, online services, counseling services, and tutoring. The college employs over 300 full-time and part-time instructors and staff, the president of the college, dean of technology center, vice president of instruction, vice president of student services, and vice president of administration. I selected this setting, since it is one of the few colleges in the study state that still offers a DM NCBO program.

Developmental mathematics students represented the target population from the following demographics of the student population: 59.1% European-Americans, 19.1% Hispanics, 18.9% African Americans, 1.6% Asian, and 1.4% Other (OIER, 2019). The

average age of the student body is 27 years old. The primary distinction was the focus on DM NCBO students who had successfully completed the mathematics sequences.

Sampling

Using a purposive sampling method, data were collected from information-rich cases related to the phenomenon of interest (Patten, 2017). Participants included 11 students who successfully completed the DM NCBO sequences. The focus of data collection was on the in-depth, rich descriptive narrative, rather than the number of participants (Merriam & Tisdell, 2016; Merriam, 2019). For the sampling, algebra classes at GCC were selected to identify participants due to the larger number of cohorts compared to the number of students in other mathematics classes. Algebra also serves as the gateway to other mathematics courses for most students at the study site. Therefore, this study targeted the academic success of students in algebra after their completion of the DM sequences. Selecting a sample of participants was necessary for those "who can best shed light on the topic through personal life experiences. When participants are invested in the topic, they have more to say" (Hesse-Biber & Leavy, 2010, p. 178). This purposive sampling approach provided a pool of varied participants who shared perceptions related to the phenomenon regardless of background, age and gender.

I used the following criteria for sampling to ensure an accurate representation of participants: (a) students who tested into the lowest level mathematics through standardized placement tests when they enrolled in college; (b) students who had successfully progressed through DM sequences by obtaining a grade of C or above, and were enrolled in college-level courses, such as college algebra; and (c) students who were

juniors during the 2015 to 2016 academic year. Using a homogenous sampling technique, participants were selected based on a particular characteristic or on their membership in a particular subgroup (Merriam & Tisdell, 2016; Merriam, 2019). Therefore, the key to success when conducting this study was the recruitment of participants based on the richness of information they could provide.

Access to Participants

First, based on ethics guidelines, the president of the research site granted permission in the form of a letter of cooperation from a community research partner to conduct the study on GCC campus. Second, I obtained a certificate for the Protection of Human Subjects from the National Institute of Health; the Privacy Rule codified at Title 45 parts 160 through 164 of the U.S. Code of Federal Regulations to administer the instruments on campus. Third, I obtained an approval from Walden University's Institutional Review Board (Approval No. 12-29-16-0239155). The approval was to ensure that this study met ethical standards, and that the study adhered to United States Federal regulations (Walden University IRB for Ethical Standards in Research, 2014). Walden University IRB confirmed that informed consent, and equitable procedures with minimal reasonable risks were met, and that the potential benefits of the study outweighed the potential risks (Walden University IRB for Ethical Standards in Research, 2014). Thus, I provided the IRB the process and the protocols of the project to ensure that the rights of the participants are protected, and data is collected and analyzed in ethical manner.

The most important task in the study is to select participants who can best inform the research questions and enhance the understanding of the phenomenon under study (Merriam, 2019; Roulston & Martinez, 2015). Therefore, I contacted the director of the Office of Institutional Effectiveness and Research [OIER] at the study site for a list of potential participants meeting study criteria. The OIER (2016) used the student information system to identify students who were enrolled in remedial mathematics courses during the academic semesters of Fall 2010 through Spring 2016, and who had transitioned to college-level algebra courses. I focused on a "formal gatekeeper" to provide access to potential participates for the research study. I sought out participants who had the most insight, and who had knowledge about the topic related to the guiding research questions (Patten, 2017).

In the fall semester of the 2016-2017 academic year, I sent e-mails to potential participants asking for their participation in the study. The e-mails included an overview of the proposed study with an outline of the purpose, procedures, goals, and benefits of the study. After I received an e-mail from a potential participant, I contacted him or her with the study particulars and attached the informed consent form, which included withdrawal procedures, and an approval for the study by Walden University's IRB. Once a participant returned the signed consent form, I sent the participant details on the interview process, including the methods that would be used to protect the participants.

Informed Consent

I sent informed consent forms to participants via e-mail. Students who returned signed informed consent forms, were contacted for the most convenient time for one-on-

one, face-to-face, 60 minutes of individual interview. I reminded participants of the purpose of the study; their rights as participants, including briefings on the interview process and procedures for withdrawal before, during, and after data were collected; the voluntary nature of the study; inclusion criteria; reasonable foreseeable risks or discomfort; anticipated benefits to participants and others; non-compensation in participation; and the participants' legal rights. I provided information on how data would be managed to ensure security, anonymity, and confidentiality of the collected data. Lastly, I asked participants to provide honest, detailed answers during the interview process. Additionally, I informed participants that a copy of the study would be provided to them, in person or by email. I asked participants to take their time to think about the information on the consent form before deciding to participate in the study. Participant expectations were discussed, and questions were answered.

Protection of Participants

The researcher must adhere to ethical and legal requirements; therefore, upon securing consent from the IRBs, I afforded ethical protection to all participants. Merriam (2014) emphasized this importance by stating that, largely, the "validity and reliability of a study depend upon the ethics of the investigator" (p. 228). Gatekeepers make the decision regarding who should be able to enter their organization or institution, and "it is essential to gain their permission" (Glesne, 2011, p. 57). After student participants were identified during the second part of the spring 2017 semester, prior to the start of the interview, I reviewed the consent form with the students and discussed the study's purpose, procedures, risks, benefits, compensation, and confidentiality. I addressed the

questions that arose pertaining to the consent form. Students who agreed to take part in this research signed the consent form and provided their contact information.

To establish a rapport with participants, I respectfully protected the consenting participants' privacy by using a code such as participant 1 to protect their identity. Each participant was provided with the corresponding number and referred to by the code and not the participant's name, to maximize confidentiality. The file folder with participants' names and codes were locked in a cabinet to reduce the risk of exposure. I was the researcher, the transcriber, and the keeper of records. These measures helped maintain the privacy of all participants. Because qualitative studies are an intensive form of research, I took safeguards and procedures to prevent undue influence, coercion, pressure, perception of obligation, or inducement during participation. The safeguards and procedures included the following:

1. Participants maintained the right to refuse or change their minds to participate.
2. Participants could end participation, whenever they wanted, without consequences of any kind.
3. Participants could contact the researcher's doctoral chair or the research participant advocate at Walden University with concerns about their rights or treatment in connection with the research project. Participants were informed that there would be no compensation for participating.
4. The procedure was explained to the participants for addressing complaints or

concerns against faculty and staff.

5. Participants were informed that records and field notes obtained from this study would be kept private should the study be published.
6. The identity of the participants remained anonymous and confidential.
7. All transcripts were kept confidential and anonymous.
8. The data were transferred to a password-protected personal computer and saved in password-protected files. Hard copies were locked up in cabinets.

I maintained confidentiality by issuing a pseudonym for each participant and used randomly assigned numbers for all participant data, transcription, review, and analysis. I kept the interview results confidential and secure in a locked cabinet and in a password-protected computer to protect the privacy of all participants. I also kept a reflective journal to record my own perceptions and viewpoints of the phenomena under study.

Data Collection

Interviews

The goal of each interview was to gather data regarding participants' perceptions and recollections relevant to DM learning; that is, the lived experiences of students during their participation in the DM NCBO intervention module. In keeping with Walden University's ethical standards, no data were collected until after the Walden's IRB granted approval. Within qualitative research, the researcher is often both the data collector and data analyst (Miles et al., 2014). The first step in data collection was to identify the participants to be included in the study. In qualitative studies, interviews are the basic research strategy for data collection (Creswell & Creswell, 2018). DeMarrais

(2004) defined the concept of "interview" as a "process in which a researcher and a participant engage in a conversation focused on questions related to research study" (p. 55). Qualitative data consist of "direct quotations from people about their experiences, opinions, feelings, and knowledge" (Merriam, 2019, p. 85) obtained through interviews. The intent of each interview was to allow participants to provide their perspectives (Merriam & Tisdell, 2016).

Semistructured Interviews

Interviews can be conducted using different approaches, including structured, semistructured, and unstructured formats. To answer the research questions, this study utilized semistructured interview techniques, designed to gather data on the lived experiences of DM NCBO students. This technique allowed me to address specific topics during the interview process, and to compare and cross-reference participant responses. Hence, the shared conversations produced experiential narrative data from the participants. The semistructured interview is the most popular method of data collection in the qualitative approach (Merriam, & Tisdell, 2016; Patten, 2017), and was the method of choice for this study.

Creating an interview protocol for the semistructured interviews was a crucial step comprised of the following five phases: (a) deciding information I needed relating to the research topic, (b) ensuring interview questions aligned with the research questions, (c) constructing open-ended, inquiry-based questions, (d) piloting the interview protocol, and (e) leaving room for general questions in the end. The interview protocol helped to ensure data gathered were useful in answering the research questions (Patten, 2017).

Additionally, it was important that I develop enough questions. Pilot testing with a small sample of colleagues allowed me a chance to see what questions worked and which did not. It provided me an opportunity to determine whether enough questions and time was allotted to gain in-depth insight into the research topic. The interview protocol served as a tool to capture the nuances of the lives, experiences, and perspectives of participants. The guide acted as a prompt, reminding me of the necessary topics to cover, questions to ask, and areas to probe.

The data collection process began with individual participant interviews, scheduled with each participant at his or her convenience. The duration of each interview was 60 minutes and took place during the first 6 weeks of the 2017 Spring semester. Interviews were conducted at the study site, in a private, neutral, distraction-free, soundproof conference room, which allowed comfort of the interviewees. Permission was obtained from participants before audiotaping their interviews, and each participant was issued a copy of the interview protocol (Appendix B). I used the interview guide to help direct the conversation toward topics and provide guidance on what to do or say next. My judgments while collecting, reviewing, and analyzing data were suspended.

The interview sessions included establishing a rapport with participants by introducing myself, and explaining the nature of the study, including the study's purpose, procedure, risks, benefits, compensation, and confidentiality. Participants had the option to opt out of the interview at any point with no justification or consequence. No participant opted out of the study. I addressed participant questions that arose pertaining to the interview protocol (Appendix B). The research questions grew out of initial

curiosity for a particular topic in DM. Hence, I began with the self-question: "What do I want to know about this topic?" This was the starting point for pinpointing the specifics of what the study was about, and what data needed to be collected. A clearly stated overarching question can give direction for the study design, and collection of data, and offer more specific questions during data collection and analysis (Brinkmann & Kvale, 2015; Patten, 2017).

Qualitative studies are an intensive form of research, thus I sought to prevent undue influence, coercion, pressure, perceptions of obligation, or any form of inducement during participation. The research questions guided the interview process. For example, to address how each participant reacted to being required to take a developmental class in math, I asked, "What was it like to hear that you would need to take DM 0300?" I limited my comments as much as possible, to allow more time for each interviewee to offer his or her in-depth perceptions. The researcher should allow the conversation to develop naturally (Patton, 2002). Therefore, I remained engaged and open to the interviewee throughout the process. One-on-one, open-endedness allowed participants to supply as much in-depth information as they could and allowed me to ask probing and clarifying questions to follow up on interesting points. Probing questions also helped to ensure the data obtained were accurate and credible. Participants were encouraged to reminisce about their experiences, and how they were affected by those experiences. Interview responses provided data on participants' perceptions. In qualitative research, the interviews continue until the topic is exhausted or saturated; that is, no new perspectives or information are received from the participants (Hatch, 2017).

Audio recording for a face-to-face interview is "indispensable" (Patton, 2002, p. 348). Hence, using an audio recorder with the consent of the participants, during the interview provided a more accurate interview data than a handwritten report. Moreover, audio recordings helped me to focus on the interview, to be observant, and to be able to pick up subtle cues such as body language, tone of voice, and facial expressions. Audio recordings generated more than 75 pages of transcripts. I used the interview transcripts as a source of data, to record the participants' perceptions, and to discover how participants constructed meaning related to involvement in DM NCBO intervention program. I used Microsoft Word to help with the organization of data, and transcription of data occurred after each interview.

Reflective Journal

Using a purposive sample of DM NCBO participants, data consisted of transcriptions from semistructured individual interviews. Each participant described the experience of participating in the DM NCBO program. I transcribed all of the interviews and imported them into the software package NVivo. Additionally, throughout the data collection and data analysis process, I maintained a reflective journal (Patton, 2002). As data and thoughts emerged, I recorded in real time my thoughts, feelings, and reflections that I made during the process of data analysis. I used the reflective journal not just to record my thoughts about the mechanics of the data analysis process, but also to record the connections and interpretations I made. I began to make sense of the patterns and themes as they emerged with regard to what the participants told me, and the order in which they did. The journal produced its own audit trail evidencing not just transparency,

but also the personal rigor of the questioning and reflecting. As data analysis and journaling within the software package continued, so did the interpretative process and the evidencing of its quality and validity.

Member Checking

The method of returning an interview or analyzed data to a participant is known as member checking or participant validation; the process is to establish accuracy and credibility. (Birth et al., 2016). After all data had been organized and analyzed, I sent an electronic copy of transcribed data to each participant to verify its accuracy, and the feedbacks were used for validation or to assess the trustworthiness of the qualitative results. In this technique, data, interpretations, and conclusions were shared with the participants. Member checking provided the participants opportunity to review the findings, confirm interpretations or preliminary results, correct errors, assess adequacy of data and or provide additional information (Creswell & Creswell, 2018). Furthermore, one of the implications of the project suggested that research procedures utilized by qualitative researchers to establish rigor is an important way to increase the readers' confidence that the voice of the participants is heard (Birth et al., 2016). Member checking also allowed me to reflect on the analyzed data whether the results had resonance with participants' experiences.

Role of the Researcher

I have worked at the research site for more than 17 years. During that time, I came to appreciate the struggles and challenges those students in community colleges face, in particular students who are in developmental studies. The developmental students I

encountered at the research site were struggling academically and making little progress toward their desired degrees or certificates. I realized that most of the students were required to take DM before they could begin their college-level courses (see Appendices F and G). These students started college at a disadvantage because their mathematics skills were not at the college level. When I realized this trend with the academic probation and suspension of students, I became very interested in DM and the impact that mathematics skills have on college persistence and academic success.

The current trend in DM coursework is shortening the pipeline to college-level, credit-bearing coursework through accelerated models. To investigate the impact of the DM NCBO accelerated model, I set aside any prior thoughts, conceptions, or judgments I may have had, and bracketed personal beliefs as the research proceeded. Although I conducted this study at my place of employment, I did not have personal or professional connection with any of the participants that could be viewed as having authority or influence over them.

I was the key instrument in the process of data collection and analysis. The researcher in qualitative studies is the key instrument (Creswell, 2017; Merriam & Tisdell, 2016). A reflection of my personal experiences and biases related to the study was necessary. As the primary researcher in this study, I sought to provide participants with an opportunity to voice their experiences and perceptions of participation and success. I remained objective throughout the process, although I was not separate from the research; I was an essential part of the process (Dwyer & Buckle, 2009). I

participated in the narrative process and interacted with each participant, linking experiences in the participants' stories to the research presented.

Patton (2002) stated that the researcher's data should be "credible, trustworthy, authentic, balanced about the phenomena under investigations, and fair to the people in the study" (p. 51). Merriam (2014) stated, "Because human beings are the primary instrument of data collection and analysis in qualitative research, interpretations of reality are accessed directly through their observations and interviews" (p. 241). Therefore, researchers are nearer to the truth of the matter than if an instrument used for data collection is interjected between the participants and the researcher. My role was to collect the data, free from bias and judgment.

Data Analysis Results

The purpose of this basic qualitative study was to explore the lived experiences of community college students who successfully completed DM NCBO sequences. At GCC, administrators identified a problem with first-time college students failing DM courses at a high rate. Similarly, community colleges across the state experienced the same results. The Higher Education Coordinating Board proposed a corequisite model supporting non-course competency-based options and instituted a statewide DE plan to address student readiness and improve academic performance (HECB, 2009). In response to the state legislature's mandate, officials at GCC implemented the NCBO accelerated program in September 2012. However, to date GCC has not conducted any research to identify whether the corequisite model intervention supports student learning or students' perceptions about the instructional model. Additionally, while the state instituted

mandates for community colleges to support non-competency based courses options, to date GCC has not developed a policy supporting this action. Therefore, in this section, first I present the data analysis procedure used to identify emergent codes and themes. Second, I discuss the research findings that are aligned with the research questions posed that explored the perceptions of 11 community college students concerning the DM NCBO intervention program, the conditions influencing success of DM NCBO courses, and finally the students' perceptions on math education regarding their future success in college-level courses. The emergent codes and themes are supported by descriptive evidence and current literature. Third, I provide a summary of how Tinto's theory of student integration and retention as the conceptual framework supports the results for the project study. Tinto determined that campus involvement is an important factor during the student's first year in college. The student would benefit from interactions with peers, faculty, counselor, and staff. Eventually, the student becomes part of the institution.

Data Analysis Procedures

Data analysis procedures were guided by the thematic analysis process of Braun and Clarke (2006). There are many ways to approach thematic analysis (Javadi & Zarea, 2016). Thematic analysis is a flexible approach since there is not a specific design associated with it (Braun & Clarke, 2006; Clarke & Braun, 2006; 2013). Thematic analysis can be utilized for case studies, narrative inquiry, phenomenology, and qualitative studies. I chose this analysis plan because it is perfect for both novice and expert qualitative researchers (Braun & Clarke, 2006; Clarke & Braun, 2013; Javadi & Zarea, 2016). Further, it is the most influential in the social sciences as it offers a clear

and usable framework for analyzing data. Additionally, the six steps are easy to follow but rigorous enough to generate meaningful findings from the data (Javadi & Zarea, 2016). Hence, I employed the following six step process to analyze the data: (a) familiarization of data, (b) generation of initial codes, (c) creation of the initial themes or searching for themes, (d) reviewing of the themes, (e) defining the themes, with a focused examination of the significance of themes, and (g) writing up thick, rich description of the results (Clarke & Braun, 2013; Bernard et al., 2017; Nowell et al., 2017; Rosenthal, 2016).

Familiarization of data began with data collection procedures, as I personally collected the data. All interview transcripts were closely read, repeatedly. Clarke and Braun (2006) referred to this process as "active repeated reading" (p. 78). Active repeated reading was also accomplished in a recursive rather than linear manner, as I went back and forth in the data, not just in the familiarization phase, but also throughout the data analysis procedure. The aim of this phase was to become acquainted with the data, and to take notes on prevalent topics discussed by participants as I moved to the next phase of generating initial codes.

After all data were collected, I immediately transcribed all audio recordings of the interviews, into Microsoft Word. I assigned pseudonyms to interview files to conceal the identity of the participants. I removed all direct identifiers from the raw data, including any data that may be linked to participants' identities. After reading the data from participants' several times, for emergent themes, I assigned topics, phrases, and terms, and issued initial codes (Saldaña, 2016). I sorted the coded pages again, and similar

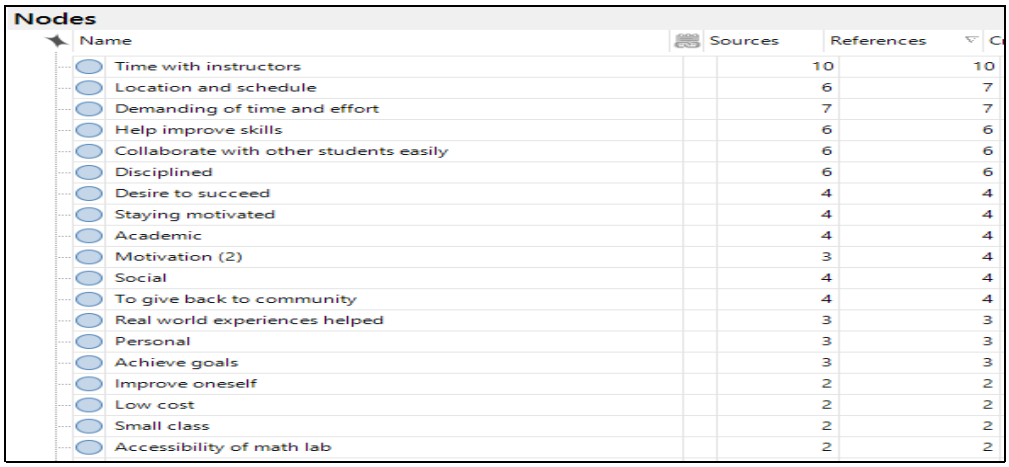
phrases from each participant's data were combined and placed into coded categories. I linked coded data to the research questions (Miles & Huberman, 2013, 2014). I then organized data around themes that emerged throughout the coding process (Saldaña, 2016). Emerging themes formed the findings and results and related to those behaviors were indicators of persistence for participants. Themes that emerged from the data shaped the narrative. In addition to physically sorting and analyzing the data, I utilized an electronic coding method, NVivo (Casteberry, 2012), a qualitative data analysis software, which sped up data analysis (Bazeley, 2013; Bazeley & Jackson, 2013; Saldaña, 2016). The files and software were stored on my personal computer in a password-encrypted computer accessed only by me. Hard copies of the data were stored in a labelled binder that was stored under lock and key in my home office. The files will be destroyed 5 years after the completion of this study.

I then proceeded to generate initial codes using NVivo. The software was used to highlight statements and assign codes in the uploaded data through nodes. No thematic meanings were assigned to data, yet. Data were coded to allow me to identify emerging patterns therein. Each interview was analyzed individually at this phase. Figure 2 shows the initial codes through nodes. The nodes may be arranged by name, number of sources, or number of references, which helped me to examine emerging patterns in the data. In Figure 1, I identified common patterns and outliers among the data through the number of sources and references. Identification of common patterns was guided by the research questions rather than by the data, a process known as theory-driven coding (Clarke & Braun, 2006). Figure 2 on page 95 shows how NVivo was used to assign codes, through

nodes, and how patterns in the data were determined through the number of sources and references.

Figure 1

Sample Nodes



Nodes

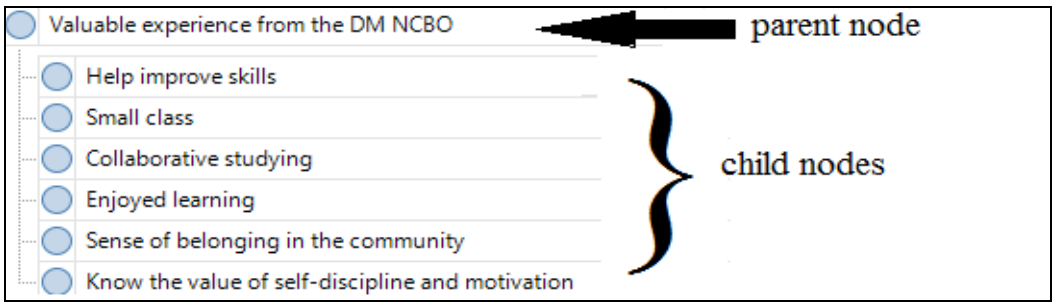
Name	Sources	References
Time with instructors	10	10
Location and schedule	6	7
Demanding of time and effort	7	7
Help improve skills	6	6
Collaborate with other students easily	6	6
Disciplined	6	6
Desire to succeed	4	4
Staying motivated	4	4
Academic	4	4
Motivation (2)	3	4
Social	4	4
To give back to community	4	4
Real world experiences helped	3	3
Personal	3	3
Achieve goals	3	3
Improve oneself	2	2
Low cost	2	2
Small class	2	2
Accessibility of math lab	2	2

After initial coding, I verified the codes. In doing so, I reviewed the statements in each code repeatedly. Again, as the coding process was recursive, repeated review was conducted for verification. With the research questions in mind, I retained un-coded data or recoded the data. After verifying the codes, I combined the codes to generate themes. I grouped the verified codes together according to the meaning of the data. The groupings were formed using the node hierarchy feature in NVivo. The node hierarchies were helpful as a tool to map out themes through visual representations, as suggested by Clarke and Braun (2006, 2013). These representations included creating a parent node to group the verified codes with the same meaning. Verified codes assigned under a parent node were referred to as ‘child nodes.’ Parent nodes were also used to assign labels to emerging themes. An example of this is presented in Figure 2. Child nodes were derived

from verified codes, while parent nodes were generated to group the child nodes and assign labels in emerging themes.

Figure 2

Combined Codes to Generate Themes in NVivo.



After emerging themes were generated, I examined the link between the themes and theoretical framework. As the coding process was theory-driven, identification of themes was guided by the research questions. The research questions were anchored in Tinto's student integration and retention model (Tinto, 1975). This model shows how academic integration and social integration can be used to increase student persistence. I reviewed the themes with the premise of this model to address the research questions.

Next, I reviewed emerging themes for focused examination and significance of themes. This phase involved reviewing the themes most relevant to the research questions. As part of the recursive process, themes were further refined, combined, or separated, and irrelevant themes were eliminated. I reviewed the themes with the data, in its entirety, to ensure the themes were explicit and accurately represented in the data. I crosschecked themes with all data to create a final overall "story" from the data.

Finally, I wrote a thick, rich description of results to depict the overall story in the data and to address the research questions. I provide this thick description below. This description includes narratives that illustrate the analytic meanings of the themes. I also provide supporting evidence, such as quoted excerpts from the interview data.

Findings

I present the findings of this study in this section, organized into three subsections addressing the three research questions and emergent themes. Each subsection is labeled according to the research questions. I first address the research questions, then present the themes. I provide narratives and quoted excerpts from the data as thick description of each theme.

Research Question 1

The first research question asked what the perceptions of the participants were concerning DM NCBO intervention program. The participants perceived that taking developmental mathematics courses at the community college was logistically convenient. The location of the community college was accessible, and classes were self-paced. The setting of the community college was a small town, where locals who graduated from the public high school transitioned to the community college. Students at the community college were not expected to study full time. Part-time students, including many of the participants, found that class schedules, as well as the pace of lessons, made learning quite efficient. Participants generally opted to enroll in DM courses due to their desire to improve and succeed. Participants perceived that DM courses helped improve mathematics skills useful in college courses. Participants perceived that DM courses

would help them achieve their academic and career goals. Consequently, DM courses also were perceived to help improve skills in general. Three themes emerged from data analysis supporting DM student success, and they are presented and discussed below: (a) convenience of location and schedule of classes, (b) desire of students to improve and succeed, and (c) the desire to help improve skills.

Theme 1: Convenience of Location and Schedule of Classes

Based on the data, the research site was "conveniently" and "strategically" located on the gulf. The community college was "the only college available to people who live on this island" (Participant 8). Other participants perceived that attending the community college was a "natural transition" due to its convenient location. Participant 5 has similar observation "I was born and raised in this area of the island and enrolling at GCC after completing high school was a natural transition to my journey as a student at the community college closest to my home." Several participants were not full-time students or had family matters to take care of, and participants perceived that the schedule of classes was quite convenient. I noted the example of Participant 3, who needed to work to support the family, and was excited to learn despite lack of encouragement from a parent. Likewise, Participant 3 appeared to be determined to complete learning, even though the college education was interrupted to take care of an ailing relative. The participant moved out independently and was able to complete the DM courses by using every support system available.

The learning method in the DM NCBO courses was self-paced, which the participants perceived as convenient to their schedule and efficient in their learning, an

experience shared by others. Participant 2 agreed with the flexibility of the schedules, "The class schedules made it possible for me to have a job and to take classes; also, they were sufficiently paced to help me make meaningful connections with other classes." This proves the flexibility of class schedules, use of support systems and resources, and determination of students to succeed have a positive effect on successfully completing an education.

Theme 2: Desire to improve and succeed

The participants enrolled in DM NCBO due to the desire to improve themselves and succeed. Participant 1 mentioned that, improving mathematics skills, made it possible to "test out of developmental education and go straight to college algebra." Furthermore, participants perceived that their desire to succeed in college and their future careers motivated them to enroll in DM NCBO courses. Participant 7 reiterated, "The main reason I chose to attend [community college] was to further my education and get a degree to pursue a career in either computers or medicine." Some participants desired to add to their skillsets for better job prospects in the future and thought that DM NCBO courses might help. Participant 2 perceived, "I chose to attend [community college] to improve my skillset and make myself more marketable in the work force, and [community college] offered a degree in a field I was interested in studying (AA Psychology)."

Some participants added that they desired to achieve their personal goals with the help of DM NCBO courses. Participant 11 said, "I wanted to graduate with an associate degree from college to better my income and as a personal goal." Participant 4 desired to

improve English fluency and perceived that enrolling in developmental courses might help with that.

> I moved from Houston to live on the island after helping my child with the baby. It seemed a quiet place that was good for people of my age. Since my first language is French, enrolling at [community college] would help improve my spoken English so that I could teach French in a continuing education class.

The desire to improve economic status and language skills have proven to be two of the major factors for motivating participants to enroll and successfully complete DM NCBO courses.

Theme 3: Helps improve skills

Aside from the desire to improve and succeed, participants also perceived that DM NCBO courses helped them improve their mathematical skills. Generally, skills were improved, especially through "repetition" and "short and self-paced classes." As Participant 2 responded by validating the skills gained from DM NCBO participation.

> The most valuable component I gained from DM NCBO was the opportunity to fill the gaps in my mathematics education that were left from attending an alternative high school and getting my GED instead of taking and passing all the high school classes I needed for a diploma. It propelled me to faster completion which led to improved success in college-level courses.

Participant 7 experience and perception was in agreement with Participant 2's that DM NCBO courses helped improve mathematics skills as well. I recorded that this participant did not get to practice college-level math, due to joining the military right

after high school. In the military, this participant stated they had to learn discipline, which helped with work on mathematics skills in the DM NCBO program.

> I joined the military right after high school although I was a very quiet person, goal and career oriented. I learned discipline from the military—preparation, critical thinking, dealing with tough situations, time management, and goal setting, which I regarded as important survival strategies. I also received academic support and academic advising.

Participant 7 also said DM NCBO courses helped to improve motivational skills.

> The most valuable experience that I gained from developmental math was the repetition of concepts. Just being able to start solving math problems and working the problems out made the beginning of the problem come back to me, and I was able to advance to higher math very quickly. The improved skills were not limited to mathematics skills, but also helped with social skills, academic skills, and life skills.

Additionally, participation in class contributed Participant 8's success.

> I experience a lot of good things by being part of the student body, but the experience in my math class was most valuable, because I learned patience and perseverance. It took me over 5 years to complete the developmental math sequences, but I stuck with it.

Participants 2, 7, and 8 prove self-discipline, self-paced courses, repetition, patience, perseverance, and even maturity helped them to succeed in DM NCBO courses.

Research Question 2

Research question 2 asked what conditions participants identify as influencing success of DM NCBO courses. Generally, the participants identified the main advantage of DM NCBO courses in the community college as having small class sizes. The participants also observed that DM NCBO courses helped them prepare for college courses and other aspects of their future. The overall progression from DM NCBO courses appeared to contribute to the success of the courses. Therefore, the overarching themes for the conditions influencing the success of DM NCBO courses were: (a) advantages of small classes, and (b) overall progression from DM NCBO courses to college-level courses.

Theme 1: Advantages of small classes

The participants perceived that having a small number of students per class was advantageous in the success of DM NCBO courses. The students maintained they learned efficiently and had easy access to the math lab for practice due to the small population of students. Based on the *Program Review: Developmental Education* document that I obtained from OIER (2016), the average class size of DM courses in fiscal year (FY) 2012 to FY 2016 was 12.6 students, despite the capacity of 23.32. Two subthemes were identified as advantages of small classes: (a) one-on-one time with the instructor and (b) ease of collaboration with fellow students. Participants' accounts were supported by Theme 1.

Subtheme 1: One-on-one time with the instructor. Several students declared that being able to communicate and build a relationship with the instructor contributed to

the success of DM NCBO courses. Over FY 2012 to FY 2017, the DM courses employed three full-time instructors and one adjunct instructor. Data regarding the number of sections taught by the full- and part-time instructors per level per term were derived from the review of the Program Review document. The data indicates that instructors had a divided workload and handled a few sections per term, which may have allowed them more time for addressing the students' concerns. I also looked into the contact hours by full-time faculty from FY 2006 to FY 2015. *Contact hours* refers to the time spent in the classroom; research, internship supervision, and directed individual studies. The contact hours of full-time faculty have been generally high and have increased since FY 2012. The data were derived from the document *Institutional Effectiveness Performance Measures FY 2006 to FY 2015*, which showed that contact hours of full-time faculty were over 70% from FY 2006 to FY 2015.

Although contact hours not only refer to individual time with instructors, however, participants appreciated their "one-on-one time" with the instructors who were generally "easily available." Participant 1 shared, "I learned to engage with my teachers, ask for clarification, look for the opportunity to have one-on-one with instructors who were always available in the lab, in the offices, by email or by phone." Participant 1 visited the academic advisor regularly to keep track of academic program and connected with the English instructor who offered valuable advice—"to stay focused, persist, not give up". Participant 1 consulted with their patient, knowledgeable math instructor, with a counselor who offered social support through campus activities—leading to academic stimulation, and with a donor who provided financial support.

Participant 4 believed the small class size provided "ample opportunity to ask questions during class and speak with the instructor one-on-one when needed" and to "have opportunities to get help from instructors on a personal basis." Participant 4 further noted the "instructors also seem to care about students, and they encourage collaborative learning." Corroborating Participant 4's notion of small class size. Participant 7 had similar observation as Participant 4:

> The small enrollment size of developmental math did not bother me, since I was only worried about myself being able to retain and understand what the instructor is teaching. It also made having a one-on-one session with the instructor possible and having discussion with other students easier.

Subtheme 2: Easily collaborate with fellow students. Participants perceived that class sizes of the DM NCBO courses were generally small. In the entire developmental education program, class sizes ranged from 9.6 to 17.4 students, with an average of approximately 13 students. The data for sections taught, average class size, and capacity were found in a review of the document *Program Review: Developmental Education*. (OIER, 2016).

The participants perceived that approaching fellow students did not appear to be "awkward" in small classes. The students were encouraged to learn collaboratively, which helped with the success of DM NCBO courses. Participant 1 also perceived the advantages of small classes, she reiterated that the small classes provided "many opportunities to form partnerships with other students and with teachers, sharing different perspectives, and learning from each other, figuring out how solve problems."

Participants perceived that they were able to "work closely" with other students, and that they had "learned a lot from each other." Expressing the same perception, Participant 8, like other Participants considered collaborative environment important,

> The class had small enrollment, which was very useful because I was able to make friends with my classmates and learn from them. We became like family, helping each other and working collaboratively. Some of the students were good with computers, and they helped me in this area.

Participant 8, a student over 60 years of age, had joined campus activities and fit in well with other students. Similarly, Participant 4, another older student, recently began to join campus activities. The participants initially felt they would not fit in with the other students due to age or a language barrier, as English was not the first language of Participant 4. Both students reiterated that they felt the environment was very conducive to learning, they were motivated, had high expectations, appreciated clear directions and clear goals, and achieved academic stimulation from activities and workshops on campus. Initially, they were not comfortable asking for help, but found that it became easier once they stated a need for assistance. Students looked for intervention resources, joined study groups, and chose activities that were important to their goals.

The small classes also allowed participants easy access to the math lab, even if they went as a group. Participant 4 said, "Working in groups is very helpful to me as a student, and we used the math lab as a group to practice." Participant 11 concurred:

> It allowed me to feel at ease asking questions. I got to know the other students as well. This enabled us to get study groups together because we became close-knit.

> We made use of the math lab that was accessible at all times. The software loaded in computers enabled us to practice solving the math problems.

Small classes enabled students to form study groups then friendships. They were also able to easily reach instructors for assistance. They worked collaboratively in classes and laboratory settings in spite of age, language barriers and abilities to overcome obstacles to successfully complete DM NCBO courses.

Theme 2: Overall preparation from DM NCBO courses

The DM NCBO courses were perceived to be successful due to the overall impact of the themes presented above in which students were equipped for college in terms of motivation, academic, social, personal, and financial preparations. Attending the courses provided "the courage to move forward." Participant 8 concluded,

> [Community college] has made me what I am now, to be able to complete all of my sequences and to graduate to college algebra. The counselors helped by directing me to the right resources, and the instructors and staff and other students guided me through the maze of course work.

The course programs were also connected to student services, which participants perceived helped "connect with other students and make friends outside of the classroom environment." Participants recognized that the friends they made in community college "shared similar goals and aspirations" and helped them "stay motivated and focused."

Other participants said that their motivation came from the self-paced classes. Participant 1 said, "Self-paced classes enabled me to move faster by keeping my motivation up." Participant 5 in accord with the other participants reiterated,

> Attending [community college] helped me prepare for more than just college. While attending [community college], I learned how to research credible sources to locate scholarly articles. I learned people skills by stepping out of my comfort zone to build relationships with teachers as well as fellow students. I learned budgeting and money skills; I learned how to have self-control.

Participant 9 observed that the courses helped in "dealing with difficult classes, goal setting, exam strategies, money matters, staying healthy, adjusting to college life." Participant 10 also perceived that DM NCBO was important in life skills preparation.

> DM NCBO program gave me the tools to use in my college-level courses and beyond. I learned that support systems are essential for my college survival, also it was very important to stay connected with my peers and with the staff and instructors. Joining activities helped me become a contributor to my society and environment as whole.

Participant 3's observation supported Participants' 2, 5, 8, 9 and 10's perceptions in stating that participation in the program helped them, not just by the course, but also by the teacher in the overall preparation for college. Participant 3 concluded:

> At the beginning, the teachers told us about other resources and information that will help me pay for my education. Some of the instructors mentioned additional scholarships given to the institution. I knew then that the teachers really care about the students. I visited the counseling and advising department. I visited my teachers during office hours. I went to the Student Success Center and asked many staff and faculty about their perceptions before enrolling in each class.

> Recently, in 2014, I found out about BBS [Building Bridges to Success]; the program helps first-generation students achieve a college degree.

According to Participant 2, attending DM NCBO classes helped in the overall preparation for college:

> Attending GCC helped me prepare emotionally, socially, motivationally, and academically for college by putting me in touch with professors who laid out expectations clearly, and I was introduced to friends who shared similar goals and aspirations with me and who could help me stay motivated and focused.

Overall, based on the data from the post-graduation outcomes, students who graduated from DM courses during FY 2013–2014 were either employed and/or pursuing additional higher education; 90.9% of students who were enrolled but non-returners were also either employed and/or pursuing additional higher education. Generally, the data supported the participants' perception that taking DM NCBO courses helped them prepare to "move forward" with their academic careers, and other life skills including health, finances, self-discipline, and social skills.

Research Question 3

Research Question 3 asked what the perceptions of participants were on math education regarding their future success in college-level courses**.** Completing the DM NCBO courses was generally perceived to help the participants adapt in college and fueled the desire to obtain a college degree. I identified two emerging themes regarding the impact of DM NCBO courses on the future success of students: (a) adapting to college and (b) desire to obtain a college degree.

Theme 1: Adapting to college

Many participants were in their late 20s to early 30s and had experiences out of school (i.e., between high school and college). The participants perceived that taking DM NCBO courses helped them adapt to college. The DM courses provided students with mentors in their instructors, and with fellow students for collaborative study. The DM courses also helped students to build the determination to learn. Two major subthemes emerged as to how the courses helped in adapting to college: (a) expected demanding academic rigor in college and (b) developed behaviors from DM NCBO courses.

Subtheme 1: Expected demanding academic rigor in college. In undergoing DM NCBO courses, the participants generated an idea of the academic rigor in college. Generally, participants perceived that college courses were demanding of their time and effort in contrast to the self-paced classes in the community college. Participant 2 communicated that academic rigor in college was "like a full-time job" and a "substantial effort" was required to achieve academic goals. Several other participants shared the same perceptions. Participant 8's response was, "I knew that taking academic classes would be demanding of my time; therefore, I had to balance my academic demands with social demands." Participant 9's response concurred, "I mentioned some of the things I had to do to succeed. Since I am a single parent, I had to learn to manage my time to find enough time to study." Participant 1's expectations of college were stimulated by a parent. This participant believed that "one has to make a lot of sacrifices or put on hold social things that may interfere with studies. College work demands a lot of studying, effective communication skills, ability to solve problems, and critical thinking skills."

Since Participant 5 had little experience with school and little expectations of college. Participant 5 saw the importance of self-paced classes,

> Being that a school setting was new to me, I had few expectations. College was nothing that I expected. It was more time consuming than I ever anticipated. I made a lot of sacrifices for GCC and they paid off! However, I did not imagine having to put so many things on hold in order to give school, assignments, grades the attention that they deserved.

Comments from Participants shows each of them had to cultivate a new mindset in order to adapt to the rigors of academic demands.

Subtheme 2: Developed positive behaviors from DM NCBO courses. Participants adopted certain behaviors from DM NCBO courses, which helped them in other college courses. These behaviors mostly pertained to self-discipline, motivation, and determination. Several participants mentioned the desire to be "independent" and "self-sufficient" behaviors they believed were developed in DM NCBO courses. In college, discipline was the most mentioned behavior that was learned and applied from the DM NCBO courses. Participant 1 stated:

> It was easy to adapt to college environment because I wanted to succeed in college to be self-sufficient. My goal is to be an engineer in future, and I have to work hard in all of my classes, especially in math courses. I have to be motivated to focus in my education, that means that there would no time for fun things like partying or watching television.

Similarly, Participant 2 also shared that discipline was required to complete the course, especially in completing homework assignments and attending classes:

> To be academically successful in college, I expected that I would have to invest a considerable amount of time reading and doing assignments, attending class and getting help if I needed it. Behaviors I had to change included watching less television and waking up earlier every day.

Participants also mentioned "reducing weaknesses," which meant attending every class, and turning in assignments on time. Participant 5 mentioned time management skills, a skill set that Participants, 4, 6, 9 ad 11 regarded as important in helping students develop positive learning behaviors.

> I expected that I would need to study and work as hard as I possibly could in order to achieve the goals that I had during my time as a student. I had to change my time management skills. I hardly had any before college, and I had to quickly learn how to develop them once I was enrolled.

However, some participants believed that although time management skills were necessary for completing tasks, the self-paced nature of the classes helped them learn mathematics effectively. Participant 4 said,

> I knew I would have to work hard at reducing my limitations in order to participate in my new community. This meant I would have to attend every class, and turn in every assignment on time. I was too slow on everything, and I was able to change my behavior to become faster and more efficient. The self-paced nature of the class was helpful in developing discipline, and the flexibility of

> course schedules were good for me as a commuter student as I was able to practice coursework and complete assignments during my daily commute.

Similarly, participant 6 felt that self-paced classes contributed to success in DM,

> I had to learn to manage my time by balancing and giving equal time to each subject. I had to change my attitude from 'can't' to 'can'." Participant 8 shared,
>
> "Previous to developmental math classes, I had taken fun classes in piano lessons and art, but these were not challenging enough to motivate the younger generation. I had to persevere to be able to complete the math class.

Participants were generally excited to participate in the study. For example, regarding Participant 11, I wrote, "very enthusiastic about the DM program as it helped students build a foundation that they need to succeed in college." Participant 11 appreciated being one of the participants in the study. The participant enjoyed providing help to other students, was talkative, jolly, very approachable and kind. Participant 11 did all they could to accomplish academic goals and was a good example to the next generation.

GCC organized several workshops for the students on campus. Both Participants 6 and 9 showed a lot of motivation in learning by taking advantage of campus offerings, like the workshops to enhance their knowledge. Participant 6, a returning student attended workshops to enhance academic skills, stated:

> I got into the program to brush up math skills. I was never good in math but was determined to complete the DM sequences to move forward. I attended the college success workshops offered—study strategies, personal and career

> counseling, goal setting, dealing with tough classes, financial aid, and other survival tips. As an older and returning student, I was more focused, and motivated to apply learned skills to academic life.

Participant 9 said that several of the abilities needed in college were taught in workshops in the community college:

> I had to learn exam strategies and test preparations, critical thinking skills, and better communication skills. All of these strategies were offered in workshops around the campus, and I could take advantage of them. I spent a lot of time in the math lab, and it paid off.

Participants developed critical learning skills necessary to successfully complete not only developmental mathematics courses, but these same skills could be applied to all courses and areas of their lives.

Based on data from the document review, the average number of course completers in the developmental courses have generally been high from FY 2006 to FY 2015. The same data revealed a small number of students who were academically disadvantaged, averaging at 16.4% in FY 2015. Additionally, the number of remedial mathematics students who met the SI obligation has been above average, with an average of 52.7% in FY 2015. The overall institutional effectiveness, based on the percentage of course completers, has generally been high, thus supporting participants' accounts.

Theme 2: Desire to obtain a college degree

The DM NCBO courses were considered successful as these courses stimulated students' desire to obtain a college degree. Participants shared that they considered giving

back to the community and achieving personal and career goals through their college degrees as a measure of success. Participants perceived that taking DM NCBO courses influenced them in their desire to finish college. Participants 5, 7, and 9 were not only motivated but set high goals of academic achievement. For example, Participant 5 reiterated,

> Achieving my associate degree opened the door for bigger opportunities. I am prepared to transfer to a university when the time is right in order to graduate with a bachelor's degree. I am excited and look forward to the future goals that I will achieve because of [attending community college].

Participant 7 maintained, "I know that if I can be motivated and focused on what I need to do to further be successful, then I can inevitably achieve the task of getting a degree to pursue a career." Several participants also mentioned that they desired to obtain a college degree for the fulfillment of career goals. Participant 9 was serious in completing the DM NCBO program and was dedicated to obtaining a degree:

> As a parent, I am determined to complete a medical coding degree to give a better life to my family. DM program at GCC offered me the foundations I needed to move ahead. Also, I am first in college and hope to be a good example to my family.

Participant 1's desire to obtain a college degree was motivation shared by other Participants.

Stating that you have a degree helps with applying for jobs that requires a college degree since you get better pay. I feel proud to have achieved my associate degree as I am

now working full time. It wasn't easy. So, I finished with a GPA of 4.0. That was quite the victory for me. I spoke at graduation. That was momentous. Participant 11 was proud of the achievement, while Participant 2 felt proud but in a different way. Her pride stemmed from the ability to give back to the community.

Other participants claimed obtaining a college degree might help them give back to the community. Participant 2 said obtaining a degree allowed her to be a "credible" and "respected" member of society and pointed her in the right direction toward having the "financial means" to give back to the community, provide purchasing power. Similarly, Participant 1 stated:

> Attaining [a] college degree will enable me to be a contributing member of society, to give back to my community by using my knowledge to solve environmental issues like water pollution and working with others to help make the world a better place.

Data obtained from the document review regarding the number of DM students who transferred to a university revealed that at least 40 DM students who had undergone developmental courses in the community college transferred to a university from FY 2012 to FY 2015; while FY 2016 recorded the highest number, with 97 students transferring to a university. Over 40% of the students from FY 2012 to FY 2015 transferred to a university after completing the developmental courses.

Evidence of Trustworthiness

I used techniques to enhance the credibility, confirmability, dependability, and transferability to increase the trustworthiness of the study. *Credibility* refers to confidence

in the truthfulness of the results. *Confirmability* refers to ensuring that the findings are derived from the context of the participants' responses, and not according to the bias, motivation, or interest of the researcher. *Dependability* refers to the consistency in the findings should the study be repeated. *Transferability* refers to the applicability of the findings in other contexts (Patten, 2017). Through the literature, I was trained and equipped with relevant experiences to conduct this study sufficiently. To increase the credibility of the study, I continually checked the truthfulness of the data during data collection and analysis. I verified the truthfulness of the data through member checking and reflexivity. I used member checking to establish the believability of the results through the perspectives of the participants. Interview transcripts and results were sent to participants to review for accuracy of the interpretation of their experiences. I sought data saturation through repeated immersion in the data to ensure that no new information emerged from the data. I used reflexivity to minimize researcher bias. Throughout the study, I inquired and reflected on the process often to achieve reflexivity (Creswell & Creswell, 2018).

Transferability and dependability involved using reliability techniques. To increase the transferability and dependability of the study, I properly documented all the data. All the data collected from the interviews were systematically organized, and notes were kept in a journal to ensure that all data were properly documented. Documentation allows for future researchers to replicate the study. Proper documentation also allowed me to crosscheck references throughout data analysis (Creswell, 2017; Patten, 2017).

The purpose of this basic qualitative study was to explore the lived experiences of 11 community college students who successfully completed DM NCBO sequences. The interview questions were developed in order to answer the guiding research questions. In the research design, I outlined the participant selection process, ethical protection of participants, and my role as a researcher. In this basic qualitative study, I collected data from semistructured, audio-recorded interviews. Audio recordings were transcribed, and field notes added in the margins to capture the essence of the interpretations. I read the transcriptions to develop common themes. I used the mechanism cited by Guba and Lincoln (1994), and Clarke and Braun (2006, 2013) to establish credibility. I employed member checking of the recorded and transcribed interviews to ensure proper analysis of the recorded interviews, which confirmed the validity of the study.

Summary of the Findings

The research questions guiding the study focused on participant perceptions of the DM NCBO program and their motivations to persist. I used a basic qualitative study methodology and semistructured, individual, open-ended, in-depth interviews to address the research questions. The study was guided by three research questions. The first research question asked about the perceptions of the participants concerning the DM NCBO intervention program. Data analysis revealed that participant students perceived the DM NCBO courses as convenient in terms of location and schedule. These factors are important considering the time and financial constraints experienced by community college students who, according to the research, often balance work and family responsibilities with attending classes. Participants also perceived that DM NCBO

courses were taken due to their desire to improve themselves and succeed in achieving their goals.

The second research question explored the conditions participants identified as influencing success in DM NCBO courses. Participants identified the small class sizes as key to facilitating success in these courses. The small number of students allowed for more one-on-one interaction with the course instructor and collaboration with fellow students.

Finally, the third research question investigated the perceptions of participants on math education regarding their future success in college-level courses. The impact of DM NCBO courses on future success included helping students adapt to college by setting expectations of academic rigor and facilitating the development of behaviors, such as discipline and motivation. Students also cited the desire to obtain a college degree to give back to their communities and achieve their personal goals. The participants stated the DM NCBO courses improved social, emotional, financial, and personal skills, as well as academic skills, which helped the students to prepare for college and contributed to their success in college.

Interpretation of the Findings

The literature on DE, acceleration, and retention provides important context for this study and its findings. Building relationships with instructors and performing collaborative work with fellow students are central to increased learning, engagement, and persistence (Tinto, 2017; Wong, 2015). The findings of this study confirm existing knowledge of the efficacy of Tinto's theory of student integration (1975, 1993) in

analyzing student persistence, as well as earlier findings about students' positive perceptions of accelerated courses (Li, 2017). The findings here contradict the assessments of DE skeptics who argue that little can be done to help DE students succeed due to their overall academic weaknesses (Jenkins & Fink, 2016). The students sampled in this study succeeded in a DM course despite initial academic weaknesses. These findings extend knowledge in DE research by focusing on student perceptions of DE and acceleration, which has rarely been researched, and provides important perspectives about student success in these courses.

The present findings were analyzed and interpreted within the theoretical framework of Tinto's theory of student integration. The participants sampled were well-integrated into their learning environment, citing strong collaborative relationships with instructors and fellow students. The DM NCBO course was convenient for them and fit their needs. Therefore, they were able to persist and succeed, which is in keeping with Tinto's persistence theory (1975).

Finding 1: The first major finding derived from the research is that students who successfully completed the DM NCBO course and progressed to college-level courses appreciated the DM course for its low cost as well as convenience in terms of location and scheduling. Cost and flexible scheduling are crucial concerns for these community college students. Many community college students come from low-income backgrounds and must balance work and family responsibilities with part-time school attendance, all of which are risk factors for attrition (Davidson & Wilson, 2017; Tinto, 1993, 2017). Other researchers have studied acceleration or the organization of teaching methods in

ways that speed up the requirements needed to pass a DE course (Bickerstaff et al., 2016; Edgecombe et al., 2018)

Edgecombe and Bickerstaff (2018) found that students at a community college in Colorado who took a compressed DM sequence were more likely to complete the highest DM course and pass college-level mathematics. Thus, acceleration may improve student access to college-level courses, a finding consistent with the present study's findings. Moreover, recent student surveys conducted by college institutional research offices across the country have found that many students, particularly nontraditional students, prefer more intensive accelerated courses (AACC, 2018; CCCSE, 2016). When community college students were surveyed on employment and family responsibilities, it was found that approximately 79% of college students were employed and 35% cared for dependents, reinforcing the need for flexible scheduling to promote retention and completion. These surveys, like the present study, demonstrate the importance of policies and practices that enhance acceleration and graduation.

Finding 2: The second finding highlights participant perceptions that small class sizes are key to facilitating success in the course, as this arrangement allows for collaboration with fellow students as well as one-on-one interaction with instructors who provide personalized help. Astin's (1984) model of involvement emphasized that the more involved students become with the social and academic institution, the more likely they will stay focused on finishing college. Social and affective elements of the classroom have approximately the same level of influence on student learning as do traditional characteristics (Scott-Clayton, 2018). This proved true for successful DM

students sampled in this study, who cited their collaborative work and involvement in campus activities and had a sense of connectedness with their community college. Social factors that aid student engagement and integration were present in these courses, which facilitated student persistence in keeping with Tinto's (1975, 1993) model of student integration. Collaborative work with fellow students in the math lab and study groups helped to promote learning as well as engagement and retention. Students who are more engaged in their education, especially those who learn collaboratively with other students, have a higher chance of graduating (CCCSE, 2016).

When instructors build relationships with students and restructure their delivery methods, they increase student success (Machera, 2017; Pallegrino & Jaeger, 2017), a finding confirmed by the present study. The DM students cited positive relationships with instructors who provided one-on-one assistance to help them learn the course material. There is a need for strong relationships between teachers and students in the learning environment (Karp et al., 2017). The active learning environment of accelerated DM courses, in which students solve problems rather than just listen to lectures, supports student engagement and memory (Carrico et al., 2019). A self-paced method may help to improve motivation levels, which may lead to students mastering various mathematical concepts. A self-paced method supports the findings of the present study, in which participants' mathematics skills were improved through short self-paced courses where concepts were repeated, and students began working on mathematics problems from the outset.

Finding 3: The third finding illustrates that achievement in accelerated DM courses help students prepare for college-level courses by familiarizing them with academic rigor and strengthening their discipline, motivation, and desire to earn a degree, give back to their communities, and achieve their personal goals. Thus, their social, emotional, and personal skills are enhanced, along with their academic skills. This is important in underscoring social and personal factors found in other research on retention (CAPR, 2016). Students succeed in institutions that set high expectations for their student population (Tinto, 2002). Some acceleration programs have been shown to improve the rigor of the DE learning experience by pairing college-level work with tailored supports to help DE students who learn to succeed with such rigorous tasks (Tinto, 2002). Students should feel challenged in higher education; as Tinto (2002) stated, "no one rises to low expectations" (p. 3). The students in the present study gained confidence about succeeding in rigorous college courses when their efforts in DM paid off, leading them to set high expectations for themselves for the future. Overall, this study confirms earlier research showing that student interaction and participation in the learning process supports achievement (Hatch, 2017). The learning environment contributes to building self-efficacy, autonomy, and confidence, which in turn strongly influences student success (Cox et al., 2019; Tinto, 2002, 2014).

This study's findings relate to the literature review in terms of population characteristics, research design, and theoretical framework. The present study sampled community college students in DM, a subset of the population in higher education that has been under-researched in comparison to traditional-age students in four-year colleges.

The present research design involved in-person interviews of these students, whereas most higher education researchers have used surveys and data analysis with enrollment records, which suggested that students placed in DE courses performed better in accelerated course structures (Rustchow, 2019). I used Tinto's (1975) model of student integration and retention as a theoretical framework, a model that has been used by other researchers interested in social and emotional factors in facilitating student integration and retention (Astin, 1993; Bahr et al., 2019).

Validity

For this qualitative research, I employed member checking to validate the findings (Merriam, 2019). To enhance accuracy of the study, I used member checking to corroborate data from various participants to check for consistency, and to validate findings that emerged from the data. During member checking, I asked participants to make sure the transcription of their account was full and true (Merriam, 2019; Merriam & Tisdell, 2016). Furthermore, the inclusion of multiple voices in the lived experiences supported the credibility and trustworthiness of the findings.

Discrepant Cases

Discrepant cases, such as data that were contradictory or redundant, were discarded, because they did not contribute toward finding answers to the research questions. Information was edited, and redundancies were sorted out as data were fitted together and organized for ready access (Merriam, 2019).

Assumptions, Limitations, and Delimitations of the Study

Assumptions. Researchers make assumptions and hold preliminary beliefs (Creswell & Creswell, 2018). In the current study, I made the following assumptions:

The research questions would illuminate the lived experiences of DM NCBO students.

Participants would be honest and open in response to the interview questions.

Document information obtained from the OIER regarding course participation and grades would be complete and accurate.

Limitations. Limitations are possible weaknesses that are out of the researcher's control and may have affected the results of the study (Creswell & Creswell, 2018). I identified five limitations for this study. The first limitation was a result of the limited selection of DM NCBO students from one community college setting. The second limitation was the small, yet adequate purposive sample of 11 participants willing to participate. A larger sample size might yield different results. Additionally, the study was not longitudinal, and did not continuously follow participants through their journey in postsecondary education. The third limitation was that participants' memories and ability to reflect accurately upon their prior experiences was limited. The fourth limitation was that using a purposive sampling in this qualitative study may have limited generalizability (Merriam & Tisdell, 2016). This study's findings reflect only the transitioning of participants into college-level courses. The fifth and final limitation was that several students were enrolled as a part-time student (Cohen et al., 2014) or switched enrollment (Carrico et al., 2019). Time and other constraints make measurements of their success a

complex matter. It is important to delve deeper into the analysis of why students in other DE courses do not persist. With these limitations in mind, this research sets a foundation that may be complemented by future quantitative research to extend the results and provide additional context and understanding that could not be provided in this study.

Delimitations. Delimitations are the boundaries of research as it is being investigated (Creswell, 2017; Maxwell, 2020). Delimitations for this study included: (a) I limited the study to a small community college setting, because of the limited amount of time available to complete the study, (b) the participants did not include people from other disciplines that may have had similar challenges to contribute to the overall attrition rate, (c) participants were progressed through the DM sequences and enrolled in or had already finished a mathematics course at a college level, (d) the study focused on the participants' perceptions and experiences and not on placement test scores, performance data, or other variables, (e) the study focused on participants' narratives and not the institutional narrative, and (f) the primary framework employed was Tinto's (1975) student integration and retention model. I did examine other theories of persistence, experience, and retention. However, integration, affiliation, departure and persistence are the key concepts of Tinto's (1975, 1993) model.

Implications of the Findings

This basic qualitative study has the potential to affect social change because the findings may assist college administrators and other policymakers by: (a) helping them plan and implement programs that increase retention and reduce attrition of community college DE students; (b) support DE students through DM sequences in an accelerated

manner; and (c) improving persistence and graduation rates. Community colleges have sought to reduce attrition rates through a variety of acceleration models (Bond, 2019). College administrators familiar with this study could influence instructors to change their teaching strategies to increase student retention in mathematics courses and facilitate students' timely, successful completion. As faculty interact with students frequently and closely, they serve as valuable institutional agents who advocate for and support early college-level mathematics course-taking behavior (Karp et al., 2017).

Instructors, especially those who teach introductory college-level mathematics courses, should consider adopting high impact practices such as active learning (Hatch et al., 2018). By exploring several factors associated with students' academic preparation for, and success in, such courses, researchers will be in a better position to develop a model of educational attainment, which may help with educational reform efforts at the state level. Over the long-term, gaining stronger skills in mathematics will help students in the labor market and enhance the global competitiveness of the American workforce, which has lagged behind other industrialized nations in mathematics (Boylan et al., 2017). Postsecondary credentials also are linked to decreased unemployment, lower rates of lawlessness, and less welfare dependency (NCES, 2016; OECD, 2013).

In terms of theoretical implications, Tinto's (1975, 1993) theory of student integration continues to be a useful theoretical and interpretive framework, as the students sampled in this study meshed well with their community college, a significant factor in their academic success. Thus, the present study's findings were consistent with the theoretical framework, and with current theories in the field linking social and

emotional factors with persistence and academic success. The methodological implications of the present study include increasing the use of qualitative research, particularly in-depth interviews, in research on DE and acceleration. The present study helped advance the research methodology by uncovering students' perspectives on DM, which have previously been under-researched. Qualitative data gathered on students' perceptions may help determine aspects of the learning environment that best suit DM NCBO students to enhance their learning. To provide current and relevant information on the students' perceptions, it is important to investigate the main stakeholders, the students themselves.

Summary and Conclusion

To conclude, the purpose of this basic qualitative study was to explore the lived experiences of 11 community college students who successfully completed DM NCBO sequences. College and HECB officials designed the NCBO intervention modules to provide a method for enhancing the success of DM students in the accelerated program. The study was framed by Tinto's (1975) theory, which stated that several factors are responsible for student persistence and attrition, two of which are social support and feedback. The dataset for this investigation included transcripts from 11 individual interviews. Successive reviews of the interview transcripts allowed me to develop meaningful codes by comparing the themes across all codes. Thematic analysis was used to identify themes to address the research questions as indicated in the data analysis phase. Three findings emerged from the interpretation of the themes and subthemes: (a) convenience of location and schedule of classes, (b) desire to improve and succeed,

which included advantages of small classes, and (c) helps improve skills, leading to overall preparation from DM NCBO courses, and adapting to college, due to a desire to obtain a college degree.

According to the findings of this study, advisors should ensure that students have the necessary support systems in place to help them succeed. Additionally, students with lower levels of preparation, particularly in mathematics, may benefit from additional support found in the DM accelerated program or other support systems that provide basic skill development (Maxwell & Person, 2016; CCA, 2016) Another finding was that some students enroll in these programs to gain specific skills for job advancement, with clear vocational goals, and are more likely to progress and graduate. The present study may contribute to practice by looking at how exposure to the accelerated module helps guide students through these transformations, which may affect the success of DM students.

This study had several implications for policy, practice, and research. This research could elucidate participants' prior educational experience and factors that contributed to their success in DM NCBO courses. The results indicates that the effects of DE on students' learning and success in other courses. This study provides empirical evidence that may inform course design and development, program sequences, and academic advising at both the study site and in other similar community colleges. The findings indicate that completing DM sequences greatly contributes to students' credential completion.

The Findings and the Resultant Project

The present study explored community college students' experiences of successfully completing developmental mathematics remedial option. The project goals are derived from Section 2 findings. Study participants were aware of institutional practices that impact student completion rates. Strategies that address academic preparedness were discussed by participants during the interviews and were seen as significant factors in students' ability to succeed. These factors are cited in literature as best practices. Every participant mentioned convenience of location, flexibility in class schedules, advantages of small classes leading to a desire to obtain a college degree, and that the program helped improve their lives and academic skills. Additionally, these factors were mentioned within the broader context of supporting students throughout their student experience. The analysis of the data identified information that could be utilized at the study site to implement a policy supporting a corequiste model of instruction. Although there is no one-size fits-all process, the corequisite remediation policy will allow the stakeholders to examine the current curriculum techniques and identify areas of improvement to be customized for GCC. A corequisite modle has been supported by both longitudinal studies as well as programs in community colleges across the country (Carrico et al., 2019). Integrated reading and writing, modular math and corequisite remediation if properly implemented may improve completion rates in remedial or college-level courses (Chen, 2017).

Section 3 presents a brief description of the proposed project based on the findings from the study. The genre of this project is a Policy Recommendation with detail

to support XYZ. The project includes background of existing policy problem, summary and analysis of the findings, evidence from literature, project evaluation plan and implication, and outline of recommendations connected to the evidence and to the audience.

Section 3: The Project

Introduction

The study focused on community college students' experiences of successfully completing DM with a remedial option. The project is designed to provide GCC stakeholders and policymakers with information necessary to develop a plan to address college persistence, retention, and completion rates in DE based on the current study findings. The target audience are the stakeholders including GCC administrators, the president of the study site, the vice president of administration, the vice president of student services, the vice president of academics, the dean of workforce, the Board of Trustees, faculty senate, donors to scholarships and programs, and local businesses. Local businesses have a vested interest in student achievement of degrees and certificates. Understanding employment demands require regular communication, and networking among businesses, educators, and service providers (Agasisti & Belfield, 2017). This stakeholder group has significant influence to directly impact completion rates. To achieve the desired rates in completion, the study state would have to perform differently.

Mathematical skills are essential to the success of students, and the fulfillment of the challenges found in professional careers (BLS, 2019; Carriico et al., 2019). The research questions for this basic qualitative study addressed the perceptions of participants concerning the DM NCBO intervention program, conditions participants identified as influencing success of DM NCBO, and participants' perceptions about future success in college-level courses. The analysis of data collected from 11 semistructured interviews in Section 2 indicated that several strategies could be utilized

to address the problem of attrition since the state legislatures mandated a one-size-fits all solution. The emergent nature of the basic qualitative study led to findings that were directly aligned with research questions and helped shape the kind of state mandated corequisite policy project to address the problem. The findings were presented thematically and described students' perceptions about the DM NCBOA course sequence and what led them to success: (a) the need for a convenient location to attend classes and schedule of classes, (b) small class sizes to support peer collaboration and one-on-one interaction with instructors, and (c) preparation for college-level courses. Additionally, the findings from this study indicated a need for policy change to fulfill the state mandated requirement and support students in DE mathematics courses through the corequisite model.

In Section 3, a description of the project serves as a policy recommendation paper containing information on DM NCBO remediation policy for a recommended improvement model. In this policy recommendation paper, I discuss the merits and potential benefits of improving the DM NCBO program at GCC. This section includes the description and goals, the rationale for the project, review of the literature, recommendations, and project evaluation and implications. Analysis of current research and successful DM students' perceptions of the benefits of the DM NCBO course, allowed for the generation of suggestions for future DM courses.

Rationale

In choosing policy recommendation to address the problem of underprepared college students attending developmental courses in mathematics, I used findings from

this research, in combination with extant literature guided by Tinto's theory of retention, to substantiate the policy recommendations for corequisite remediation. Policies can serve to accelerate and enhance student persistence and completion (American College Personnel Association [ACPA], 2015; Brower, et al., 2017). Less than a quarter of community college students earn a credential or transfer to a 4-year institution within 5 years (CCA, 2016; Chen, 2017). There is high attrition due to high rates of enrollment in DE, family and school responsibilities, lack of integration into college life, and the cost of education (Hlinka, 2017). Developers and instructors of DE programs may adopt the reform strategies included in this policy paper. A new policy could, therefore, have positive implications for reform across the college's DE programs, and in other states that are considering reforms to improve persistence and graduation. Due to implementation of corequisite remediation policy, students scoring a 13 or below on the ACT are now identified as college-level at much higher rates (Logue et al., 2018). When developing a policy paper, it is necessary to substantiate the work by presenting results of the research to stakeholders (Mannin & Frye, 2017). Hence, an evidence-based policy recommendation will provide stakeholders with the opportunity to review the findings. The aim of this presentation is to create awareness and develop support for the proposed changes in the DM program.

Review of the Literature

I performed a thorough literature review to support my findings, and to prepare a background for the basis of the policy recommendation paper. I conducted literature review from scholarly, and/or current peer-reviewed articles related to policy reform

dated five years old, or less. Databases utilized for this project included Academic Search Complete, ERIC, Sage, ProQuest, Educational Research, and eBrary. Search terms were: *Community college policy, developmental education policies, curriculum policy, developmental mathematics policy reform, corequisite models, educational reform policy, program evaluation policy, outcome-based models, policy recommendation, white paper, and strategies* and *academic support*.

In reviewing literature pertaining to the project, I identified the most promising policy approaches for revising the structure, curriculum, and delivery of developmental education (DE) reform models. The literature review focused on several types of intervention policies for improving student progress through remedial education, and into college-level courses, with a specific focus on developmental math (DM). The discussion highlights trends in recommendations based on outcome data or the effectiveness of DE models.

When introducing recommendations for corequisite policy change, the participation of interested parties is essential, as they may provide additional information or perspectives to mitigate or solve the problem addressed by the policy recommendation (Logue et al., 2019.). Therefore, presenting and discussing the information contained in the policy recommendation paper is needed to create awareness, facilitate buy-in, and obtain alternative viewpoints (Community Evaluation Toolbox, n.d.). To be successful, change processes need the commitment and support of those affected by it (Cullen et al, 2014). Hence, I aim to arouse interest in, and facilitate awareness of the plight of DM students as I suggest DE policy change.

Policy Recommendation

A policy paper is a written report that reflects the attitude or intentions of a person or organization on a specific issue (Graham, 2015). Additionally, a policy paper is a research piece focused on a specific policy issue that provides clear recommendations for policy makers (National Collaboration Center for Methods and Tools [NCCMT], 2020). As such, a policy paper is firmly grounded in research that substantiates the writer's findings, and the rationale for the intended outcomes of the document. A policy recommendation paper provides the theoretical background for the recommendation (Sakamuro et al., 2015; Stelzner, 2007, 2010). The purpose of the policy recommendation is to "provide a comprehensive and persuasive argument justifying the policy recommendations presented in the paper, and therefore act as a decision-making tool and a call to action" (Young & Quinn, 2002, p. 18). The focus is on identifying key policy issues and applying the most current research to help understand and address the issues. Furthermore, a policy recommendation paper is generally expected to increase the involvement of the organization and individuals in an important effort to endorse the policy. Educating others through presentations of scholarly information may influence their perceptions and support (American Academy of Family Physicians [AAFP], 2019). Policy recommendations are the key means through which decisions are made in most levels of organizations. However, researchers contend, "policies are rarely implemented as written nor necessarily as intended" (Woulfin & Rigby, 2016, p. 295). The policy recommendation paper relies on the researcher's authority over the research conducted on the issue or the problem (NCCMT, 2020). Policies are used to regulate outcomes and

they are the *what* and *why* things are done (Swain & Swain, 2016). Therefore, a policy recommendation was the best option for this project to support GCC institute the state mandate on DE.

Hoang et al. (2017), documented policy tensions and challenges associated with developing programs in colleges, and a key survey revealed ambiguity as one of the barriers. For example, literature revealed a lack of specificity among colleges on the application of DE programs (Hoang e al., 2017). Community colleges have been termed the *contradictory colleges* because they represent a variety of societal purposes that may conflict with one another (Hoang et al., 2017). Challenges include responding to calls from federal and state policymakers for higher education to increase completion rates, and reduce the cost of earning a credential, finding effective ways to help underprepared students become successful, providing access to college information, explaining new college rating systems, coordinating across institutional boundaries to help mobile student populations to transfer more seamlessly and successfully from one institution to another, and responding to new performance funding (Doherty, et al., 2017).

Policy Recommendation Structure

In the world of policy, recommendations bring the issue to policy makers' attention. The decision maker or the stakeholder then refers to the paper for a deep analysis that supports the core findings and/or recommendations (Fagnant & Kockelman, 2015). Therefore, a policy paper must be developed systematically and with attention to detail. The author must pay close attention to the target audience, who may be the stakeholders. The recommended policy should detail *what s*hould be done, and not *who*

should be doing what (NCCMT, 2020). Policy recommendations are usually presented in a standard format, and all of them begin with an issue at hand. Whether the recommendation is accepted as sound advice depends on the how well the recommended course of action is presented (Fagnanat & Kockelman, 2015).

In an academic institution, such as the study site, stakeholders include the Board of Trustees, the president, academic administration, and the faculty senate. Well-written policies always have three parts: (a) issue, (b) analysis, and (c) recommendations (AAFP, 2019). I chose to develop a policy recommendation on DM. The focus of the recommendation was on the policies of remediation models based on the findings of the basic qualitative study that I conducted. This study focused on the lived experiences and perceptions of successful DM students. The choice of a policy recommendation paper is appropriate for this project as it aims to inform stakeholders and influence their perceptions of GCC DM in terms of both its success, and how to address the needs of the students using the corequisite remediation model mandated by the local state in 2017.

When developing a policy recommendation paper, it is important to be cognizant of the views and needs of the intended audience, so that the paper is pitched correctly, which includes defining the problem accurately and providing well-researched suggestions to address the problem successfully (Sakamuro, et al., 2015). This policy recommendation paper, therefore, includes a problem statement with detailed background on the problem, and discusses how it affects students, the local community college, and the wider public or interested and affected parties. The suggested solutions are derived from the study findings and extant literature, with reference to the theoretical framework

that guided this study. A discussion of how the suggested solutions will benefit the students, and the interested and affected parties, or stakeholders, addresses the needs of the audience by answering the question, "what is in it for me" (Sakamuro, et al., 2015).

Multiple resources on the art of writing policy papers identified the following topics to be included: description of the issue under scrutiny, statement of the problem, discussion of current policies or practices, alternative solutions to the problem, addressing the identified gaps supported by current research, and suggestions for policy change or action plan (Graham, 2015; Musandu, 2013). Musandu (2013) emphasized the importance of identifying the needs of the audience and using appropriate language to attract the audience's attention. Researchers emphasized the need for substantiating viewpoints with research findings (French-Constant, 2014). Literature identified the inclusion of a theoretical framework to guide the paper, and discussion of the research findings (Graham, 2015). Therefore, in this policy paper, I recommend that GCC adopt the corequisite model program to satisfy the legislative requirements of HB 2223. After writing the policy paper, it is important to disseminate it to the target audience, which includes GCC administrators, the Board of Trustees, and the faculty senate. Electronic and paper copies must be sent to the targeted audience (Fench-Constant, 2014), followed by leading a discussion to create a buy-in (Cullen et al., 2014).

In planning the policy paper, I employed recommendations from National Collaborating Center for Methods and Tools [NCCMT] (2020) and Peabody (2013). The following are some of the key sections that I included in the recommendation paper:

1. A clear and concise title easily understood by the reader.

2. A description of the boundaries of the recommended policy that includes the scope and to whom it is applicable.
3. Concise identification and definitions of the main points of the issues, as long sentences may discourage the reader.
4. Clear, readable, and accurate main ideas using active verbs and not passive verbs.
5. A compelling argument, and recommendations based on the most recent and accurate information.
6. Persuasive writing to construct an effective argument that the decision maker will find intellectually, and emotionally compelling enough to take action.
7. References to the community organizations that have identified as expert, and resources on the issue.
8. A thorough and persuasive argument for the policy position, where advocating for change is based on a summation of data findings.

Since the policy paper is a decision-making tool (Peabody, 2013), I intend to present my recommendations to stakeholders at the research site by using a strong argument for why this policy option (corequisite model) is the best course of action. The results of my study will be used to frame the argument in the discussion phase. Policy process will include the background of the problem, a summary of the research study, policy alternatives or options, and research-based evidence that led to the formulation of recommendations.

The Importance of Adopting Developmental Education Policy

Developmental education policies are a priority in many institutions (Cafarella, 2016; Maxwell & Pearson, 2016). In this section, I examine developmental education intervention policies in higher institutions of learning. Studies on the effectiveness of various interventions are imperative to ensure that reforms across the states, and institutions of higher education throughout the country, are effective in improving student outcomes.

Given the necessity to improve DE for underprepared students, the current study explored the course delivery for DE math and student outcomes. I focused on one intervention in DM course delivery that is shorter than the length of a semester and is associated with alternative delivery methods. Such an intervention has the potential to improve student progress and success by providing additional support, thereby increasing student persistence in degree programs (Dunigan et al., 2018). The goals of these reforms by community colleges were to enable students to achieve college readiness, successfully integrate DE students into college, and improve student retention and degree attainment (Brower et al., 2017; Xu & Dadgar, 2018).

Studies indicate that interventions have national significance (Cafarella, 2016). Several states are considering similar reforms to DE policies (Kosiewicz et al., 2016). In particular, the local state has been promoting innovative DE programming through legislation (Senate Bill 162, 2012) (Higher Education Coordinating Board [HECB], 2018). While qualitative research is not generalizable, the findings from the current study may be of interest to other states that may pursue promoting reforms to DM.

Developmental Education Reform Policies

States started implementing large-scale DE reforms to address the challenges of persistence and completion for community college students (Boylan & Trawick, 2015). Faced with the problem of low completion rates, policy makers, administrators, and members of the public are calling for change in developmental education policies. Complete College America has succeeded in getting many states to overhaul remedial education, urging lawmakers to replace such courses with credit-bearing courses that include tutoring and to "eliminate remedial courses completely" (Boylan & Trawick, 2015, p.27). Therefore, community colleges across the United States are developing alternative models of delivery with support from federal, state, and private funding. For example, the Bill and Melinda Gates Foundation, working alongside the Lumina Foundation, and Jobs for the Future have helped influence higher-education policy at the state level. Complete College America [CCA], (2016) has persuaded 32 states, including the District of Columbia, to join an alliance whose members pledge to develop and implement aggressive state and campus-level action plans to meet college-completion goals (Boylan & Trawick, 2015; CCA, 2016).

Alternate Models of Delivery

Academic institutions and states have implemented different reforms, such as accelerated approaches, shortened courses, a reduction in the number of required courses, reform of curriculum and instruction to improve student engagement, offering additional supports to complement instruction, and reforms of placement policies and advising policies that move students efficiently and successfully through DE at community

colleges (Melguizo, 2016). For this study, I examined a form of accelerated DE course; a DM course that allowed students to complete courses in less than a full semester without sacrificing the rigor of DM content. Only a few studies of accelerated delivery programs focused on shortened courses (Jessen et al., 2020), while other studies had alternative forms of acceleration, such as mainstreaming and paired courses (Ganga et al., 2018). However, studies on shortened courses revealed positive outcomes with higher passing rates in DM, and in subsequent college-level courses, and increased credit accumulation (Ganga, et al., 2018). This study focused on a single institution, with one approach to DE reform, the NCBO sequence. Although the representativeness and generalizability of findings may be limited, the results of the current study suggest that state initiatives designed to improve DE performance was associated with positive student outcomes. Even though new state policy required changes to DE, it did not dictate specific course design objectives (Wang et al., 2017). The research site is therefore charged with the responsibility of adopting the state policy of expanding a particular form of delivery, the corequisite model. As states continue to make policy changes to alter or eliminate DE, evidence may play a central role in helping administrators and policy makers choose alternatives that are most likely to lead to higher education success for students.

Placement Policies in Education

Most open-access institutions require incoming students to take standardized assessments in math, reading and writing, which are used to place students into their developmental or college coursework (Kosiewicz & Ngo, 2020). There is no national standard regarding assessment; hence, some institutions rely on the open-access policy

(Weiss et al., 2019). For instance, in a 50-state comparison, 31 states have a statewide or system-wide assessment and placement policy; 19 states or systems allow for the use of multiple measures in placement decisions (ECS, 2019). For example, California State University Board of Trustees' policy no longer requires a mandated placement into developmental education (Ngo et al., 2018). First time, first-year students who require DE are required to participate in the Early Start Program (ECS, 2019). However, literature indicated that California has 80% in DE, the largest number of all college students in developmental education, and 7% in developmental math (Ngo et al., 2018).

Florida State has a state or system-wide DE assessment and placement policy. The state statute of Florida directs the State Board of Education and Board of Governors to develop and implement a common placement test. In addition, institutions must implement a student success plan for students placed in DE (ECS, 2019). However, in 2013, the state of Florida passed a new policy that exempts students entering state colleges from placement assessment, regardless of deficiencies (Ngo et al., 2018). The State of Georgia has a more comprehensive approach on DE policies. The University of Georgia System Board of Regents' policy requires that associate or baccalaureate degree students be evaluated for placement in English (reading and writing) and math. All students must be enrolled in a college-level course with corequisite support by default, unless they meet exemption criteria (ECS, 2019).

New York State took a different policy approach, while there is no system-wide DE assessment and placement policy, state statute requires the state university trustees to develop a comprehensive DE program to be implemented as part of the master plan at

each state college and University of New York (Wyner et al., 2016). In addition, instructional methods are addressed by including accelerated DE offerings, and incorporating DE instruction into college-level programs by integrating strategies into the course. Also included are supplemental academic support, consolidated course schedules, advisement models and tutoring (ECS, 2019).

The State of Tennessee has been at the forefront of the reforms in DE. There is a system-wide DE assessment and placement policy. Tennessee Board of Regents academic guidelines outline DE assessment, placement, and learning support framework for the state community colleges and technical colleges. The approved assessments include ACT, SAT, or other assessments. Instructional methods are addressed, including corequisite courses and non-credit-earning interventions (Brower et al., 2018; ECS, 2019).

In. the state where the research was conducted, a system-wide DE assessment and placement policy exists for all higher education institutions (HECB, 2018). The Higher Education Coordinating Board requires every public higher education institution to assess the academic skills of every student (HECB, 2018). The only approved assessment is the Success Initiative (SI) offered by the College Board. However, multiple measures are allowed to determine placement, including high school academic performance and non-cognitive factors.

The strategies I discussed are a few examples of DE placement policies determined at the state level by statute, board policy, or a combination of both. Many stakeholders have pushed for changes in higher education policies and practices with

regard to placement in DE courses. Although to date there are few studies of these new programs, experts believe that college-readiness interventions show promise, especially when implemented statewide (Brower et al., 2017; Logue et al., 2017).

Potential Resources and Existing Support

This project is part of the research on DM students' experiences at GCC. Several avenues of support were developed which could be utilized for this project. During this study, I met with members of the GCC Board of Trustees and the Dean of the DE department who have a personal stake in the outcome of the research project. Additionally, a greater level of interest was developed among the faculty of the college, who often discuss DE/DM approaches and outcomes. This college-wide interest in DM may support the intended discussions of the policy recommendation paper. Therefore, there may not be a barrier to dissemination of information to the administrators, board of trustees, and faculty senate.

Potential Barriers

The most important potential barrier I may have to manage is the initial presentation of this policy recommendation paper to the stakeholders. To date, GCC has not completed research about students' perceptions of the DM NCBO sequence. GCC faculty were not interviewed for this study. Therefore, without the research support of the GCC faculty, the findings may not appear as important to the GCC academic senate, administrators, and members of the board of trustees. However, since this is the first study conducted exploring students' perceptions of the DM NCBO sequence, the

presentation to the administrators and stakeholders explaining the findings through the policy recommendation will be important to support change at GCC.

Although there has been widespread interest in the DM project, not all faculty and administrators are convinced of the merit of DM due to the high student attrition levels and poor student achievement. However, GCC may be committed to continuing the DM program because of the research results discussing benefits to students. I believe the academic senate and board of trustees will be interested in the study results and will be able to discuss suggestions included in the policy recommendation paper for program improvement. Furthermore, I plan to share the findings with DM and DE faculty to garner additional support for the policy.

Timeline for Policy Implementation

After completing my doctoral study and publishing the study in ProQuest, I will contact the chair of the GCC faculty senate to ask for a time to present the findings at the next available faculty senate meeting to familiarize faculty with my study and policy recommendation paper. The presentation will enable the academic senate to integrate my findings and suggestions into the other curriculum projects on the GCC campus. Additionally, I will send an electronic copy of the policy recommendation paper to all stakeholders, including the dean of DM, the academic senate of GCC, and the board of trustees for review explaining the purpose, goal, and objectives of my study. At that time, I will ask the president of the board trustees to allow me to present the findings to the stakeholders at the next trustee meeting. During my presentation, I will provide the stakeholders with printed copies of the policy recommendation paper. Following the

trustee meeting and discussion, I would ask for implementation of the recommended policy for the 2022-2023 academic year.

Role of Project Developer and Other Parties Involved

In my role as the researcher of the DM project at GCC, I am responsible for coordinating with the academic senate on the team of stakeholders. As each research project is entirely managed by the principle investigator, I must present the final data analysis and findings in the form of a policy recommendation paper to the identified stakeholders. I must ensure the findings are presented clearly and are not influenced by my own beliefs. In addition, I must present the limitations of the study together with suggestions for further research. It is my duty to inform the stakeholders of the policy recommendation paper by contacting them and seeking an opportunity to present the findings to them during one of their regular meetings. After receiving the electronic copy of the policy recommendation paper, stakeholders will be asked to read it carefully and request clarification on areas where they may have questions.

Project Description

The project developed from the research findings is a policy recommendation paper. The policy paper will then include proposed policy recommendations to increase the effectiveness of DM courses, and student retention, through a corequisite remediation policy model. The project goals include an overview of the findings of my research study, linking them to extant research and Tinto's (1975) model. This section reviews the ways states and institutions responded to the remediation problem by developing innovative approaches.

The corequisite remediation model places students in college-level or gateway English and mathematics courses, but pairs those courses with additional support (CCA, 2016; HECB, 2018). The aim is to get those students in courses that count for credit sooner, by implementing the corequisite model. Students take the remedial courses that run concurrently with their college-level classes. The corequisite model has been implemented successfully by more than 26 states including Colorado, Georgia, Indiana, Tennessee, some colleges in the local state and West Virginia (AACC, 2018). Tennessee was one of the first states to scale up corequisite remediation policy in mathematics, writing, and reading, for its community colleges (Tennessee Board of Regents [TBOR], 2019). The result was a significant increase in students passing college-level courses (TBOR, 2019). Approximately 20 states are moving to implement corequisite courses without a legislature mandate (AACC, 2018). In July 2017, the Governor of the local state signed into law House Bill 2223 mandating the use of corequisite remediation, as the required model for students in developmental courses (HECB, 2018). Institutions of higher learning were mandated by the HECB to implement corequisite model courses by the year 2020–2022. Hence, the GCC Board of Trustees should consider getting on board with the local state requirement of corequisite policy change, to put GCC at the forefront of a movement that has been gaining slow momentum in the local state. The stakeholders, GCC administration, DE faculty, academic senate, and board of trustees may have no choice but to buy into the corequisite curriculum reform policy.

Corequisite models vary. The models implemented in 36 community colleges studied (AACC, 2018) include five general model types, namely: paired course models,

extended instructional time model, Accelerated Learning Program (ALP), Academic support service models, and technology mediated model. The Paired Course corequisite remediation model was implemented by the 13 community colleges in Tennessee (Tennessee Board of Regents [TBR], 2019). DE students in Tennessee take entry-level college courses simultaneously with remedial academic support. The findings from the pilot study indicated the number of remedial students passing a college-level mathematics course increased from 12 to 51% (CCA, 2018). This is the favored model by many education reformers in several colleges including the study site (AACC, 2017). Remedial students attend a standard 3-hour mathematics course three times a week, in addition to 1-hour courses in English or a lab in science that helps them develop the skills needed to succeed in the college level class. DE students retain the same textbook and much of the coursework that was used for the traditional prerequisite DE course. Schedules are aligned, learning communities and collaborative teaching practices are established. Student-to-instructor ratio is smaller, although the class meets during the same week, in a smaller setting.

Results of the data analysis in Section 2, which form the basis of the recommendations, indicate a relationship between student support services and successful course completion. An important aspect of the project is to inform stakeholders of the results of the research, the theoretical background, and evidence from extant research leveraging support for suggestions on DE corequisite program design policy. Strategies outlined in Appendix A of the project are intended to guide stakeholders in their reform efforts, and to offer a sampling of practices that can help achieve intended results. The

approach to this topic includes the description of the project, the rationale, scholarly review of literature related to the topic, implications, recommendations, reflections, and conclusions.

Project Evaluation Plan

Evaluation is a "continuous process that begins in the preliminary planning phase and continues throughout the program" (Cafarella & Daffron, 2013, p. 233). Program evaluation is "a process used to define whether the design and delivery of a program were effective and whether the proposed outcomes were met" (Cafarella & Daffron, 2013, p. 233). Evaluation plans include goal-based evaluations for each presentation and workshop, and a summative evaluation for the entire project, which will span the contributions of all researchers.

A main goal of this project is to provide information regarding the DM students' perceptions of DM courses with a view to use this information in redesigning the courses and developing local policy on DM. When evaluating the project, it must be done in conjunction with the research project on DM at GCC. When planning presentations and workshops, it should be done with the desired outcomes in mind (Oshima et al., 2020). The academic senate team and I will, therefore, focus on the outcomes envisaged for each stakeholder group. The identified stakeholders for this project are the academic senate, board of trustees, executive administrators, program planners, and instructional faculty of the DE and DM NCBO courses at GCC. The question we will be discussing is how stakeholders should perceive DM differently, and what they can do differently after attending the presentation(s). In line with this, I will design summative evaluations to

determine to what degree the presentation of the policy recommendation paper (s) achieves those goals (Oshima et al., 2020).

The goals of the project will constitute the base of the evaluation. A summative evaluation will be performed to establish if the goals and objectives were addressed. Oshima et al. (2020) stated that this evaluation procedure should focus on changes in participants' experience. Summative evaluation forms will be disseminated at the end of the presentation, and all stakeholders will be requested to complete the evaluation. The evaluation forms will not collect the stakeholders' names, though they will be free to provide their contact information for follow-up discussions if they choose. Stakeholders will be asked to place the completed evaluation forms in a specified collection box. Data of the summative evaluation will be used to determine the success rate of the presentations, the acceptability of the suggestions, and areas of concern that must be addressed by the academic team and myself. Goal-based and summative evaluations will be analyzed and interpreted by the academic team and me. Stakeholders will receive a summary of the goal-based and summative results via e-mail.

Apart from a summative evaluation for the project, I will focus on a goal-based evaluation for my presentation of the policy recommendation paper (Community Evaluation Toolbox, n.d.). Oshima et al. (2020) explained that goal-based evaluation focuses on measuring goal achievement by a program or activity. Evaluating the outcomes of an activity enables planners to use past actions to plan better future actions (Vedung, 2017). Evaluation facilitates improved systematic planning and executing of actions, as well as grading of plans and their implementation (Vedung, 2017). The

outcomes of the present research, in combination with the literature and theoretical framework, formed the basis of the policy recommendation paper. The present research aims to enlighten stakeholders about the DM students' perceptions of the DM NCBO course, thus increasing their understanding of the students' views and experiences about what is important when attending DM. Moreover, the presentations and policy recommendation paper aim to enlighten stakeholders about what elements of the DM NCBO courses may facilitate student retention and success. This could lead to a program redesign that will foster greater persistence, retention, and increased graduation rates of students.

To achieve the goal-based and summative evaluation goals, I will use a dual system of feedback by noting the stakeholders' questions and discussions after the presentation to compile a questions-and-responses register. Apart from the notes taken during the discussion section, I will collect all flip chart notes used in workshops to assist me in developing a thematic analysis of the stakeholders' responses. Secondly, I will provide stakeholders with a short questionnaire to complete after the presentation, to obtain quantitative feedback (Oshima et al., 2020).

Project Implications

The overall goal of DE is to provide the necessary support for underprepared students to succeed in their chosen college courses (Park et al., 2018). The realizations that the outcomes of DE are poor, and that many students do not complete their programs, spurred a series of program design and redesign activities (Park et al., 2018). In support of program redesign endeavors, this project, together with the accompanying

research, was undertaken. The goal was to determine which factors successful DM NCBO students perceived as important in completing the course. This information is deemed important when redesigning DM courses to achieve improved student retention, persistence, and success. The findings may contribute to positive social change by assisting college administrators and other policymakers to: (a) plan and implement programs that increase retention and reduce attrition of community college DE students; (b) support DE students through DM sequences in an accelerated manner; and (c) improve DE persistence and graduation rates. Additionally, the project offers direct impacts on DE students by offering opportunities to increase their confidence and improve persistence, retention, and graduation rates. Overall, improved retention rates would not only benefit the rating of the community college but would also benefit the community by filling gaps in the workforce. Increasing community college students' opportunities for employment opportunities and earning potential could benefit the college, students, their families, and the community.

The policy recommendation paper that was developed in conjunction with the research project has the potential to provide stakeholders at GCC: (a) board of trustees, (b) academic senate, and (c) executive administrators with specific information pertaining to successful students' perceptions of DM NCOB programs. I supported the findings with extant literature and interpreted it in terms of the theoretical framework, which also guided the discussions of the implications. In Section 4, I share my reflections regarding the development of the policies concerning the program. I also discuss what I have learned through the process of research and scholarship during my doctoral journey.

Section 4: Reflections and Conclusions

In this section, I provide: (a) reflections and conclusions about the strengths of the project and (b) recommendations for remediation of its limitations with a discussion on scholarship. The reflections include: (a) my journey as a researcher, (b) project development and evaluation, and (c) leadership and motivation. I provide self-analyses concerning my role as a scholar, practitioner, and project developer. Finally, I discuss the potential impact of the project on social change together with suggestions about implications, applications, and direction for future research.

Project Strengths and Limitations

The goal of this project was to provide information on students' perceptions and experiences of the DM courses with a view to use this information in redesigning the courses and developing policy on DM. The strength of this project is that the creation of this policy recommendation paper consists of perceptions of successful DM NCBO students as collected in this study. Collecting the perceptions of the students provides information about which elements of the DM NCBO course positively affected their studies. This information is a potential point of departure for redesigning DM courses and making decisions pertaining to implementing DM NCBO more widely throughout GCC. Furthermore, the themes that emerged from data analysis are applicable to other DE courses as well and could be implemented more widely at GCC. Since this doctoral project forms part of a broader research endeavor on DM at GCC, its overall impact may be broader due to the collaboration and complementary nature of the other curriculum projects.

Although it is a strength that this project is part of a research project focusing on DM at GCC, that can also be regarded as a limitation. The relative impact of this project may be minimized due to its position within the main research. Additionally, there are constraining factors in the supporting environments that will need to be solved in the future. First, the accelerated model standards should be clearly stated in the policy design. Second, enough financial incentives should be provided to faculty to serve in the stakeholder team. In addition, not all stakeholders will approve the project at the same time; therefore, it may be met with less enthusiasm and interest from stakeholders who are waiting on other team members for approval.

The GCC Academic Senate will be requested to approve the policy recommendation project consisting of the research, policy recommendation paper, presentations to stakeholders, and possible workshops. Several discussions surrounding the project may occur. Even though this may be the case, it is possible that some stakeholders hold personal beliefs that may act as barriers when presented these findings. The identified stakeholders consist of GCC officials including the board of trustees, academic senate, DE curriculum committee, and executive administrators at GCC. Stakeholders may not read the policy recommendation paper thoroughly or skim it, and not be fully prepared when listening to the presentation. This can result in unnecessary questions or misunderstandings that could affect the success rate of the presentations. An executive summary that accompanies the policy recommendation paper was prepared to improve the stakeholders' understanding of the scope of the project, should they not have the time or motivation to read the complete document. It is with excitement that I prepare

for the communication opportunities this policy recommendation project may bring. However, I am aware of the possible limiting elements that might accompany such opportunities. To present the policy recommendation paper, different stakeholder groups must be willing to place the presentation on the agendas of their regular meetings. In conducting this study, I made personal contact with some of the stakeholders whom I could approach to ensure that the presentation will be placed on the agendas.

Recommendations for Alternative Approaches

An alternative approach in addressing student attrition and poor achievement in DM NCBO could be to conduct an empirical study utilizing questionnaires to collect data. An advantage of such an approach is the inclusion of a larger sample, which could be generalized across the state or country depending on the number of community colleges involved. However, this would not provide the unique perspectives of the basic qualitative study design and the contribution to the literature would be different.

Another alternative is a quasi-experimental design comparing students from DM and DM NCBO courses to determine which course format is more beneficial. Such a design would enable me to compare the views of the two groups, thus determining whether there are any differences in their expectations and experiences of the two courses. On the other hand, I would be limited to existing questionnaires or would have to design a questionnaire. In both cases, the data would be limited by the questionnaires, which would not provide the in-depth review that a basic qualitative study provides. However, the basic qualitative approach provided a thorough, in-depth holistic exploration of the topic.

Alternative Definition of the Problem

Researchers have indicated that a notable percentage of people in U.S. colleges are underprepared for college-level classes in at least one subject matter, most often mathematics (Park et al., 2018). Educators understand that mathematical skills are linked to student persistence and motivation (Rakoczy et al., 2019). I have defined the problem from a deficit perspective, namely students who are underprepared for college mathematics and in need of DM courses. An alternative definition could be to approach the problem from the viewpoint of the community college, namely measures implemented by the community college (GCC) to ensure student success in DM.

Alternative Solutions to the Local Problem

The diversity of the GCC student population, together with the relative high level of under preparedness for college, has resulted in high attrition rates with poor achievement. Nationally, the local state lags other states in graduation and retention rates (Boylan et al., 2017). Approximately 39% of students who enroll in higher education in the local state require DE courses (Hatch & Garcia, 2017). Despite various initiatives to increase student achievement and mitigate attrition, the positive results have been short-lived. If the present research site could improve the percentage of the students who pass its classes, the college could improve retention rates (OIER, 2019). If college officials do not improve the outcomes for DM, the school will not meet its academic goals. Thus, the research site could fail to meet SACS accreditation standards, which would result in the school needing to improve (HECB, 2018).

An alternative solution to the problem could be to address the issue of underprepared students at the high school level. Inspiring students to take their high school studies more seriously, thus avoiding the need to take DE courses, would be ideal. This could be done by recruiting employers and college students to address high school students to emphasize the importance of mathematics. Moreover, college students taking DM courses could inform students about the hardships associated with having to take these courses. Such presentations and discussions could motivate high school students to work harder on their mathematics at the high school level and be better prepared for college-level mathematics.

Another approach could be for GCC to set higher enrollment requirements, thus limiting the number of underprepared students entering the community college. Ngo et al. argued convincingly in favor of implementing different testing instruments that test more accurately in determining whether a student needs DE/DM courses. These researchers found that placement in mathematics classes below the student's skill level served to discourage the students. Challenging students may be beneficial. For example, Ngo et al., (2018) found that students who skip DM and went directly into college-level mathematics obtained similar pass rates as those who were not required to attend DM. By setting the enrollment requirements higher and employing more accurate assessments, GCC could sufficiently challenge its mathematics students to maintain their interest and effort.

In addressing the problems of student attrition, poor pass rates in mathematics, and dropping enrollment figures, the community college could implement another approach. Instead of researching the DM NCBO issues from the students' perspectives,

GCC management could change the curriculum by presenting only those courses that need minimal mathematics, thereby minimizing the need for complicated mathematical courses. Although this approach could increase GCC's pass rates, thus safeguarding it from closure, it would not be beneficial to students who depend on GCC to improve their job opportunities and earning potential.

As an alternative to developing a policy recommendation paper and presenting it to various stakeholders at GCC, I could have embarked on a more traditional doctoral study that does not necessitate an outcome such as a policy recommendation paper. I could have opted for developing professional development on this topic, which would serve to inform those at the practice level without involving the chosen stakeholders.

Scholarship, Project Development and Evaluation, and Leadership and Change

The doctoral program required me to challenge myself on various levels as I was both studying and doing research while holding a full-time job—not an easy road. This situation necessitated time-management and self-discipline, as I not only had to structure my life rigidly, I also had to discipline myself to complete the set tasks in the allocated time. The amount of reading and knowledge assimilation required in this study program filled me with apprehension. At the same time, I found reading and structuring the new knowledge very fulfilling and enlightening. By gaining more understanding into community colleges, student experiences, and alternative courses, I found myself constantly in a position where people asked for my perceptions on education matters.

Scholarship

When I began this doctoral journey, having to do the prerequisite program felt overwhelming at first. However, once I found a working rhythm, everything fell into place. The process of completing the doctoral study complemented my current work situation perfectly, as I found myself constantly drawing on my new knowledge. When engaged in scholarship and learning, one must stay focused and critically evaluate journal articles (Coleman et al., 2017). At first, this was not easy for me, and I had to work hard at the skill to appraise journal articles critically. The exposure to scholarly works and being contextually grounded enabled me to move forward as a scholar. This also informed my current work situation. Throughout this project, I had to stay focused on the lived experiences of students following DM courses and participate in discussions with other scholars in research, all of which enabled me to grow as a researcher and scholar. My doctoral studies enabled me to become a practitioner with a deeper appreciation into the underlying theory and research results. This enriched my practice and inspired me to stay focused on studying and theoretical inquiry in my daily educational practice.

As this project unfolded and I became more skilled and knowledgeable in educational and research matters, I found myself better equipped to participate in the academic discussion revolving around the research project. This brought my collaboration with research partners to a higher level, and I could contribute to the discussions in a more meaningful manner. The knowledge I gained throughout the study as well as the skills to observe and write more critically will continue to benefit me in my work situation and empower me to impact the community that I serve.

Project Development and Evaluation

My ability to structure and manage this research project while dovetailing it with the other projects and my daily work elevated my skills as a planner, manager, and practitioner. Conducting discussions grounded in a theoretical framework and having to integrate different views from colleagues and stakeholders afforded me the opportunity to better formulate my ideas and integrate other views without violating the theoretical underpinnings. Throughout the research and study process, I sharpened my skills as project developer, research partner, presenter, and evaluator. The completion of this project for my doctoral study option enhanced my managerial and administrative skills at GCC and facilitated my growth as a presenter and facilitator.

Leadership and Change

This journey has opened my eyes to a wide range of things. Literature has pointed out that feedback from students and faculty members can highlight the misalignment between their expectations. For example, a recent study suggested that students expected more guidance from faculty, but faculty members were unaware, because students failed to ask for help (Wang et al., 2017). What learners remember in education is an educator who establishes a culture of safety and support in their classroom, whether it is physical, emotional, or intellectual. I also learned that as an educator, I must take a leadership role in encouraging students to talk about their own views and experiences to open up opportunities for self-awareness. Through such opportunities, we can learn about ourselves, reflect on our roles, and achieve a greater responsibility in teaching and learning. These findings may be helpful for other colleges currently striving to find

solutions to the challenges faced by DM students and faculty. Although GCC accepts the challenge of providing the resources, curricula, and instructional support to serve the many educational needs of its students, lessons can also be useful for institutions that have implemented or plan to implement an accelerated model design.

The process of analyzing the DM NCBO course in the research study together with the participants' narratives of their perceptions, and reporting on it through the policy recommendation project, improved my leadership abilities. It was fortunate that I had to collaborate with colleagues during this research project, as I had the opportunity to learn from them during the planning and execution stages of the research. Those scholarly discussions served to focus my thoughts and allowed me to take the lead when discussing my project and findings. Although I have previously been in leadership positions, leading academic discussions was different, and taught me to stay open and focused in the face of differing perceptions. This prepared me for the presentations and ensuing discussion with the stakeholders when presenting the policy recommendation paper. I had to synchronize my deliverables with the due dates set by the University and colleagues, which challenged my organizational abilities. I also had to manage my workload and personal life. However, I learned to appreciate how factors contributing to student attrition often operate in combination, not in isolation. Additionally, the results of the study may be able to assist stakeholders to identify ways students can initiate, develop, and nurture meaningful relationships with appropriate people to navigate their college experiences and build a supportive community. Through this experience, I was able to identify the often-contradictory stories students may tell themselves about their

priorities, and the stories they live. I developed a better understanding about the work–life situation of my subordinates, which brought more empathy with their situations. As a result, my leadership style changed, and I became a more collaborative leader.

Reflection on Importance of the Work

Analysis of Self as Scholar

This paper centers on qualitative analysis to highlight the need to examine how successful students experience the accelerated design, and what they perceive as helpful for learning and retaining knowledge. As I explored these elements, I delved into adult learning theories and a holistic model, which tends to emphasize the significance of the processes over products and qualitative change over quantitative change. Additionally, it tends to emphasize the significance of the role of experience in facilitating the course of development, rather than the effect of training as the source of development (Vicary et al., 2017). With this and the preceding set of concepts as a frame of reference, I examined theories of Dewey's holistic model of experience (1938), Astin's input-output model (1999), Bean's student departure model (1980), and Tinto's student integration model (1975). Finding literature was extremely time consuming, as I spent long hours searching, reading, analyzing, organizing, and rereading peer-reviewed articles, books, and reports. It was a never-ending part of the project. Meanwhile, I had to balance full-time employment; family, including school-age children; study; and "other duties as assigned" from my employer. Although I know about the time management concept, I found it was not applicable in my case, because I had no time to manage. During the data collection phase, I had to practice interviewing skills, since I had to learn to listen intently and not

to interrupt the interviewee. At the same time, I had to take notes, which helped me immensely during the transcription phase, so I could accurately remember the responses. Transcribing the recordings was very time consuming, as I had to listen to a recording many times to get all the elements of the response.

Throughout the doctoral program, I had to stay open and not allow my preconceived ideas to cloud my interpretation and participation in scholarly discussions. Initially, I was not aware that I held different beliefs on education or that I imposed boundaries on several aspects of my daily encounters with colleagues. This awareness of the self-imposed barriers marked a breakthrough. As a scholar and practitioner, it allowed me to grow by stretching my boundaries. Prior to embarking on this doctoral journey, my focus was mainly on the practical execution of daily work, and I did not really bring scholarly pursuits into my work environment. As a result of this study, I am now able to function as a scholar-practitioner. This brought a new dimension to my participation at work and during the research discussions with my colleagues. Where I had previously regarded research with apprehension, I am now motivated to make this part of my life. I will continue to explore issues in this fashion by posing questions, finding explanations in literature, and gathering information before concluding. I will stay aware of my tendency to make assumptions that could act as barriers to fact-finding information and reaching accurate conclusions. I have learned to approach research findings critically and not to accept statements as facts. I will continue this newfound approach.

Analysis of Self as Practitioner

My colleagues and students have always indicated that I am effective as a teacher and administrator. I have constantly looked for ways to improve my practice through observing others' activities and actively looking for ways to augment my administrative and practical work. A habit that I developed was to question the outcomes of the educational practice and ask how the curriculum could be changed to equip the students better for their future lives. My effectiveness as an administrator and practitioner will be confirmed after the completion of this doctoral program. I was particularly challenged during this study in terms of my organizational abilities to effectively manage both my time and my various roles. In that regard, I have grown tremendously. The journey of this study confirmed my ability as practitioner and at the same time questioned it. I accumulated new perspectives and had to change my practice as a result. This brought momentary discomfort until I found a new equilibrium and gained self-confidence in the knowledge that I now am a better practitioner than before. I will continue to study and challenge myself to grow as a practitioner and assist adult learners in their search for excellence.

Analysis of Self as Project Developer

Initially, the thought of developing the policy recommendation project filled me with apprehension. Through a structured approach and with the support of my Chair, I succeeded in breaking down the complex task into manageable portions. I had been managing different projects in the past, and these projects were familiar. I had specific guidelines to follow which made it easier to master. The doctoral project that I chose was

unchartered territory to me, and I had to make a series of decisions along the way. For instance, I had to decide on the problem to be studied and develop corresponding research questions. Thereafter, I had to choose the best methodological design and theoretical framework. Collecting and analyzing data brought with it several issues that I had to negotiate to best execute the task and align all the aspects of the study into a well-structured product. Throughout this process, I had to collaborate with colleagues, which required that I take a leading role in developing and executing aspects of the project. This total process facilitated growth in my project management abilities, and I am certain that future similar projects will reflect increased capability.

The project development phase came as a surprise because it was never discussed in any of the residency programs I attended. My initial reaction was that I would have to go through another study that I never envisioned. I felt completely overwhelmed until my chair explained that it is what is referred to as a white paper and that it is not like a proposal. Initially, I had no idea about developing a policy recommendation paper, and I felt challenged by the process it would involve. The purpose of the policy recommendation paper is to educate and help the readers and/or stakeholders make decisions in choosing the policy that suits their needs best. However, I still dreaded the idea of writing the statement of the problem, the rationale, and conducting a literature review on a variety of subjects including DM, student participation, educational experience, persistence, undergraduate students, mathematics and preparedness, instructional strategies, leadership, policies, basic skills accelerated programs, and technology in education. Since the methodology involved a qualitative approach, I was

concerned about the time it would take to complete data collection and analysis, and whether the findings would be consistent with the theoretical framework. Nevertheless, I was determined to stay motivated and to overcome every challenge that came along the way. Reflecting on the doctoral process revealed to me that although it has been slow and sometimes painful, it was worth the journey. Guidance from my chair and the committee member helped me to move forward with faith. Local librarians at the research site were a valuable resource. The process of research will remain my life-long learning.

Reflection upon Importance of Work

Community colleges have been under scrutiny for some time due to issues of student dropout and poor grade achievement coupled with significant financial outlay. The question of how to deal with underprepared students and how to equip them better for their lives as working adults has been asked repeatedly. Although several programs have been developed and implemented as a result, the changes were not lasting or significant. Although this policy recommendation project aimed to address a local problem, it touches on a national issue in higher education. This project has, therefore, implications locally as well as nationally. It is essential to execute this policy recommendation project with the utmost care during presentation of the policy recommendation paper at the local level as well as at conferences nationally. Publishing the results of the project in journals will attract attention of educators involved in the education of underprepared students. Academic institutions may compare policies and practices and consider appropriate ones for adoption.

Implications, Applications, and Directions for Future Research

The increased awareness raised due to the project has the potential to impact organizational processes and bring about positive change. This basic qualitative study and accompanying policy recommendation project can potentially affect educational practice at the local community college, GCC, and other colleges that experience similar issues with underprepared students in mathematics. By presenting the findings to the stakeholders of GCC, and through presentations at national conferences, changes in practice may follow. As a result, changes could be instituted at colleges that would bring about positive social change in the academic offerings to underprepared students. Those changes could lead to their increased success in occupational courses and eventual graduation. In the following section, I will discuss the potential impact of the study project and suggest directions for further research.

The Project's Potential Impact on Social Change

An important aspect of this project is that it forms part of the research aimed at positively impacting DM courses at GCC. The project has the potential to affect social change because the findings may assist college administrators, the Board of Trustees, and other policy makers by a) helping them plan and implement programs that increase retention, and reduce attrition of community college DE students; b) support DE students through DE sequences in an accelerated manner, and c) improve persistence and graduation rate. As such, this research focused on the perceptions of successful DM NCBO students aiming to facilitate informed decisions about selecting and redesigning DM courses. Several approaches were developed to address the notion of underprepared

students entering colleges to address the issues of accelerating developmental students, decreasing attrition, and increasing student achievement (Boylan et al., 2017). Although the DM NCBO programs and approaches met with some success, the results were varied and often decreased with time, which may be due to implementation issues (Allen et al., 2018).

The approaches of the different researchers ranged from targeting the students who were near college-ready to a general viewpoint (Huang, 2018). The issue of accelerating developmental students has significant financial implications to the U.S. taxpayer, and the students' failure to successfully graduate or obtain certificates affects their future careers and gainful employment. Therefore, it is imperative to identify strategies that lead to student success and mitigate student attrition.

This current project adopted a top-down approach by exploring the needs and experiences of successful students to find a solution to the problem of attrition and poor achievement. Implementing the findings of this project, when redesigning DM programs, may result in more successful students, higher levels of mathematical competency, and successful completion of courses, which could lead to social change. Additionally, the project offers direct impacts on DE students by offering opportunities to increase their confidence and improve persistence, retention, and graduation rates. Overall, improved retention rates would benefit the rating of the community college and would also benefit the community by filling gaps in the workforce. Increasing community college students' opportunities for employment opportunities and earning potential could benefit the college, students, their families, and the community.

Individual Change

The distribution of the findings of this research, as well as that of the project, which is the purpose of the policy recommendation, may lead to the successful redesigning of DM courses to accelerate developmental students. Failure can discourage students from realizing their educational goals (Saxon & Martiroysyan, 2017). Therefore, it is essential to find ways to ensure student success. Successful completion of the DM courses opens opportunities to developmental students as many college courses build on mathematical skills. Improving their mathematical skills will better enable students to enroll in college programs where they could obtain a certificate or degree, which brings with it increased employability and better salary prospects (Smidova, 2019).

Institutional Change

Many students, especially those who are enrolled in algebra courses, do not complete the course sequences because they drop the course or drop out of college (AACC, 2018; Hodara, 2019; Hoang et al., 2017). This reflects poorly on the college's record of accomplishment, and may result in funding being withheld, which has implications on the college's ability to provide quality education (Smidova, 2019). An instructional method that addresses the needs of the students, and the incoming students at GCC who require remedial coursework, is important (HECB, 2018). Reporting increased success rates will better enable GCC to maintain their current status and funding levels, including eligibility for increased funding in the future.

The goal of this policy recommendation project was to spread information to stakeholders, such as the GCC Board of Trustees, to raise support for the continuation of

the DM NCBO program and to redesign DE/DM courses to include the findings from this project. Such changes could increase student retention and successful completion of courses, which would contribute to the students' gainful employment. That, in turn, could benefit the larger community.

Applications

The objectives of the policy recommendation project focus on the local community college and surrounding community, which includes the distribution of the information to the stakeholders. Furthermore, presentations to national bodies and publication in peer-reviewed journals that will disseminate the information to a wider audience, are envisioned. The research that informed the policy recommendation paper was a basic qualitative study that focused on the lived experiences and perceptions of successful DM NCBO students.

Although the in-depth findings are not generalizable or representative of a particular population, they are informative for educators, policymakers, and other stakeholders to meet the specialized needs of students who are not prepared and are in DE and DM. The inclusion of multiple sources of data and multiple voices of the lived experiences contribute to the credibility and trustworthiness of the findings. As indicated by prior researchers (Haupt et al., 2018), community colleges are redesigning their DE programs to accelerate developmental students and increase student success.

Postsecondary institutions are redesigning course formats to help developmental learners acquire mathematics skills and transition into credit-bearing programs (Chrysikos et al., 2017). The current study approached the issue of program design from

successful DM NCBO students' viewpoints, constituting a top-down approach that could be used in tandem with the current program redesign efforts.

Directions for Future Research

The decision to embark on a policy recommendation project was driven by the main research, of which this research forms a part; alternatively, this research could be completed, and the information disseminated via publication only. The narrative data analysis yielded themes pertaining to successful DM NCBO students' experiences and perceptions of the course. These themes were indicative of elements of the existing course that contributed to the students' persistence and successful completion of the course. Inclusion of the notions covered in the themes in redesigned programs could contribute to increased persistence and course completion of other similar courses. To verify this notion, a quasi-experimental study design could be used where the only difference between the two study samples is the inclusion of the findings discovered from the current study. Another direction of research could be to design questionnaires that include the findings of this research for surveys targeting a larger sample across the United States to determine which factors lead to student success and persistence. Lastly, replicating this study with a larger sample that includes both successful and unsuccessful students and addresses the students' performance in relation to their demographics—gender, age, race, ethnicity, and socioeconomic status—could increase understanding of which factors most affect the decision to continue the course or drop out, and overall course success.

Conclusion

In the United States, the issue of underprepared students is so prevalent that over 50% of community college students attend at least one developmental course (Logue, 2018). Policymakers and scholars are alarmed at the poor success rates of the large body of students registered in these courses (HECB, 2018) as well as the high costs. Students enrolling in DE courses are typically identified through standardized placement tests as academically underprepared and requiring developmental coursework (Goldwasser et al., 2017).

The purpose of this study was to explore the perceptions of DM students who successfully completed sequences of DM NCBO sequences. This study research project took place at GCC, which stands to lose funding and status should it not succeed in increasing student persistence, retention, and successful completion of courses. This study was relevant to the local community college where findings may support strategies designed to inspire students to prepare for higher-level education, and careers that they might otherwise not have considered. Moreover, the study may contribute to social change when used by college planners and administrators to plan infrastructure and prioritize funding of the projects and programs. These programs could directly affect students' confidence and contribute to improved persistence, retention, and graduation rates.

The fact that GCC's DM NCBO course proved successful for a portion of its students is indicative of its usefulness and the continuation of the course. It shows that this course is relevant and useful to the students by enabling them to pursue their desired

study programs and career choices. The findings of this research largely provide confirmation of Tinto's (1975) model for student retention, which formed the theoretical background for this study, thus increasing the applicability of the findings. The project linked to the research included policy recommendation together with a policy recommendation paper and presentations to stakeholders. In collaboration with the faculty, I will be presenting the findings and recommendations of this research at larger forums such as national conferences and journal publications. It is my hope that the outcomes of these endeavors will not only contribute to the increasing body of research on underprepared students but will also make a definite contribution in addressing the pressing issue of underprepared students. I hope to contribute to the acceleration of their development and, thus, their future employability.

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Appendix A: The Project

Policy Recommendation: A Corequisite Model of Instruction for Community College Students in Developmental Mathematics Non-Course Based Option

A Policy Recommendation

by

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Executive Summary

Gulf Community College (GCC) was experiencing low retention rates of students in the developmental education (DE) program, specifically in developmental English (DEE) and developmental mathematics (DM). Students failing to pass DE courses, were unable to enroll in college-level courses in a program of study. Therefore, to improve retention in DE courses in 2012, GCC instituted a corequisite model of non-semester-length and non- course-based options (NCBO) in DM. To date, GCC has not conducted research about the DM NCBO course sequence and no policy exists supporting this corequisite model of instruction. Therefore, the purpose of my study was to explore the lived experiences of community college students who successfully completed DM NCBO course sequence. I conducted face-to-face semistructured interviews with 11 junior level students during the 2015-2016 academic year who successfully completed the DM NCBO sequences with a grade of C or higher. Three findings emerged from the interpretation of the emergent themes. In order to be successful in the DM NCBO program sequence, DM students need the following: (a) a convenient location to attend classes along with schedule of classes, (b) support for the internal desire to improve and succeed, which students feel comes from the advantages and benefits of small classes, and (c) the ability to improve math skills, which leads to overall preparation from DM NCBO courses while helping students adapt to college and help them achieve degree completion. The findings indicated that to address the problem of low retention in DE students, GCC should develop a policy to support the corequisite model of instruction for

DM. Therefore, I wrote this policy recommendation paper to support a new policy titled, *A Corequisite Model of Instruction for Community College Students in Developmental Mathematics Non-Course Based Option.* This policy recommendation paper includes the following sections in support of a corequisite model of instruction for DM NCBO course sequence: a statement of the problem with detailed background of the problem at the local level, a discussion about how the problem effects students, GCC, and the local community, recommendations supporting a new policy, and conclusion.

Problem Statement

The problem prompting this study was low retention rates in DE courses at GCC, especially in DM and DEE. According to the department chair in the mathematics department, only 41% of first-time college students passed DM in 2009. Additionally, community colleges across the state were experiencing similar issues. To improve retention rates the Higher Education Coordinating Board proposed a corequisite model supporting non-course competency-based options (HECB, 2009). The local state legislature then emphasized that DE could be offered to learners in different ways to address the unique developmental needs that students have, especially through non-semester-based or non-course-based developmental interventions (HECB, 2009, p. 2). Therefore, in response to the HECB proposed instructional model and the state mandate, starting with the 2010-2011 academic year, the statewide DE plan described the need to pioneer creative or novel projects aimed at effectively addressing the distinct needs that

learners should improve their career readiness and overall academic performance (HECB, 2009). Beginning in September 2012, GCC implemented the NCBO accelerated program.

Problem at the Local Level

Improving DE outcomes is a major focus of activities of GCC. Many of the colleges and universities nationally and across the local state are redesigning their remedial programs. The goal of DE is to improve the academic performance of underprepared students, so they may pass gateway courses and enter a program of study in less time (Maxwell & Pearson, 2016). One strategy is to adopt a "*corequisite"* approach in which students take entry-level college courses simultaneously with remedial academic support (Lee, 2020).

The Concurrent and Consecutive models were reported to be popular and were studied rigorously by many students (Lee, 2020). The Tennessee Community College System, one of the national leaders on remediation reform, determined that the corequisite approach could work for all students, including those with low ACT scores (Lee, 2020). The concurrent or consecutive corequisite remediation model allows faculty to focus on content and structure, while ensuring that alternative methods are explored. Furthermore, the corequisite model is data driven with information taken from a longitudinal study of 13 community colleges, and a wide range of sources was utilized to help determine scope, content, effectiveness, and efficiency (Lee, 2020; Valentine & Price, 2021).

Since the reform efforts were initiated by the study state regulation, it was imperative that the study be carried out at the study site to mitigate the problems discussed in the next section. The study explored the perceptions of developmental Mathematics (DM) students at GCC who successfully completed sequences of non-course competency-based options (NCBO). GCC could lose funding and accreditation status if student attrition rates continue to increase, and student retention rates continue to fall. To date, GCC has not completed research about DM NCBO sequence, nor has a policy supporting the corequisite model been developed. The findings from the current study revealed the following, a) the location of the study site to be convenient for attending and scheduling classes, b) the small class sizes the allowed for the support of peer collaboration and one-on-one interaction with instructors, c) the program prepared students for college-level courses This study is part of a project at GCC exploring a corequisite model policy for DM students. Therefore, this study may provide a foundation for the new statewide corequisite initiatives directed toward increasing retention and graduation rates (HECB, 2018). The new corequisite initiatives focused on reducing the amount of time students enrolled in developmental education (HECB, 2018). Since the initiatives are relatively new, no widely published research has addressed the impact of NCBO accelerated on students' successes. Hence, this study may result in the enrichment of the educational experience for DE mathematics students in 2-year colleges.

Considering the proposed corequisite policy, state legislators, external stakeholders, and institutions may employ methods that will move students through DM requirements at a quicker rate while improving the students' pass rate in DE courses allowing them to move on to college level courses. Redesigning the curriculum to support a corequisite model has already been implemented in many community colleges in the nation (AACC, 2018; Manning & Frye, 2017). The state higher education strategic initiative issued recommendations of policies and practices that sought to accelerate the progress of DE students to college-level courses (HECB, 2018). The corequisite model was one of the state-mandated policies required of all public 2-year colleges and universities in the state to be implemented by the year 2022. In addition, Manning and Frye (2017) indicated that corequisite courses allow students to maintain pace toward a degree by enabling them to receive simultaneous supportive, supplemental instruction, and college-level credit.

Effect of the Problem

Research on retention has been one of the most widely studied topics in higher education over the past 40 years. Levels of academic preparation, commitments, motivations, and other individual characteristics shape the reasons why students attend college, and directly affect the chances that students will be retained and persist to earn a postsecondary degree. Studies indicated that most students who enroll in courses at community colleges do not intend to earn degrees; therefore, retention varies by type of program within community colleges (American Association of Community Colleges

[AACC], 2019]; Boylan et al., 2019). As such, each institution must use different retention strategies to fit the specific needs of its students, and the context of that institutional environment. The knowledge of student behaviors would be beneficial in finding ways to help students achieve their academic and social goals, and to assist students in developing a desire for lifelong learning. Despite the research that has been conducted to date, little work has been devoted to the development of a model for student persistence. The corequisite model would be used as a guideline for the study site, Gulf Community College [GCC]. Additionally, the model would help with the creation of policies, practices, and programs to enhance student success in developmental education [DE]. In this regard, a significant gap remains between the nature of student retention and what practitioners know that would enhance retention. This policy recommendation paper describes the design and development of a corequisite model of instruction to support developmental mathematics education students at GCC.

Mathematics skills are essential to the success of students, and the fulfillment of the challenges found in professional careers (BLS, 2019; Carrico et al., 2019). According to HECB (2018), if the local state's economy is to continue to grow and create the high-skilled, high-wage jobs that will define the workforce of the future (Bureau of Labor Statistics [BLS], 2019), the state must provide high-quality postsecondary instruction, research, and student support at higher education institutions. Additionally, local businesses have vested interests in student achievement of degrees and certificates. Understanding employment demands require regular communication, and networking

among businesses, educators, and service providers (Agasisti & Belfield). The stakeholders' group has significant influence to directly impact completion rates. To achieve the desired rates in completion, the study state would have to perform differently. As a result of HECB (2018), college administration at the study site designed strategic programs to increase retention by 20% through a learning community program, a mentor program, and a bridge to excellence program, which support advising, drop-in tutoring, and technology. Initially, the motivation for instituting these programs came from a desire to bring retention rates in line with the national average of comparable colleges (OIER, 2018). However, attrition rates increased locally after the financial crisis in 2008 and then have remained high with the average retention from fall 2008 through spring 2011 at 65%, 63%, and 59% respectively (OIER, 2018).

In 2009, fall-to-spring student retention averaged 73.4% and fall-to-fall retention averaged 40.3% (OIER, 2018). During the Bridge to Excellence (BTE) program in 2014-2015, retention was 74.4%; in Mathematics, the retention rate was 42.6% (OIER, 2018). According to data from the OIER (2018), during the 2014-2015 academic year, the retention rate was 73.5%, with Mathematics having a retention rate of 44.1%. When the college administration examined the overall enrollment of students, and those who graduated, fall-to-fall retention rate was 59.7%. However, the study site is a non-residential community college with 73% part-time students, considered by HECB (2018) as an average level of retention in comparison to similar colleges in the study state.

Therefore, retention continues to be a vexing problem for the study site both for part time and full-time students.

Nationally, the local state lags other states in graduation and retention rates (Center for Community College Student Engagement [CCCSE], 2020; HECB, 2018). Approximately 54% of students who enroll in higher education in the local state require DE courses (HECB, 2018). For example, about 40% of students enrolled in the required Mathematics remediation programs made up over half of the Mathematical offerings at the study site (OIER, 2018). If the study site could improve the percentage of students passing these classes, the college could improve retention rates (Boylan et al. 2019). According to the Office of Institutional Effectiveness and Research [OIER] at the study site, between 2016 and 2019, 56% of the students enrolled in DM courses either dropped out or failed to persist, while another 13% opted to defer their enrollment into developmental courses until after their first year in college (OIER, 2018). Furthermore, a student in the basic arithmetic course might take two years of Mathematics classes before being able to enroll in a college-level course (Woods et al., 2018). Additionally, students may be placed on academic probation before beginning each academic module, due to their inability to pass a DE course (OIER, 2018). Therefore, DM courses have a significant effect on students' ability to take traditional academic courses, which requires a longer time for them to achieve their degrees, and future employment (Woods et al., 2018).

According to HECB (2018), the local state initiated numerous pilot efforts to increase college access, persistence, and graduation rates for underprepared college students. However, few efforts yielded positive outcomes for DE students, resulting in students not completing their degree requirements within a prescribed amount of time (Boylan, et al, 2019). Therefore, college administrators are considering alternative innovative approaches to DE to expedite student progress in mastering important academic competencies. State legislators considered the non-course-based option (NCBO) for preparing at-risk students with the skills and dispositions they need to be able to move beyond remedial Mathematics (HECB, 2018). The goal of retention is to have college administrators address the specific needs of each student based on course parameters that are outlined in the legislation for House Bill [HB] 2223:

> Each institution of higher education shall develop and implement for developmental course/intervention, other than adult basic education or basic skills education using a corequisite model under which a student currently enrolls in a DE course/intervention and a freshman-level course/intervention in the same subject area (Dunigan et al., 2018).

House Bill 2223 requires the use of corequisite remediation as the model for students in DE courses. Corequisite remediation places students in college-level, or gateway English and Mathematics courses, and pairs those courses with additional support (HECB, 2018). The corequisite model allows students to enroll concurrently in a freshman-level college course, and a DE course; an intervention designed to support

student success in the college-level course (Dunigan et al, 2018). Consequently, DM courses were not the sole characteristic in determining GCC's status with the Southern Association of Colleges and Schools [SACS]; however, during the 2014-2015 SACS accreditation process, officials used DM courses as one of the indicators to determine student academic progress. Based on the resulting SACS report, if GCC fails to improve the outcomes for DM, the school will not meet the requisite academic goals resulting in a citation. To date, GCC has not adopted a policy supporting HB 2223. Therefore, there is an immediate need for policies and recommendations to support DM courses and curriculum to improve retention rates. The following section discusses the suggested solutions to the study problem derived from the study findings and extant literature, and the theoretical framework that guided this study.

Rationale for Corequisite Model Policy

I conducted the current study to explore the lived educational experiences among recent baccalaureate-aspiring college students who attended a community college and completed DM sequences. A basic qualitative inquiry was appropriate for this study since it aimed to acquire a deep understanding of how the college experience transformed the lives participants as interpreted through the lens of each participant. Thus, the methodology was an appropriate method utilized to examine how and why changes in students' behavior led them to complete DM sequences successfully at GCC. Given the limited research on the context of success on DM NCBO sequences, I conducted an exploratory study using interviews as the primary data source to achieve a holistic

understanding of a single case (Creswell, 2017; Creswell & Creswell, 2018; Merriam & Tisdell, 2016). Since this study is part of a larger project at GCC exploring corequisite acceleration policy as potential DE model of choice for the local state, the study is limited to primarily students in developmental mathematics [DE] division.

Three research questions explored the perceptions of the participants concerning DM NCBO intervention program, conditions participants identified as influencing success of DM NCBO courses, and the perceptions of participants on Math education regarding their future success in college-level courses. This top-down approach brought rich narratives and unique insights that were arranged in emerging themes to inform and to generate suggestions for future program planning. Student perceptions strongly coincided with Tinto's (1975) model of student retention and resonated with Knowles' (1984) guidelines for adult education.

The data analysis conducted demonstrated a strong relationship between accelerated program, student progress, and readiness for advanced college-level mathematics. An evidence-based policy will provide GCC with the opportunity to review the results of the current study to implement a corequisite model to improve student graduation rates. The new policy at the local state mandated that all the state's public colleges and universities with DE programs have 25% of DE students enrolled in a corequisite course model by the first year of implementation, 50% enrolled by the second year of implementation, and 75% by the third year of implementation (HECB, 2018). Gradual scaling up based on research findings will provide GCC an opportunity to assess

the NCBO corequisite model and demonstrate to lawmakers its effectiveness. Adoption of the corequisite model may put GCC at the forefront of a movement that had been slow to gain speed in other parts of the state (HECB, 2018). While many corequisite models and programs have proven effective, there is no *one-size-fits-all* approach for students (Maxwell & Pearson, 2016). Based on findings from the current study, the concurrent and/or consecutive corequisite models would be the best fit for GCC.

National program accreditation for educational institutions ensures program quality with the oversight of state, and federal governing bodies, such as American Association of Community Colleges [AACC] (2019), Education Commission of the States [ECS] (2019), and Southern Association of Colleges and Schools [SACS] (Eaton, 2019). Hence, it is imperative GCC remains in good standing with the state government by implementing a corequisite model. Moreover, the NCBO corequisite model policy would upgrade the current NBCO, while fulfilling the state requirement. Findings from the current study were used to develop recommendations for research and practice within a corequisite model.

Themes that emerged from data related to factors that positively affected student experiences in the NCBO program. Factors that facilitated GCC students' satisfaction with the NCBO program and the benefits of a corequisite model included (a) small class sizes that allowed meaningful interaction with peers, and instructors, (b) instructors who spent one-on-one time with students and who were available by telephone and email to answer questions, (c) instructors who showed genuine concern and interest in students'

well-being, (d) open communication channels between students and instructors which facilitated self-confidence and enabled the students to ask questions in class, (e) participation in campus activities as a result of classroom participation, (f) flexible scheduling of courses and low tuition. These findings are consistent with Tinto's (1975) quoted by Chrysikos et al., (2017) theory of integration. In order to persist, students must be academically and socially integrated in the institution.

Students' willingness to integrate socially relies heavily upon their sense of belonging. Data analysis from the current study suggested that having a positive classroom experience may be a way to integrate GCC students into college life, and to enhance their sense of belonging, which may lead to improved persistence and success. Inappropriate placing of students into DE programs has been cited as one of the barriers to student success (Bahr, et al., 2019; Lee, 2020).

The findings also suggested that one of the factors that contributed to the success of DM NCBO students resulted from efficient instructional methods employed by instructors. Consequently, the formation of a task force to customize opportunities for specific needs of faculty will be explored. The task force will be responsible for bringing in trainers from other universities and national associations with special DE training programs. The task force members will be comprised of faculty and administrative staff who will assist in the development of the course redesign. Evidence from the Tennessee college system corequisite implementation in 2016 of 36 community colleges indicated that specialized staffing and professional development was necessary for the success of

corequisite programs (ECS, 2019; TBR, 2019). Increased professional development (PD) for faculty should include targeted work in specific curricula and teaching practices to fit individual need. Training on new technology should be a continuous process to keep up with technological innovation in the field of education.

The focus on PD should be on content not curricula. For example, faculty should learn instructional approaches that accelerate student progress, such as technology-assisted instruction (Cox & Dougherty, 2019). Faculty members should continually observe and assess the effectiveness of the learning activities, methodologies, student-learning outcomes, and relationship of the courses and the curriculum. When gaps or concerns are detected, it should be the responsibility of faculty member to report the observation to the leader. Price (2019) noted that PD should include workshops and conferences to familiarize teachers and administrators with the new interventions. Based on the findings, the focus of the recommendation for GCC is implementation of a corequisite model.

Recommendations

Policy Recommendation

In choosing a policy recommendation to address the problem of underprepared college students attending developmental mathematics courses, I used findings from this research in combination with extant literature to substantiate the policy recommendation for the implementation of a corequisite instructional model. A new policy at GCC requiring DE to utilize a corequisite instructional model across the curriculum could have

positive implications to support students building skills for success beyond, math, reading, and writing. A policy supporting the corequisite instructional model would identify resources for faculty to design and develop instructional content and to prepare students for college-level success.

The corequisite instructional model places students in college-level or gateway English and mathematics courses, while pairing those courses with supplementary instructional support (CCA, 2016; HECB, 2018). The goal of corequisite instruction is to enroll those students in courses that count for credit sooner. Students take the remedial courses that run concurrently with their college-level classes.

To date, the corequisite model has been implemented successfully by more than 26 states including Colorado, Georgia, Indiana, Tennessee, some colleges in the local state and West Virginia (AACC, 2018). Tennessee and Texas have passed laws requiring colleges to use corequisite instructional models, and other states are considering similar policies. Tennessee was one of the first states to scale up corequisite remediation policy in mathematics, writing, and reading, for its community colleges (Tennessee Board of Regents [TBOR], 2019). The result was a significant increase in students passing college-level courses (TBOR, 2019).

Approximately 20 states are moving to implement corequisite courses without a legislature mandate (AACC, 2018). In July 2017, the Governor of the local state signed into law House Bill 2223 mandating the use of corequisite remediation, as the required model for students in developmental courses (HECB, 2018). Institutions of higher

learning were mandated by the HECB to implement corequisite instructional model courses by the end of 2022. Therefore, the GCC Board of Trustees should consider implementing the corequisite instructional policy change to put GCC at the forefront of a movement that has been gaining momentum in the study state. The stakeholders, GCC administration, DE faculty, academic senate, and board of trustees may have no choice but to buy into the corequisite curriculum reform policy. The implementation of the Corequisite Model Policy will fulfill the local state's legislative mandate for House Bill (HB) 2223.

Implementation of corequisite instructional models vary at community colleges, however there are five general model types: (1) paired course models, (2) extended instructional time model, (3) Accelerated Learning Program (ALP), (4) academic support service models, and (5) technology mediated model (AACC, 2018). The paired course corequisite remediation model was implemented by the 13 community colleges in Tennessee (Tennessee Board of Regents [TBR], 2019). DE students in Tennessee took entry-level college courses simultaneously with remedial academic support. The findings from the Tennessee pilot study indicated the number of remedial students passing a college-level mathematics course increased from 12% to 51% (CCA, 2018). The paired course model became the favored model in Tennessee and by many education reformers in several colleges across the U.S. including the study site (AACC, 2017). Traditionally, remedial students attend a standard 3-hour mathematics course three times a week, in addition to 1-hour courses in English or a lab in science that helps them develop the skills

needed to succeed in the college level class. DE students retain the same textbook and much of the coursework that was used for the traditional prerequisite DE course. Schedules are aligned; learning communities and collaborative teaching practices are established. Student-to-instructor ratio is smaller, although the class meets during the same week, in a smaller setting.

Solutions

Within the Corequisite Model Policy, the core mission of GCC must be addressed. GCC divisions must hold themselves accountable for student learning, especially in the case of DE programs. To be effective, DE programs must be connected to the curriculum and to students' learning needs. Therefore, for underprepared students, the Corequisite Model Policy may serve to integrate academic assistance to the curriculum so that students get academic support as well progress towards their degree goals at the same time. When GCC adopts the corequisite instructional model policy to enhance student persistence, the following institutional conditions should be in place for student success:

- ***Setting.*** Boylan et al., (2019) advocated students are more likely to persist and graduate in a setting that expects them to persist and graduate. Moreover, students are also likely to persist and graduate in settings that provide clear and consistent information, such as providing effective advising during their college years (Boylan et al., 2019). Additionally, students are likely to persist

and graduate in settings that provide academic, social, and personal support (Bailey, 2017; Chrysikos et al., 2017; Tinto, 1975).

- ***Activities.*** As a commuter college, support may be provided through student clubs, mentor programs, or summer bridge programs that are available at GCC. Involvement in academic activities is very important for students to succeed.

- ***Class size.*** Students stated that mall class size was key to facilitating success in the DM NCBO course, as it allowed for collaboration with fellow students and one-on-one interaction with instructors. With smaller class sizes, instructors were able to provide more personalized support to students. These factors made a significant impact on student success and retention, which correlated with Tinto's model of student integration (Tinto, 1975). Due to small class sizes, students were able know their peers, and to form study groups. Students were also able have one-on-one sessions with faculty. Therefore, collaborative learning, another mediating factor, contributed to the academic success of students and achievement through an environment of engagement. Students who are more engaged in their education have a higher chance of graduating (Zientek et al., 2019).

- ***Achievement in accelerated DM courses.*** DM NCBO courses prepared students for college-level courses through academic rigor. Students succeed in institutions that set high expectations for their student population (Zientek et

al., 2019). Tinto (2002) stated, “no one rises to low expectations” (p. 3). Further, completing the DM NCBO courses was perceived to help students adapt to college and encourage the desire to obtain a college degree. Some acceleration programs, such as corequisite models, improved the rigor of DE learning experience by pairing college-level work with tailored supports (Doherty et al., 2017).

- ***Student expectations.*** Students in DM gained confidence in rigorous college courses and set high expectations for themselves. Consequently, the learning environment contributed to building self-efficacy, autonomy, confidence, and positively influenced student success (Zientek et al., 2019). Adult learners in this study demonstrated an intentional approach to academic success and viewed themselves as responsible and active learners. The DM NCBO course results indicated increased student retention and successful completion of not only the DM courses, but also student retention in other areas of study.

- ***Faculty incentives.*** Faculty and staff will need to work together to design and develop content and instructional environments that promote active involvement and learning for all students. The instructional design goals must encourage building collaborative partnerships across campus between faculty and student affairs professionals.

Policy Recommendation Goals

Two recommendations are suggested for implementation of a corequisite instructional model at GCC for DM courses: (1) the creation of a corequisite oversight committee (COC), and (2) the design and the development of a corequisite model educational pilot program to support DM course redesign.

Goal 1: Create a corequisite oversight task force/committee. The first goal pertains to the development of the corequisite oversight task force/committee at GCC. Traditionally at GCC, a task force is created for a group of faculty to meet to obtain short-term goals, and then the task force is changed over to committee status once the initial goals are met and long term goals are needed.

- The actions of the COC will be to set attainable goals, achieve collaboration or form a strategic coalition of groups from college divisions, and to set institutional conditions that would increase persistence and graduation.
- The COC should be established to assist with the planning, and implementation of the DM course redesign to accommodate the flexible scheduling of classes, ability collaborate with peers, and one-on-one time with instructors as indicated in the study findings (Allen et al., 2018; Bishop et al., 2018).
- The newly created COC should oversee the pilot program by utilizing

approaches that have worked for college reforms in similar academic settings.

Goal 2: The design and development of the corequisite instructional model. For successful implementation of a corequisite instructional model, a pilot program should be implemented.

- Mathematics faculty will be content matter experts and will be responsible for evaluating the existing content of the DM course to identify the specific competencies that need to be addressed.
- Mathematics faculty will consult with the COC about which course competencies should be integrated into the redesigned DM course. Furthermore, faculty members will provide input on what measures are to be used in the course. Educating the faculty on the details of the corequisite model, the advantages, and potential challenges to be expected will be necessary for the success of the corequisite model. GCC may underestimate the number of staff members affected by the new corequisite policy. Consequently, the effort will be led by faculty of the mathematics department to work with the following individuals in the COC: chairperson and program coordinators of DE, dean of workforce program, director of the Office of Admissions, the president of the faculty senate, and the vice president of Student Services.
- Data from the current study will be available to guide decisions on the DE

corequisite instructional model pilot study. The chairperson, program coordinators of DE, and the dean of the workforce program will be responsible for advisement, registration, and matriculation of the incoming first-year students. Since the suggested members for the COC already serve in retention and general education committees at GCC, they will provide a unique perspective on the impact of DE courses. The director of admissions will be responsible for placement exams. The president of the faculty senate and the vice president of Student Services will ensure that the new course and testing processes comply with the GCC policy related to course changes.

- Additionally, the college administrators will ensure that the curricular review and approval process is followed, and that shared governance is maintained during the process, including assisting in the management of potential conflicts. If conflicts arise, administrators will relay GCC's institutional goals and priorities, such as institutional effectiveness, student success initiative, and institutional policies. Creating a positive environment is essential to building trust and collegiality among the COC team members. In the presence of the local state requirement for the corequisite redesign of DE, the logical starting point should be the planning process.

Policy Implementation

The overall goal of this project is to recommend the adoption of a policy to GCC administrators supporting a corequisite model of instruction +

for DE students, which is aligned with the state requirements. If the policy is accepted, there are several steps that I would propose GCC take for successful implementation. Project implementation begins with a planning process. During the first stage of the planning process COC members will meet to review current state requirements and identify opportunities and preferences at the local level. The outcomes of this type of activity could enable planners to use past actions to plan better (Vedung, 2017). Table 1 provides a suggested implementation for the project.

Table 1

Suggested Implementation

Action 1	2-3 months	Institutional level	Communicate with college president, VPs, Math dept. Chair, faculty senate, dean of workforce, and Math lab coordinator.
Action 2	1 month	Leadership team	Cooperation between faculty and COC
Action 3	2-3 months	Goals, vision, and implementation plan	Review data, input from stakeholders, align corequisite with program design and schedule
Action 4	2-3 months	Implementation and training	COC, administration, faculty leaders, Math faculty
Evaluation	At every stage of planning	Continuous	Continuous at all levels

The following information explains detailed information about each action and an approximated completion timeframe:

Action 1: Institutional level. Communicate with the college president, the vice president of student services, vice-president of administration, math department chair, faculty senate, dean of workforce, and Math lab coordinator. Discuss how implementation of the corequisite model requires cross-institutional participation. I estimate it will take 2-3 months to complete the first action item.

Action 2: Establish leadership team. Leaders work with faculty (Corequisite Oversight Committee, [COC]) to build a shared understanding of the corequisite program. I estimate it will take approximately 1 month to complete the second action item.

Action 3: Establish communication, goals and vision and implementation plan. Review the data and input from stakeholder groups; align corequisite with programs of study within GCC; design and schedule courses. I estimate it will take 2-3 months to complete the third action item.

Action 4: Implementation. The COC to work with other groups to develop, share, and enact implementation strategies. Faculty leaders offer faculty training as needed. I estimate it will take 2 months to complete the fourth action item.

Continuous Improvement. Identifying areas for improvement will be important for the success of implementation of a corequisite model of instruction for DE. The COC will set up a continuous improvement plan to monitor the progress of the pilot study. I would encourage the COC to ensure that state standards are being met. Additionally, the COC will have access to pilot study data to review in order to make recommendations for changes to the instruction. I would also suggest that the COC be charged with providing recommendations to the GCC leadership team concerning suggested changes for administration and support of the corequisite model.

Success to Implementation

The success of an institutional corequisite policy implementation at GCC will depend on collaboration. For a policy to achieve results, resources and actions must be mobilized in the appropriate directions (Allen et al., 2018; Krantz, 2018). Executive leaders should have a conceptual understanding of research-based practices in student success at the community college (Dunigan et al., 2018). The factors include organizational governance, curriculum design, and delivery models since these are critical features of the policy change (Kok & McDonald, 2017). A list of policy changes include: (a) student success policies, such as maximizing student enrollment; mandatory student orientation; (b) test preparation classes to prepare students with placement test materials; and (c) strategies to ensure better performance, holistic advising, and counseling (Ngo & Yun, 2018). Active leadership is the key to policy success (ECS, 2019); college administration must collaborate with all facets of the institution, in

particular registration, admission, placement and assessment, counseling and advising, faculty and staff. Buy-in and commitment to the policy objectives will be essential.

Furthermore, staff and faculty must be motivated in their commitment and must be willing to be trained in their respective areas. Inter-organizational communication and cooperation among college personnel should be encouraged (Price, 2019). Planning for completion of DE requirements may include additional institutional modifications requiring administrative buy-in due to uncertainty around state policy.

Although many practitioners support state and institutional reforms, critics of reform movements argue there has been limited research on the effectiveness prior to scaling (Chen, 2017). There have also been concerns about a one-size-fits-all approach (Chen, 2017). Dissemination of information to faculty, support staff, and student services staff, all of whom play a role in the policy change, may allow the faculty and staff to exercise their roles more strategically.

Developmental education policies are a priority in many institutions (Cafarella, 2016; Maxwell & Pearson, 2016). In this section, I examine developmental education intervention policies in higher institutions of learning. Studies on the effectiveness of various interventions are imperative to ensure that the reform I recommend is effective in improving student outcomes.

Conclusion

Given the necessity to improve DE for underprepared students, the current study explored the course delivery for DE math and student outcomes. I focused on one intervention in DM course delivery that is shorter than the length of a semester and is associated with alternative delivery methods. Such an intervention has the potential to improve student progress and success by providing additional support, thereby increasing student persistence in degree programs (Dunigan et al., 2018). The goals of these reforms by community colleges were to enable students to achieve college readiness, successfully integrate DE students into college, and improve student retention and degree attainment (Brower et al., 2017; Xu & Dadgar, 2018).

Studies indicate that interventions have national significance (Cafarella, 2016). Several states are considering similar reforms to DE policies (Kosiewicz et al., 2016). In particular, the local state has been promoting innovative DE programming through legislation (Senate Bill 162, 2012) (Higher Education Coordinating Board [HECB], 2018). While qualitative research is not generalizable, the findings from the current study may be of interest to other states that may pursue promoting reforms to DM.

States started implementing large-scale DE reforms to address the challenges of persistence and completion for community college students (Boylan & Trawick, 2015). Faced with the problem of low completion rates, policy makers, administrators, and members of the public are calling for change in developmental education policies. Complete College America has succeeded in getting many states to overhaul remedial

education, urging lawmakers to replace such courses with credit-bearing courses that include tutoring and to "eliminate remedial courses completely" (Boylan & Trawick, 2015, p. 27). Therefore, community colleges across the United States are developing alternative models of delivery with support from federal, state, and private funding. For example, the Bill and Melinda Gates Foundation, working alongside the Lumina Foundation, and Jobs for the Future have helped influence higher-education policy at the state level. Complete College America [CCA], (2016) has persuaded 32 states, including the District of Columbia, to join an alliance whose members pledge to develop and implement aggressive state and campus-level action plans to meet college-completion goals (Boylan & Trawick, 2015; CCA, 2016).

Academic institutions and states implemented different reforms, such as accelerated approaches, shortened courses, a reduction in the number of required courses, reform of curriculum and instruction to improve student engagement, offering additional supports to complement instruction, and reforms of placement policies and advising policies that move students efficiently and successfully through DE at community colleges (Melguizo, 2016). For this study, I examined a form of accelerated DE course; a DM course that allowed students to complete courses in less than a full semester without sacrificing the rigor of DM content. Only a few studies of accelerated delivery programs focused on shortened courses (Jessen et al., 2020), while other studies had alternative forms of acceleration, such as mainstreaming and paired courses (Ganga et al., 2018). However, studies on shortened courses revealed positive outcomes with higher passing

rates in DM, and in subsequent college-level courses, and increased credit accumulation (Ganga, et al., 2018). This study focused on a single institution, with one approach to DE reform, the NCBO sequence.

Although the representativeness and generalizability of findings may be limited, the results of this study suggest that state initiatives designed to improve DE performance was associated with positive student outcomes. Even though new state policy required changes to DE, it did not dictate specific course design objectives (Wang et al., 2017). Therefore, the study site is charged with the responsibility of adopting the state policy of expanding course delivery to include the corequisite model. As states continue to make policy changes to alter or eliminate DE course delivery, data will play a central role in helping administrators and policy makers choose alternatives that are most likely to lead to higher education success for students.

In the state where the research was conducted, a system-wide DE assessment and placement policy exists for all higher education institutions (HECB, 2018). The Higher Education Coordinating Board requires every public higher education institution to assess the academic skills of every student (HECB, 2018). The only approved assessment is the Success Initiative (SI) offered by the College Board. However, multiple measures are allowed to determine placement, including high school academic performance and non-cognitive factors.

The strategies I discussed are a few examples of DE placement policies determined at the state level by statute, board policy, or a combination of both. Many

stakeholders have urged for changes in higher education policies and practices regarding placement in DE courses. Although to date there are few studies of these new programs, experts believe that college-readiness interventions show promise, especially when implemented statewide (Brower et al., 2017; Logue et al., 2017).

Corequisite remediation combines a credit-bearing course with mandatory non-credit remedial support. The objective of the corequisite model is to provide *just in time* support for the college-level courses (Dunigan et al., 2018). The corequisite approach includes aligning Mathematics courses to individual programs of study; enrolling more students in college-level gateway courses with additional support; and using a placement range rather than a score to provide gateway courses (Dunigan et al., 2018).

While some studies emphasized the important role of institutional agents in promoting policies that enhance adult learning experience, Knowles (1984) introduced the notion that adult education differs from the usual education. Knowles (1984) postulated that adult students are: (a) self-directed, (b) have in-depth experiences that become part of their self-identity, (c) want to learn, and (d) are motivated to complete a learning task. Nix et al., (2020) underlined the fact that adult students (aged 24 years and older): (a) are goal-directed, (b) regard themselves as a worker living off campus, (c) are likely to have a permanent job/occupation and family responsibilities, and (d) have limited time to study. These differences in adult students require a special approach when designing courses and advisory services.

If the corequisite policy is adopted, there are potential challenges to implementation, which may include administrative logistics and faculty buy-in at different levels. Implementing and sustaining corequisite remediation involves substantial organizational changes, such as different instructional methods and procedures (Allen et al., 2018). Issues with scheduling and advising logistics may also provide problematic to implementation (Allen et al., 2018). Logistics may include but not be limited to fitting new courses into existing schedules and scheduling processes, balancing instructor and student course loads, lack of new advisors for the new courses, uncertainty about state and institutional policies on assessment and placement, limited time for preparation, and lack of professional development for staff and instructors. Consequently, college leaders may need to consider these issues beyond the cost-effectiveness of the model.

For the corequisite model to be successful, faculty need to buy in to the new system as they will be required to provide *just in time* instruction (Dunigan et al., 2018) to speed up the transition of underprepared students into college-level classes (Denley, n.d). The overall goal of DE is to provide the necessary support for underprepared students to succeed in their chosen college courses (Park et al., 2018). The realizations that the outcomes of DE are poor, and that many students do not complete their programs, could be a potential barrier for faculty to embrace the corequisite model of instruction. The DM program would need redesigned along with new activities to support the corequisite model (Park et al., 2018).

This policy recommendation supports the adoption of a corequisite model program at GCC. As an institution of higher learning, GCC can be more effective by focusing on the factors that have the greatest influence on retention and persistence in the pilot program. Additionally, the policy recommendation is designed to promote student engagement with academic support and interventions. Conditions for the success of the implementation of a policy supporting the corequisite model of instruction include:

- The Mathematic department will be responsible for leading implementation at the institutional and classroom level.
- The policy will require transparency of cross-institutional and inter-departmental communication.
- Mathematics faculty will play an important role as leaders of the effort and as content matter experts.
- The Mathematics faculty will redesign learning outcomes to define the content of Mathematics using information from state learning outcomes and requirements.
- The Mathematics department chair along with other GCC leaders will initiate corequisite course approval and scheduling.
- Mathematics faculty will select the curricular materials and methods that support students' preferences.
- Working in conjunction with the GCC leadership team, Mathematics faculty

will create an evaluation plan to assess student learning with the corequisite model of instruction.

- Faculty senate will identify professional development needs to prepare and support faculty to teach corequisite courses along with continuing pedagogical training and professional leaning workshops.

Academic administrators together with the Board of Trustees can use the current study as a foundation for implementing the corequisite policy reform. The study site will have the opportunity to implement the compulsory state mandated policy that requires all DE students to be enrolled in a corequisite model program. The implementation of this policy will lead to improved rates in retention, persistence, and graduation for DM students at GCC. In addition, the adoption of the corequisite policy may increase student engagement with the resources available at GCC, leading to acceleration into college-level Math. Torres et al., (2018) suggested that to align institutional expectation with student achievement, students must be motivated to effectively use existing resources (). Administrators have a priority of sustaining DE programs through evidence-based policies (Kok & McDonald, 2017). Hence, GCC is recommended to test the new policy through a pilot program, which will be evaluated before it is scaled up to serve DE students.

The Corequisite Model Policy may serve to integrate academic assistance to the curriculum so that students get academic support and progress to college-level courses at a faster rate. Over time, the pilot program is redesigned to improve student learning and

persistence for DE students. With more students involved in the program in the future, a better understanding of how corequisite models will affect the students' leaning outcome will be achieved.

In this study, I used basic qualitative approach to explore the lived experiences of eleven community college students who successfully completed DM NCBO course sequences. During the students' participation in the accelerated modules, I found that the students experienced changes in their perceptions in Mathematics. The results of this study support literature about benefits of accelerated modules in DE (AACC, 2018). By using DM NCBO accelerated design, we promote student learning through engagement, teamwork, friendly competition, and creativity. The overall theme focused on a feeling of connectedness among students and faculty. Hence, the proposed corequisite model can be delivered effectively in an accelerated platform as evidenced by positive participant feedback. More importantly, this study provided a lens into the long-term benefits of DE research experience. However, further research is needed to determine why some students can thrive in accelerated programs and integrate their experience in future learning. I further recommend that GCC support future investment in DM research experiences to build a knowledge-based workforce to advance scholarship, and knowledge integration. Students who have engaged in accelerated modules gained unique knowledge and abilities, which cannot be attained in a regular classroom, which are vital to equip the future workforce and impact their value for higher education to combat the anticipated shortage of skilled labor (BLS, 2019).

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Appendix B: Interview Protocol (Questions) for Student Participants

You have been selected to speak with me today because you were identified as someone who participated, and successfully completed DM NCBO program on this campus. My research project focuses on the improvement of DM students' progression to college-level courses; with particular interest in understanding how students in developmental math courses perceived their participation in this program, and the practices that helped improve student learning on GCC campus.

Institution: Gulf Community College

Interviewee (Name) _____

Interviewer _____

Interviewee Background _____

What was the main reason you chose to attend Gulf Community College?

Probes: How did you find out about Gulf Community College?

What do you believe to be the most valuable component or pre-college experience you gained from the DM NCBO?

Probes: What else did you accomplish through campus-based initiatives?

How did the small enrollment size of the DM NCBO assist you as a learner?

Probes: Why does that stand out in your memory?

The behavior standards in college are much higher than high school. How did you adapt to the expectations of college?

Probes: How did others [e.g., students] respond to that? Why was that important to you?

What were your expectations regarding the academic rigor of college?

Probes: How did you feel about that?

What did you expect you would have to do to be successful academically in college? What behaviors did you need to change?

Probes: Can you tell me more about that?

How did attending GCC help you prepare emotionally, socially, motivationally, or academically for college?

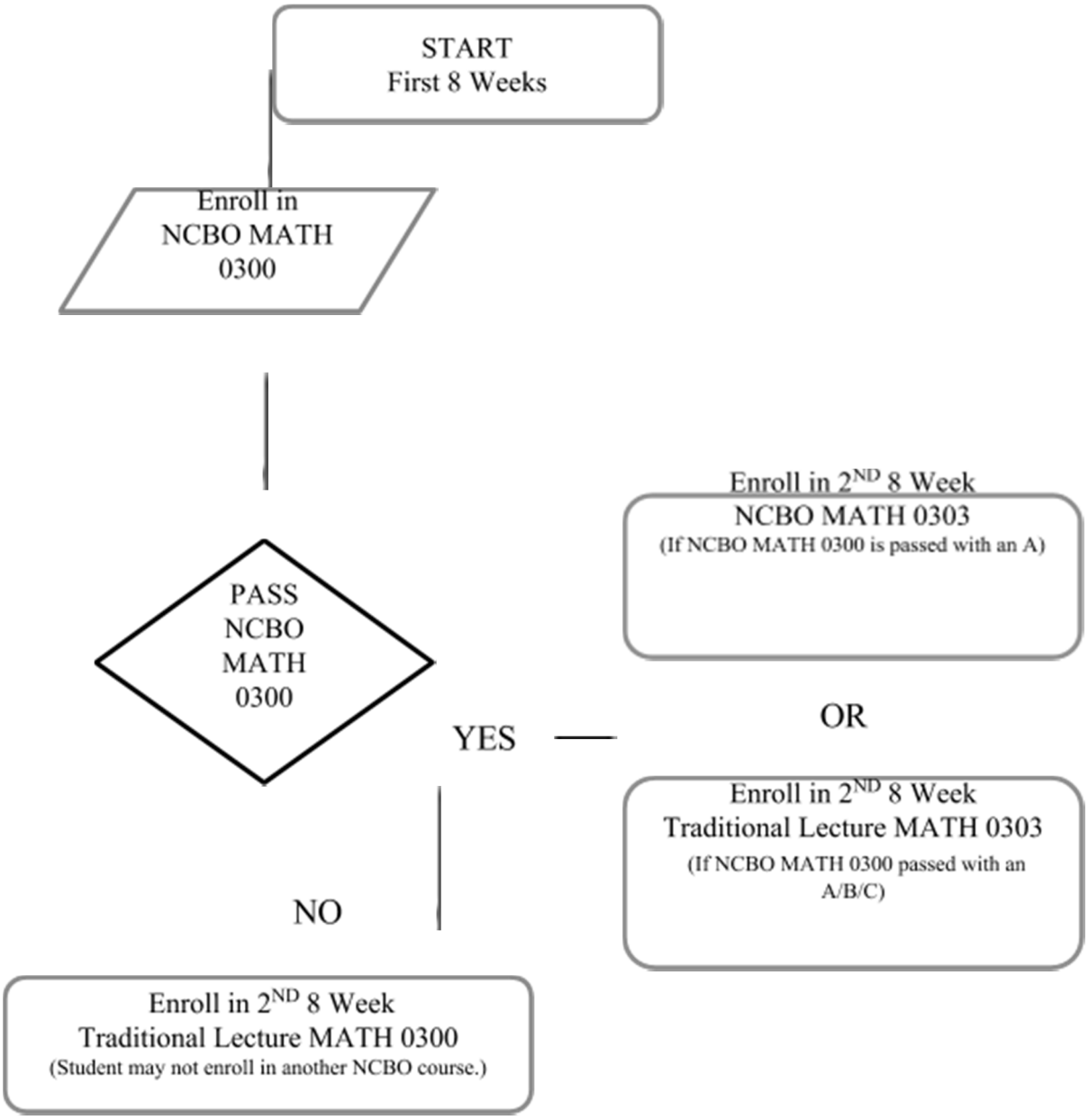
Probe: Can you give me an example?

How do you perceive attaining college degree support your future goals in society?

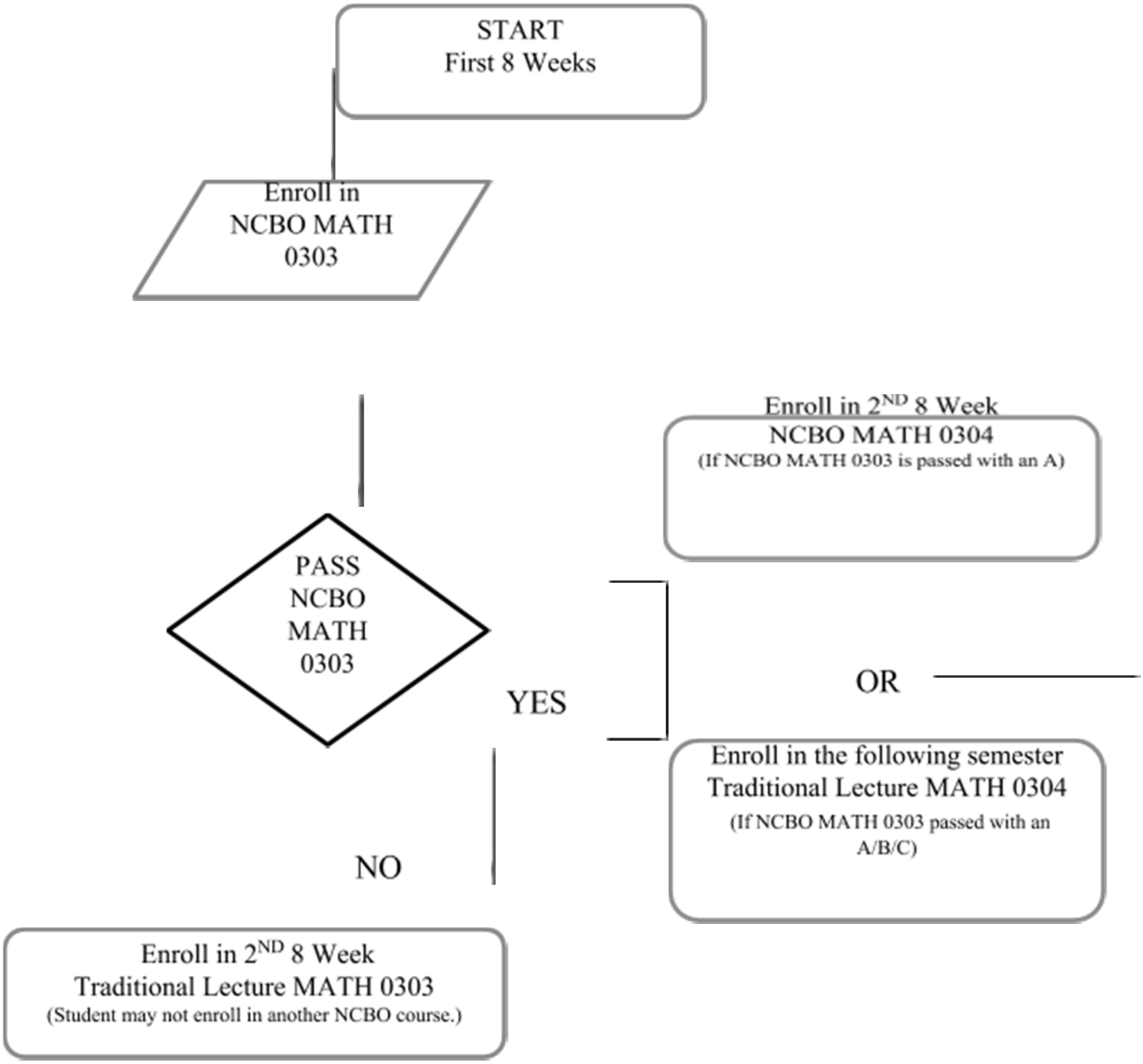
Probes: How does this issue relate to the question we started with?

Appendix C: NCBO Math (0300, 0303, 0304)

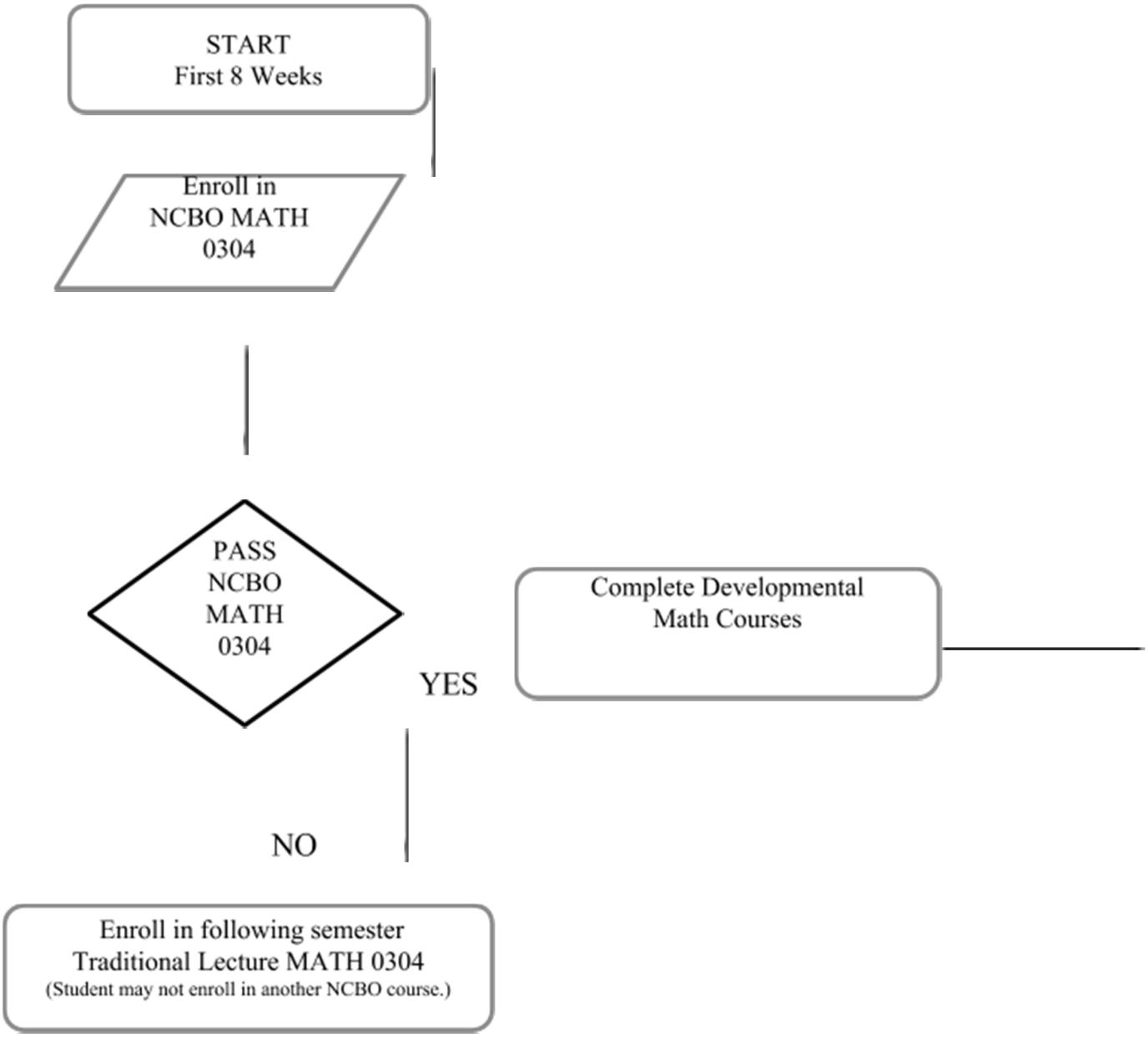
NCBO MATH 0300



NCBO MATH 0303



NCBO MATH 0304



Course Descriptions and Scheduling. Each course requires that the student earn an overall Average of 70% to receive credit to move to the next level.

Appendix D: Questions for Small Group Discussions

1. What did you know about developmental education particularly Developmental Mathematics courses and reform before to this presentation?

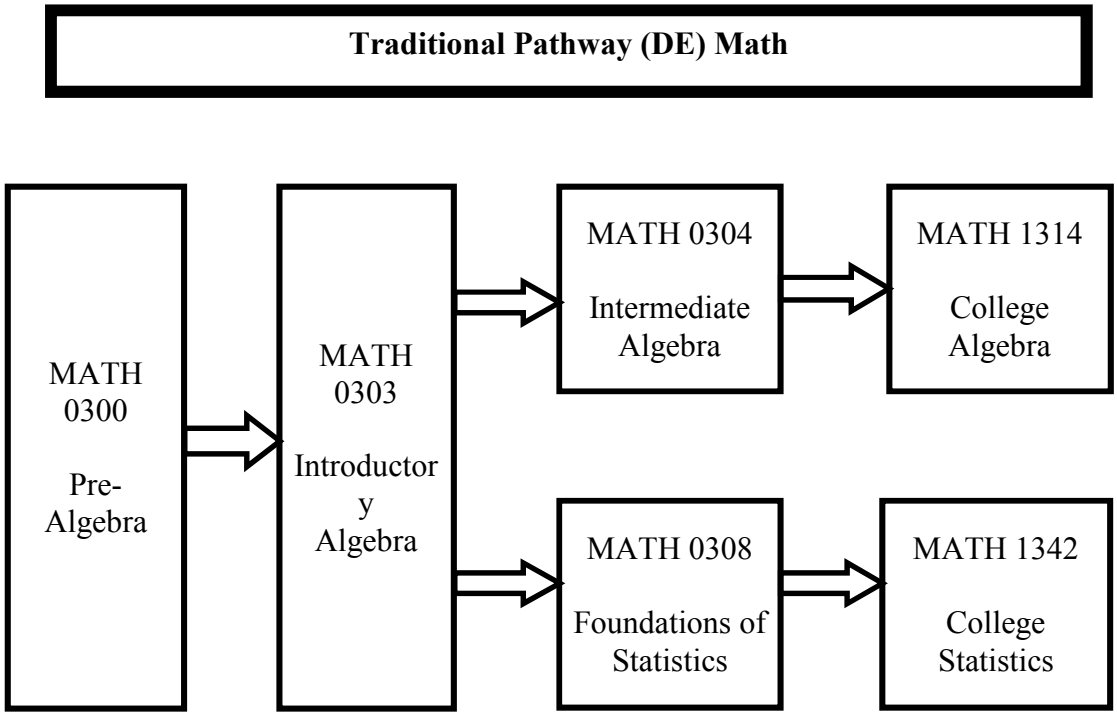
2. With GCC's institutional demographics, how does the DM NCBO program meet the needs of our students?

3. In your perceptions, does the DM NCBO program structure assist students in moving toward their future education goals? Please explain why you say so.

4. What strategies do you consider useful to increase student retention and successful course completion by DM students?

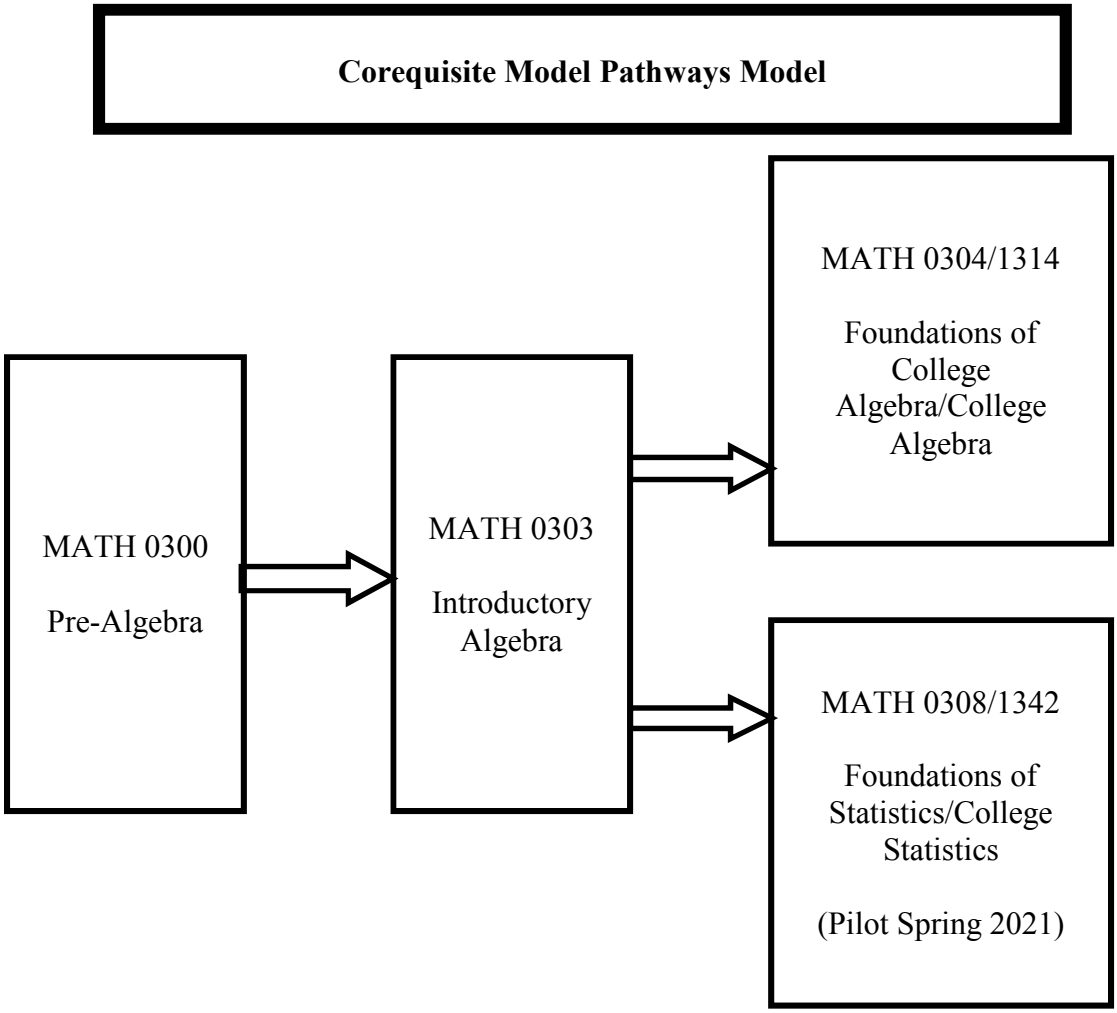
5. Would you support continuing and expanding the DM NCBO program offering? Please explain why you say so.

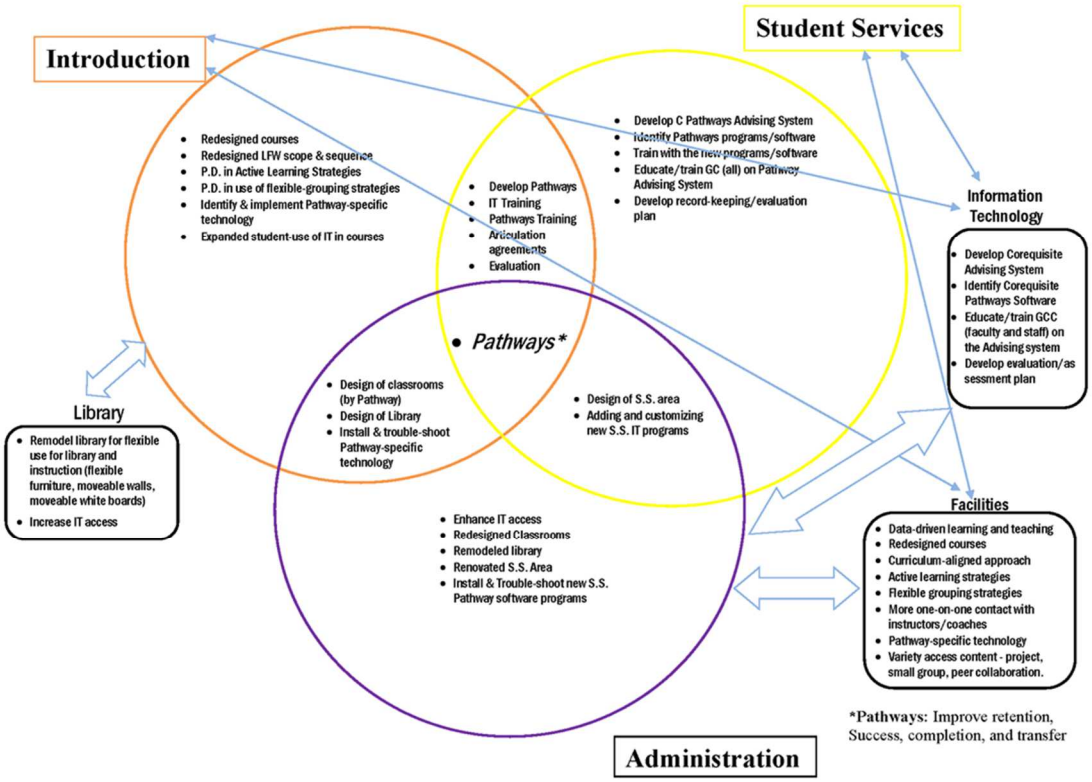
Appendix E: Traditional Pathway (DE) Math



(A student may spend up to 4 semesters before they complete their gateway level Math course)

Appendix F: Application of NCBO Corequisite Model at GCC




Introduction
Student Services
Redesigned courses
Redesigned LFW scope & sequence
P.D. in Active Learning Strategies
P.D. in use of flexible-grouping strategies
Identify & implement Pathway-specific technology
Expanded student-use of IT in courses
Develop C Pathways Advising System
Identify Pathways programs/software
Train with the new programs/software
Educate/train GC (all) on Pathway Advising System
Develop record-keeping/evaluation plan
Develop Pathways
IT Training
Pathways Training
Articulation agreements
Evaluation
Information Technology
Develop Corequisite Advising System
Identify Corequisite Pathways Software
Educate/train GCC (faculty and staff) on the Advising system
Develop evaluation/assessment plan
Pathways*
Design of classrooms (by Pathway)
Design of Library
Install & trouble-shoot Pathway-specific technology
Design of S.S. area
Adding and customizing new S.S. IT programs
Library
Remodel library for flexible use for library and instruction (flexible furniture, moveable walls, moveable white boards)
Increase IT access
Enhance IT access
Redesigned Classrooms
Remodeled library
Renovated S.S. Area
Install & Trouble-shoot new S.S. Pathway software programs
Facilities
Data-driven learning and teaching
Redesigned courses
Curriculum-aligned approach
Active learning strategies
Flexible grouping strategies
More one-on-one contact with instructors/coaches
Pathway-specific technology
Variety access content - project, small group, peer collaboration.
*Pathways: Improve retention, Success, completion, and transfer
Administration