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BRIDGEWORKS: AN EXPLORATORY MIXED METHODS STUDY OF STUDENT TRANSITIONS FROM NONCREDIT TO CREDIT IN MATHEMATICS

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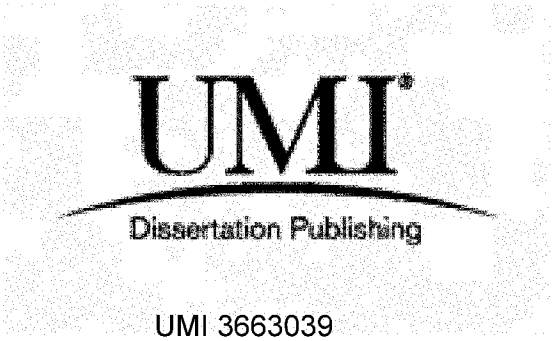

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ABSTRACT

Providing access to a post-secondary education for a diverse population of learners with varied levels of academic preparation continues to be a challenge for California community colleges. One response has been to establish partnerships. Each partnership incorporates different scopes, instructional patterns, and outcomes to impact students. The literature supports the construction of academic pathways that provide evidence of persistence and student success. Research legitimizes connections that link students to student support services and academic skill development. California community colleges are implementing partnerships designed to achieve this end.

This study examined the impact of a noncredit to credit partnership. It explored the factors that contributed to student success in community college credit entry-level mathematics courses. The findings of the study revealed the impact of alternative course structures that integrate subject competency with preparation for the rigor of credit math courses. The study findings revealed the benefit of in-class tutoring and counseling that connects students to support services and reduces transitional barriers. This study will add to the volume of research regarding student success as it examines a noncredit program utilizing untapped resources to support student success in a community college district setting.

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To a young woman with character and maturity far beyond her years who walked this pathway with me. She knows my passion for education better than anyone and her profound depth, reflection, dialogue, and wisdom regarding life and education enrich my communication.

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The pathway to any dream is comprised of stepping stones of learning and the hand of those who believe in your dream makes all the difference in the climb. Nothing in life is accomplished alone. This dissertation is the culmination of hours of devoted leadership by the directors and instructors of the Department of Educational Leadership at California State University, Fullerton. Dr. Karen Ivers, Dr. Meri Beckham, Dr. John Hoffman, and Dr. Carol Lundberg coached me in the skills of inquiry and writing. Dr. Dawn Person journeyed each step of this process with me and shared her beautiful heart and educational leadership. Dr. Jan Connal shared her educational experience. The unity of my cohort held me to the goals we dedicated ourselves to fulfill. The input of the Building Connections Innovation team and researchers brought pragmatic meaning to the research. All great work in education is completed through cooperation of stakeholders. I humbly and profoundly acknowledge the consistent belief, support, scholarly reflection, educational knowledge, and patience of my daughter, now my colleague. The lives this research touch will be influenced by all of us.

CHAPTER 1

INTRODUCTION

In 1960, California made history when it established systematic and accessible opportunities for students to pursue higher education. The plan organized California higher education systems to meet the varying achievement levels of students and "promised universal access to a baccalaureate education" (Boilard, 2009, para. 2). California community colleges continue to prioritize resources to provide access to higher education. Boilard (2009) charged educators with the need to continually review changes in student demographics, workforce and academic preparation, and enrollment eligibility levels to assess how to effectively coordinate segments of higher education that will keep the doors open for students in all segments of society. Boilard (2009) stated that a "review of the state's Master Plan will focus attention on the state's educational needs in the 21st century" (para. 19).

Contemporary educational leaders responding to 2013 budget proposals and an increase in achievement gaps have developed programs and support services to increase educational access, persistence, and completion rates, particularly in mathematics. Bailey and Dynarski (National Bureau of Economic Research, 2011) stated there was an 18% difference in college completion rates between lower and higher income students. Community college faculty and leadership have realized efforts to close achievement gaps, increase persistence

and improve completion rates have shown limited change (Bandyopadhyay, 2011; Moore, Offenstein, & Shulock, 2011). The contemporary search for untapped resources to address these challenges is leading community college districts to evaluate alternative programs including noncredit courses as a possible source for remedial instruction (Fouts & Mallory, 2010; Frey, 2013; Orange County Community Development Council, Inc., 2013; Ryder & Hagedorn, 2012; Taylor, 2012; Walton et al., 2009).

Background of the Problem

California offers its residents 112 community colleges, serving over three million students—"the largest system of public higher education in the world" (California Department of Finance, 2015). The American Association of Community Colleges (2012b) reported the average student age is 28 years old, not the typical post high school, pre-university student. In addition, the American Association of Community Colleges (2012a) reported 47 % of community college students received financial aid. The community college classroom serves students from multiple generations with numerous goals and varying degrees of learning and achievement gaps (American Association of Community Colleges, 2012b; Wilson, Floden, & Ferrini-Mundy, 2001). Twombly (2005) described the community college classroom as "twenty-five people with twenty-five different interests all going in different directions" (p. 432).

Unprecedented Challenges

The California Scorecard collects data for students whose academic achievement is below community college entry-level under the classification of

Basic Skills Students (California Community College Chancellor's Office, 2013). The California Basic Skills Initiative characterizes basic skills as "foundational skills in reading, writing, mathematics, and English as a Second Language, as well as learning and study skills" (Illowsky, 2008, p. 84). The Basic Skills Strategic Plan includes student support strategies, program construction, staff development, and instructional practices (Bausch, 2013; Center for Student Success, 2007; Cooper, 2014). These support services facilitate access to education for the 50% of students who enter California community colleges below entry-level achievement in mathematics and English (American Association of Community Colleges, 2012b; Bausch, 2013; California Department of Education, 2010; California Community College Chancellor's Office, 2012a; Kuhn, Kinzie, Schuh, Whitt, 2010; Steenhausen & Kuhn, 2012). The Student Success Act of 2012 established eight recommendations for community colleges that strategically connect basic skills programs and student support services to student achievement gaps. Student achievement gaps are related to disabilities in learning, cultural distinctions, race, ethnicity, socioeconomic components, and attitudes related to academic endeavors (Moore & Shulock, 2010; Siqueiros, 2010; Student Success Act of 2012). California community colleges design student support service programs, financial aid, accelerated courses, and noncredit and credit developmental and basic skills courses to increase access and educational opportunities that enable students to earn job certificates or complete degrees (Basic Skills Initiative (BSI), 2013; CSS, 2007; Wathington et al., 2011).

Basic skills programs are designed to meet the needs of remedial students in credit and noncredit programs. In California the majority of noncredit academic courses are offered within the credit discipline or department. For example, a credit mathematics department could include three remedial math courses designed to meet the varied prerequisites for credit mathematics courses. Alternatively, two community college districts in California developed and maintain independent noncredit institutions that offer an entire set of programs and courses students complete for no credit. These two institutions exist within multiple college districts and offer remedial mathematics courses, basic skills, English as a Second Language, career and technical certificates, high school diploma courses, and community education. This study explored the noncredit to credit partnership between the basic skills mathematics department of a credit community college and a basic skills program in a noncredit institution within the same district.

Tinto's (1993) model of institutional departure described the strength foundational connections in academic, relational, and engagement elements of college life have on academic success, degree completion, and achievement of individual goals. Tinto suggested the integration of academic support services, curricular components, and social connections to orient students and foster successful learning environments. Tinto (2001) promoted institutional commitment to collaboration and partnerships to impact retention, persistence and degree completion.

Moore, Offenstein, and Shulock (2011) challenged California lawmakers and educators to focus on "improving the numbers of Californians who earn postsecondary credentials of value" (p. 3). They proposed systematic analyses of data summarizing "trends in performance areas" that characterize the "consequences of neglect" (p. 3). They proposed that educational institutions perform systematic analyses of data to reveal proficiency levels and varied learning trends within student groups. In their view, the systematic review of courses, support services, and curriculum would decrease the impact of possible neglect and increase consistent, data-informed decision making related to effective academic pathways that foster higher performance rates. The findings of Moore et al. (2011) indicated that student performance and opportunity were limited in regions where there were limited educational pathways and that student enrollment was less diversified. Regional distinctions in performance mirrored the availability of academic pathways. In those regions in which academic pathways were available, there was an increase in completion rates, student success, and work mobility. Pathways designed with broad educational opportunities developed higher achievement and persistence rates. For example, pathways such as noncredit to credit basic skills partnerships connected students to resources and mitigated the "consequences of neglect" (p. 3).

Untapped Resources

The California Department of Education (2010) indicated that over 20% of the population has not earned a high school diploma. Approximately 27% of California citizens between the ages of 14 and 44 face various achievement gaps

resulting from disparity in socio-economic status that impact job mobility and college entry. The National Center for Educational Statistics (2010) aligned achievement gaps with significant differences in performance. Data revealed notable differences in mathematics and reading performance related to ethnic background (United States Department of Education National Center for Educational Statistics, 2010). According to Barton (2003), school location, family background, socio-economic factors, and academic journeys are factors related to contemporary achievement gaps. Although achievement gaps are varied and many factors contribute, Barton (2003) proposed two foundational components that contribute to student achievement gaps as those that occur at school (ethnic, learning and self-esteem) and those that occur at home (low and high income). Other areas of difference in achievement between student groups are "familiarity with college culture, self-efficacy, and self-esteem" (Barton, 2003, para. 12). These data characterize the factors related to the achievement gaps that have resulted in as high as 70% of California community college students being placed in basic skills classes in mathematics and 42% being placed in English basic skills classes (California Department of Education, 2010). California community colleges continue to be dedicated to broad access for all students, but the challenge to provide the number of remedial courses required to ensure educational planning and degree completion, job mobility training and certification, and academic transfer status for its 2.6 million students will take a constructive use of resources (California Department of Education, 2010; Townsend, McNerney, & Arnold, 1993).

One area of contemporary research is focused on partnership programs that community colleges can develop to lower the impact of achievement gaps and to create functional collaboration that efficiently serves as conduits to student success (Community College Research Center, 2010). One effective partnership, the California Alliance of PreK-18 Partnership, involves educational leaders in elementary, high school, community college and university programs (California Alliance of PreK-18 Partnership, 2004). The scope and sequence, shared physical and human resources and unified focus meets the needs of geographically and demographically diverse institutions. Pister and Galligani included a letter in the California Alliance of PreK-18 Partnerships (2004) annual report that stated, "partnerships between schools and institutions of higher education are an effective way to boost student achievement and close achievement gaps" (CA Alliance of PreK-18 Partnerships, 2004, p. 2).

Problem Statement

California community college educators have developed different programs to improve student access, strengthen persistence, and lower achievement gaps (Houck, 2004; Lascu, 2011; Moore et al., 2011). The problem this study explored was whether noncredit to credit partnerships facilitated student success in credit entry-level community college mathematics. Current literature provides insight into predictors of student success. To strengthen the literature in noncredit basic skills programs noncredit institutions are developing new ways to incorporate data. The 2013 noncredit pilot of progress indicators and institutional development of data collection will add to the literature to

demonstrate how noncredit basic skills programs determine how they affect student success. The challenges community college districts face to advise, train, and educate students who need remedial support can be met in partnerships integrating noncredit and credit academic progress and student services. An examination of the key components of noncredit to credit partnerships that contribute to student success can inform the development of effective strategies that lead to the accomplishment of learning outcomes (Academic Senate for California Community Colleges, 2009; Community College Research Center, 2010; Fouts & Mallory, 2010).

Purpose Statement

The purpose of this study was to examine a noncredit to credit community college partnership designed to facilitate student access to credit mathematics courses. Integrated into this study was an examination of the partnership goal of incorporating untapped noncredit resources to provide alternative academic pathways that strengthen subject competency and academic preparation, and integrate student services that would result in increased student persistence in credit entry-level community college mathematics. This study included identification of the effectiveness of strategies that the noncredit to credit partnership used to address obstacles students encountered while enrolled in the partnership program.

Research Questions

This mixed method research study examined a noncredit to credit partnership in mathematics and addressed the following research questions:

1. How does a noncredit to credit partnership increase remedial student access to the entry-level credit mathematics course?
2. What key components of the noncredit to credit partnership contribute to academic success as perceived by students?
3. What key components of the noncredit to credit partnership contribute to effective mathematics instruction as perceived by partnership team members?
4. To what extent do student and team member perceptions about the partnership help to explain how the program impacts access to credit?

Significance

California faculty, staff and educational leaders have responded to economic crisis with pragmatic intellect that is leading to reform (Grubb et al., 2012; Hein, 1991; Lascu, 2011; Moore & Shulock, 2012; Tinto, 1993). Altbach, Gumport, and Berdhal (2011) proposed educational reform that is designed within contemporary social, political and economic contexts. They framed ideas for reform that take into account the challenges students face today in their financial, political, workforce and educational pursuits. They proposed that instructors receive consistent training to integrate curriculum with these challenges. Cross (1999), Houck (2004), Korr (2012), and Moore et al., (2011) reached similar conclusions and proposed an alignment of instructor training and educational goals to increase student success. They recognized that curriculum development and pedagogy in alignment with the contemporary context of

technological and societal change would help prepare students for the workforce or for their future academic pursuits. These factors are significant to community college partnerships. There is value in training instructors in instructional methodology that incorporates subject matter with challenges students encounter in their financial, political, workforce and educational pursuits. Instructional training should include the integration of technology and curricular and student support components with subject competency. Tinto and Pusser (2006) and Copper (2014) confirm the value of instruction on student achievement. These factors establish the foundational significance for this study.

The development of a noncredit to credit community college partnership to increase student persistence in mathematics is aligned with the goals of the 2012 Student Success Task Force initiative (California Community College Student Success Task Force, 2011; Student Success Act of 2012). Understanding noncredit to credit partnerships impacts the ability of community colleges to utilize optimum resources to serve students who enter community college systems "under-prepared to do college level work" (Michalowski, 2013, para. 11). The key components of noncredit to credit partnerships correlate with the academic components institutions incorporate to reach remedial and basic skills students. Partnership programs facilitate opportunities for the approximate 27% of students who have achievement gaps and are struggling to find jobs and to earn degrees and the 20% who do not possess a high school diploma (California Community College Chancellor's Office, 2012a; California Department of Education, 2010). Noncredit to credit partnerships utilize community college

resources to increase achievement and persistence in mathematics and impact student success and completion rates (Community College Research Center, 2010; Cross, 1999; Houck, 2004; Korr, 2012; Moore et al., 2011). Research in this area has influenced educational access and opportunities for students with achievement gaps and cognitive and life barriers (Ballou, 2012; Chetty, Friedman & Rockoff, 2011; Curtis, 2012; Lascu, 2011; Park, Cerven, Nations, & Nielsen, 2013; Pierce, 2005; Twombly, 2005).

Data from this study provides insight into noncredit to credit transfers and into the effect of connections to resources and academic support services they can develop inside and outside the classroom. Saret (2013) and Tinto (2001) in their respective studies found that students transfer and persist at higher rates when they interact with instructors and develop support networks. The findings of this study may serve as a model for effective construction of partnerships and programs to provide the connections students need to succeed.

Many factors influence the development of community college partnerships. Students who receive financial aid must abide by credit course requirements and maximum unit regulations (California Community College Chancellor's Office, 2012b; California Student Aid Commission, 2011). When students enroll in noncredit courses they could jeopardize financial aid. The California Full Time Equivalency Student System (FTES) is another factor to consider in the development of partnerships. FTES is the established funding metric the state uses to pay for student hours of attendance and the variance in funding for noncredit and credit courses is significant to course, program and

partnership development. The 2013-2014 rate for credit FTES was $4,636 and the noncredit FTES funding for career development or college preparation noncredit courses was $3,283 (Community College League of California, 2014). The findings of this study focused on some of the factors that educational leaders must consider as they plan and implement partnerships to strengthen student persistence and success. The study adds a noncredit to credit dynamic to the existing literature regarding community college partnerships. It explored components of a partnership that the stakeholders believed provided access and strengthened persistence and success for basic skills students.

Scope of the Study

The literature shows the value of creating academic and social connections that enable students to fit into academic settings and to achieve learning outcomes that allow them to reach individual goals (Pascarella & Terenzini, 2005; Tinto, 2003; Tinto & Pusser, 2006). Developing programs that support providing an equal education to all California students will impact statewide living status, economic strength, and societal quality (Altbach, Gumport, & Berdhal, 2011; Brown & Niemi, 2007). This mixed method research study examined data related to the development of a noncredit to credit partnership that provided access and an alternative pathway for students who faced obstacles that limited academic progress in mathematics (Fouts & Mallory, 2010; Houck, 2004; Korr, 2012; Lascu, 2011). The findings may change California economic job and transfer-ready educational achievement and inform educators of key components related to persistence in California community

college (Moore et al., 2011; Park, Cerven, Nations, & Nielsen, 2013).

Assumptions of the Study

This study assumed students desired academic pathways to degree and certification completion. That students have an understanding of their individual achievement gaps is an underlying assumption of the study. The study also assumed matriculation testing accurately reflects student achievement and knowledge. Because the influence of student services in the quest for academic success is documented in the literature, this study assumed students knew about and participated in the guidance and assistance student services offered. Another assumption of this study was that there is a commonality in the obstacles students face. The correlation of variables and narratives collected in this study using a mixed method approach involved components of the above assumptions, but the focus was on understanding the structural features of noncredit to credit partnerships.

Study Delimitations

The literature includes a variety of examples of partnership principles that impact achievement gaps and increase student completion. A delimitation of this mixed method research study is the noncredit focus in the design of the academic partnership that was investigated. This study excluded an examination of curriculum and instructor qualities. The program design was unique in that its focus was on offering an alternative academic pathway and not on providing remediation. The research involved one southern California community college multi-campus district that includes an independent noncredit institution. There are

only two independent noncredit institutions with this structure in the state. Therefore, the sample size delimits generalization of the findings to all community colleges. This mixed method research study focused on the partnership components, the leadership, and the processes of implementation, which delimits the integration of pedagogy, instructor preparation, curriculum, and various cost and time factors. The study delimits alternative ways to lower achievement gaps and increase persistence.

Study Limitations

As with any research study there are limitations. First, mixed method research involves complex integration and multiple approaches to data collection (Creswell & Plano Clark, 2011; Hesse-Biber, 2010; Reed, Rueben, & Barbour, 2006). Second, the comprehensive nature of noncredit partnerships limits the extent of the study. Third, student achievement gaps and barriers are difficult to clarify and measure. The literature presents conflicting terms and associates various elements of student demographics that impact solutions and generalizations from the study findings. Fourth, this study is limited to noncredit to credit partnerships that will impact policies and theories. Fifth, this study took place within a district with a credit college and noncredit institution on one campus. Since this may not be the case at all institutions the findings may not generalize. The physical location of programs and courses should be considered in the development of a partnership. Finally, the short-term nature of this study is a limitation and the small sample size provided a narrow perspective regarding persistence as it leads to completion of a degree.

Definitions of Key Terms

The following terms are central to the research and are defined for the purpose of this study.

Achievement gaps. Contemporary literature ties achievement gaps to disparities between groups of students including racial, ethnic, gender and socioeconomic status differences. Gaps may lead to measurable inconsistencies in academic performance. For this study the challenges included irregularities in attaining a course grade and course completion.

Articulation. Articulation refers to the agreements between two-year and four-year public institution that open access for students who complete specific academic plans. In California, community college graduates depend on guaranteed entry into state universities based on GPA and test scores.

Assessment. Assessment refers to the specific diagnostic tools community colleges use to measure college readiness. Students diagnosed below entry-level are placed in academic pathways that require remediation.

Development courses. These courses are designed to provide students with curriculum that meets individual learning concepts and allows students to acquire academic skills based on predetermined standards that strengthen the move from underprepared to prepared in college level credit courses. Developmental courses improve the probability of successful achievement in rigorous credit courses.

Noncredit courses. These are courses in an adult continuing education program. They are usually free and are not graded. The focus of noncredit

courses is the open access and the developmental study opportunities. The structure of noncredit study includes convenient course scheduling, support, and decreased rigidity. Basic skills, language acquisition, career technology, and below-entry-level courses comprise the majority of noncredit courses. Enrichment and vocational training courses are currently included in noncredit offerings.

Nontransferable courses. These are remedial courses to assist students toward entry-level status without earning transfer level credits. The tuition for a nontransferable course is the same as a credit transferable course.

Partnerships. Partnerships are connections that assist students in academic pathways. For instance, high schools may create links for juniors and seniors to simultaneously enroll and earn community college credit while completing high school diploma requirements. Community college partnerships include links with community services, businesses, state universities, noncredit to credit programs, institutions, and districts.

Persistence. Persistence is the completion of one mathematics course and enrollment in the subsequent math course.

Predetermined standards. The standards generally accepted to predict success in a credit course are foundational academic skills that relate to performance and competency. They include, but are not limited to the following: organizational skills, time management, study and test strategies, attendance, and the ability to think critically, problem solve, persist, and meet deadlines.

Remedial status. Remedial status is given if students test below entry-

level and college readiness. Traditional remedial course pathways require students to pay the same tuition as credit courses, but students do not receive college credit. Remedial courses are designed to remedy specific learning or achievement gaps.

Success. Success for the purpose of this study is defined with three levels. Level one success is enrollment in entry-level credit mathematics (Elementary Algebra -Math 20 – [2 levels below university transfer math] or (Algebra I/ II-Math 41- [1 level below university transfer math]. Level 2 success is defined as the successful completion of a credit entry-level mathematics course (Elementary Algebra [M-20] or Combined Algebra I/II [M-41]. Level 3 is defined as successful completion of one sequential higher credit math course.

Underprepared student status. Underprepared students for the purpose of this study are students who were assessed below credit entry-level and have a demonstrated need to develop organization and time management skills, study and test strategies, consistent attendance, and persistence. Underprepared students come to a college setting with limited awareness of academic pathways and available student support services.

Organization of the Dissertation

Chapter 1 of this dissertation presented an overview of the problem, the purpose of the study, and its significance. The research questions were presented along with a review of philosophic ideas and a research framework. Chapter 2 reviews relevant literature that examines ideas, principles, and concepts of academic partnerships for basic skills students. The review relates

empirically based findings from past research studies to philosophic and practical decision-making processes incorporated by contemporary community college basic skills programs. Chapter 2 also includes a review of partnership structures, including a noncredit to credit model. Program components and curriculum are integrated into discussions regarding planning and implementation of a partnership program, but are not the focus of the review. The literature reviews the principles of persistence and components of student achievement as they relate to partnerships. The literature focuses on student success and the processes and procedures that lead to successful learning outcomes. The methodology, research design, and procedures are presented in Chapter 3. The results of analysis and findings are discussed in Chapter 4. Chapter 5 includes implications and interpretation of the study findings and recommendations for further study.

CHAPTER 2

REVIEW OF THE LITERATURE

In 1960 there were 56 California community college districts. Today, 72 community college districts serve the academic and workforce training needs of a diverse California student population (American Association of Community Colleges, 2012b; California Community College Chancellor's Office, 2013; CDOE, 2013). Today, California community colleges serve 2.6 million students with diverse goals, backgrounds, and multiple learning styles and levels (California Community College Chancellor's Office 2013; California Department of Education, 2013). Twenty-first century California community college leadership is dedicated to continuing the long tradition of access for its citizens legislated by the 1960 Master Plan of Education (California State Department of Education, 1960). The increase in the college age population and in student enrollment in remedial classes along with state budget funding cuts prompted the implementation of programs that ensure access for every student.

Franco (2013) has advocated for continued open access and for the flexibility necessary to meet the needs of today's students. He reminded educators that the "open door access to higher education for all Americans fulfills the promise of American democracy" (p. 1). Bailey and Morest (2006) merged the findings from fieldwork in 15 colleges in six states and posited, "The overall concept of higher education equity involves three parts: equity in college

preparation, access to college, and success in reaching college goals" (p. 2).

In California, approximately 27% of students who enter the community college system have achievement gaps and 20% do not possess a high school diploma (California Community College Chancellor's Office, 2012a; California Department of Education, 2010). It is the responsibility of the community college to provide academic pathways for these students that can strengthen subject competency and academic preparation and integrate student services that will result in increased student persistence and academic success for these students. The purpose of this study was to examine a noncredit to credit community college partnership designed to facilitate student access to credit mathematics courses.

The review of the literature in this chapter begins with a review of the theoretical and philosophical foundation for the study. This is followed by empirically based findings that focus on the needs of underprepared students. The review also includes a review of partnership structures, including a noncredit to credit model and the principles of persistence and components of student achievement as they relate to partnerships. The literature focuses on student success and the processes and procedures that lead to successful learning outcomes.

Theoretical and Philosophical Foundation

When students leave college before completion of their educational plan, it is considered early departure. The theoretical model for understanding departure is based on the work of Tinto and Pusser (2006). To better understand student

persistence and departure three theories guide the theoretic foundation for this study. The philosophic lens for the study is based on constructivist thought.

Theoretical Foundation

Tinto (2003) highlighted the importance of student involvement and instructor feedback in reducing college departure. Tinto's findings revealed that student engagement and success were dependent on four components: (a) institutional commitment to support instruction demonstrated by funding for program development and faculty training; (b) instruction that reflects an integration of subject matter with basic skills training in basic skills courses (c) diverse student support services offerings, and (d) student effort and participation in the learning experience.

Institutional commitment is reflected when administrators provide opportunity for managers to create innovative programs. One example of an innovative program is the math partnership examined in this study. It was designed to meet the needs of students in remedial courses. The decision to designate funds for faculty training to improve teaching skills is another component of the institutional commitment that Tinto found necessary for student engagement and success. An example of effective training is the use of instructional technology to supplement curricula.

Tinto's research called for instruction that reflects an integration of subject matter with student skills instruction is a demonstration of effective teaching. Expectations of students' demonstrating time management skills as a component of a math class is an example of integrated instruction.

Diverse student support services are expansive and include services such as counseling and tutoring. Tutoring offered at different times will meet the scheduling challenges students face. Tinto and Pusser (2006) found that flexible scheduling of services made a difference in student persistence and academic success.

Student effort and participation in the learning experience is demonstrated when students take responsibility for their academic achievement. Tinto and Pusser (2006) labeled this as the "quality of effort" students applied to learning. Students who choose to seek out the guidance of instructors, ask questions in class, and engage in-group study become active participants in the learning experience (p. 9-10).

In 2006 Tinto joined with Pusser in developing an institutional departure model that integrated the four components described above. The model illustrated how interconnection of the four components strengthened student persistence. According to Tinto and Pusser (2006) the connections students develop strengthen their ability to engage and persist. The model demonstrates how the four components scaffold students and motivates their individual engagement.

Tinto and Pusser described a contemporary classroom that included opportunities for students to communicate with instructors. The model illustrated student success in relationship to immediate feedback relating to assignments. The model also illustrated how instructors played a role in the development of effective connections and educational pathways. The model demonstrated how

interconnection of the four components motivated the "quality of effort" students bring to the learning process (p. 9).

Students in the twenty-first classroom connect socially when they learn how to perform in groups and collaborate with peers. The development of social, academic and behavioral habits influences how well students are able to overcome barriers (American Association of Community Colleges, 2013). Over 70% of twenty–first century community college student have jobs and /or families leaving little time for on-campus activities with their peers and faculty; therefore, social connections must be developed in the classroom setting.

Another component of Tinto and Pusser's (2006) model is related to the internal and external partnerships institutions develop in support of student success. Internal partnerships are the previously discussed academic, student support services and social connections within the institutions. The external components include career and academic partnerships developed in the community. This model affirms the importance of academic integration for student success. Tinto and Pusser's model directly responds to the obstacles basic skill students encounter.

Philosophical Foundation

Constructivist theory involves the synthesis of learning concepts students achieve as they apply concepts to real life challenges. The constructivist theory is founded on the ideas of Jean Piaget (Hopkins, 2011). His ideals included the mental process students follow to assimilate concepts and remember them. He believed students receive information and synthesize ideas into their individual

life experiences and backgrounds. In the process of synthesizing facts students may compare or contrast the ideas to their culture, social paradigms, or an existing framework of thought. Constructivists endorse the idea of experiential learning. Educators would correlate this to active learning instructional qualities. An example of constructivist educational thought is demonstrated in the constructionism Seymour Papert (1928-present) developed in response to Piaget's teachings (Ackermann, 2004; Hopkins, 2011). Papert advocated for a student-centered model that developed opportunities for project based student participation. Papert believed in creating a "world" where learners assimilate new information into individual imagination and thought patterns (as cited in Ackermann, 2004; Hopkins, 2011). Contemporary constructivist classrooms integrate active learning opportunities in the context of assignments and lectures.

The literature related to basic skills students discusses the structure of partnerships, strategies for lowering achievement gaps, the development of academic plans, and the use of resources to connect students to opportunities that will impact their success. Studies and project descriptions incorporate tenets of constructivist thought and recommend that educators build student thinking patterns that connect academic concepts to work, life situations, and the challenges students may face (Duncan-Andrade & Morrell, 2008; Moore et al., 2011). Cuseo (2007) proposed, "Effective programs depend not only on program content (the "what"), but also on their process of delivery (the "how")" (p 11). Hein (1991) found that engaging students in meaningful thought and experiences that relate to work and life helps them construct personal meaning and integrate

concepts with other academic disciplines. Instructors that coach students to connect learning to life increase achievement (Duncan-Andrade & Morrell, 2008; Ito et al., 2013).

A study by Grubb and Gabriner (2013) also supports constructivist ideals. They researched community college partnerships and basic skills program designs. The framework for learning found in their study included instruction that connected subject content with the pragmatic use of concepts. For example, their research involved active learning models used in developmental education to develop connections between subject content and work. (UCLA Community College Studies, 2005). In addition, they examined how various student support services inside and outside the classroom influenced learning. Their study found that the development of learning opportunities was related to the meaning students placed on their individual goals.

Partnerships develop opportunities for constructive learning. Project-based classroom assignments provide students with opportunities to connect academic concepts with life experiences, job requirements, and social interactions. The educational literature includes studies that demonstrate how the connections students develop increase their ability to learn. Cuseo (2007), Grubb et al. (2012), and Hein (1991) designed varying frameworks for community college partnerships and researched the difference constructive learning made in learning outcomes.

Ferraro (2008), in his discussion of the dependency theories of Prebisch (1950), stated that economic dependency creates a cycle of wealth. Gaining

wealth by exploiting products and services of poorer nations results in inequitable labor divisions. In relationship to educational program construction and accessibility, divisions in economic and social status are also evident in the rates of student persistence and completion. Educators have labeled these divisions as gaps that impact achievement (Duncan-Andrade & Morrell, 2008, Moore et al., 2011). A study completed by Park, Cerven, Nations, and Nielsen (2013) found that training women with the skills to live independently led to long term favorable economic outcomes. This suggests that providing opportunities that alleviate low economic and social standing can change the learning outcomes for lower income women in community colleges. Park et al., (2013) found that open access and removal of common barriers are key components in academic success. Their findings prompted them to identify program availability, support services, and communication as foundational factors that impact success for this population. Women make up approximately 52% of the community college population; however, these foundational factors are also recognized in the literature as related to student success for multiple student groups (Duncan-Andrade & Morrell, 2008; Moore et al., 2011; Pascarella & Terenzini, 2005; Tinto, 2003).

Contemporary discussions associate elements of dependency theory with student access. Because educational access relates to how financial status, cognitive development, and self-efficacy create barriers for students who believe they do not fit into an academic environment (Holmquist, Gable, & Billups, 2013; Tinto & Pusser, 2006) students who face these barriers remain dependent on

others to achieve success in contrast to students who have financial means and self-efficacy. Cuseo (2007) advocated for community college instruction that included guidance into purposeful decision-making skills, critical thinking, and confident independent thought patterns that connect learning to a sustainable functionality of independence in life and work (Cuseo, 2007). Garrin (2013) completed extensive research on the cognitive development all students make in college and concluded, "The college experience reflects a hotbed for dynamic, multidimensional growth; a period of significant learning and enlightenment, and an opportunity to develop the competencies, expectancies, and evaluations that underpin the capacity for students to become socially agentic" (p. 13).

Noncredit institutions within community college districts offer an environment where students can decrease the damaging impact of thinking patterns related to negative beliefs about self-efficacy and socio- and economic barriers (Arena, 2012; CDOA, 2012; Cross, 1999; Holmquist et al., 2013; Fouts & Mallory, 2010; Walton et al., 2009). Noncredit basic skills courses afford students time without cost to increase college readiness, gain self-efficacy, and improve learning to eliminate barriers to entry-level mathematics, English and reading. Acquiring a familiarity with college culture in a noncredit environment can prepare students for transfer to credit programs simultaneously with achieving academic progress in order to decrease the academic and social gaps that students have developed in previous years. Effective community colleges make a commitment to link students to programs that develop student behaviors that will increase the probability for college success (Ito et al., 2013; Tinto & Pusser, 2006).

Student skills and talents are refined through instruction, curriculum, and active learning. Education is the bridge to success if gatekeepers to educational opportunity and outcomes ensure optimum development of each student's individual skills and talents (Chickering & Schlossberg, 2001; Grubb et al., 2012). Bailey and Dynarski (as cited in National Bureau of Economic Research, 2011) conducted a longitudinal survey of America's youth to understand the achievement gaps that are related to low-income, gender and access. The findings show a growing discrepancy in the improvement of educational opportunity. This study will explore the outcomes of a noncredit to credit partnership that opens access for all students and prepares them to meet the academic challenges of credit courses.

Review of the Scholarly Empirical Literature

The Students

California's community college system serves over 2.6 million students. The average community college student age is 29; 41% of students are veterans, and there are over 213 languages spoken in the California student populace (California Community College Chancellor's Office, 2013; California Department of Education, 2012). Fluctuations in the California education budget continue to have consequences in the programs and classroom of community colleges (CCCCO, 2013; Fouts & Mallory, 2010; Lascu, 2011; Moore et al., 2011).

The challenges student face as they compete in the job market, desire a university degree or strive to improve social status are correlated with the reasons they enroll in a community college (CCCO, 2013; CDOE, 2013). The

rationales for attending a community college are diverse. National and state reports indicate 77% of the jobs in 2014 will require some form of college achievement (CDOE, 2012; Clancy, 2007).

The Public Policy Institute of California studied the courses community college students attended in the first year and found that the majority of students took courses in five areas. Half of community college students enrolled to complete required transfer courses. "Twenty-eight percent of University of California and 55 percent of California State University graduates began at a California community college" (California Community College Chancellor's Office, 2013, Policy in Action link, p. 2). "Fifteen percent completed vocational classes and less than 10 percent completed noncredit classes. Basic skills and English as a second language (ESL) courses comprised 15%. Over half of the students did not complete courses after the first year. Thirty-seven percent of students surveyed in 2011 said they enrolled in at least one distance education course because of convenience" (California Community College Chancellor's Office, 2013, Policy in Action link, Key Facts, para.10). Usinger (2013) reported 45% of students dropped classes for academic reasons. Many did not complete a degree or earn a certificate (American Association of Community Colleges, 2012b; California Community College Chancellor's Office, 2013; California Department of Education, 2013; Sengupta & Jepsen, 2006).

California community colleges are impacted by changing student demographics, college readiness, and achievement gaps. College persistence is affected by barriers that relate to life, cognitive development, and learning habits

(CCCCO, 2013; Cuseo, 2007; Holmquist, Gable, Billups, 2013; Lascu, 2011; Pascarella & Terenzini, 2005; Tinto & Pusser, 2006; Usinger, 2013). These challenges and budget restraints prompted the 2012 Student Success Task Force (SB1456) to make eight recommendations to ensure higher levels of student success. The SB 1456 legislation recommendations included increasing college and career readiness, aligning course offerings to meet student needs, increasing coordination among colleges, and aligning resources with a focus on student success (Bacca et al., 2011; SB 1456, 2012).

Basic Skills

Student access to community college courses depends on college readiness scores. There are approximately a half million students who enroll in basic skills courses to acquire the education they need to begin progression toward a certificate or degree. Student success is influenced by curriculum, student services, and classroom instruction (Center for Student Success, 2007; Pascarella & Terenzini, 2005; Sengupta & Jepsen, 2006; Tinto & Pusser, 2006). How students think impacts motivation, belief in possibilities, and study skills (Duncan-Andrade & Morrell, 2008). Students who believe they belong in higher education and meet challenges with confident thought patterns will persist and succeed at higher rates. Cuseo (2007) identified seven key thought processes that make a difference in persistence: personal validation, self-efficacy, a sense of purpose, active involvement, reflective thinking, social integration, and self-awareness. Cuseo called these processes "the most potent principles of student success" (p. 3).

A college degree is a goal and the acquisition of a job that meets economic requirements compliments and challenges that goal. As has been stated, living standards and social and cognitive thinking processes can be challenges to students (Duncan-Andrade & Morrell, 2008; Holmquistet al., 2013; Pascarella & Terenzini, 2005; Tinto, 2001). Boyer and Usinger (2013) reported findings from a survey of 1,500 students in 2011 and 2012 that demonstrated that the difference between success and failure for all levels of students are related to motivation and confidence. Connections educators make between course curriculum and real life application can enable students to set realistic goals that are appropriate to individual learning styles and cognitive development (Ito et al., 2013). Cognitive development, technological skills, social confidence, and critical thinking are areas of training found to make measurable difference in successful learning in a 21st century classroom (Altbach, Gumport, & Berdhal, 2011; Cuseo, 2007; Lascu, 2011; Sengupta & Jepsen, 2006; Tinto, 2001). Every community college classroom is a microcosm of diverse student challenges (Hughes, 2012; Twombly, 2005).

Community colleges are incorporating programs to alleviate stress points, obstacles, and the learning gaps students face (Center for Student Success, 2007; Altbach, Gumport, & Berdhal, 2011; Moore et al., 2011). Educational leaders have developed courses to meet achievement gaps and multiple learning styles (Lascu, 2011; Slavin, 2012; Taylor, 2012). In California, the Basic Skills Initiative is designed to focus on student success and readiness (BSI, 2013; Holmquist et al., 2013). The California Basic Skills Initiative facilitates a central

composite of successful strategies and practices that support students in community college programs throughout the state. For thirty years the initiative has compiled a review and measured student success in basic skills programs and student services. The initiative funded the creation of a database that organized the findings of these studies into twenty-six categories. The database shares successful strategies and programs that have been implemented in the field for two or more semesters. This statewide strategic plan has been incorporated into a statewide professional development network. The California Community Colleges Success Network hosts and facilitates professional development opportunities that relate to effective strategies and programs various California community colleges are implementing to meet challenges within the twenty-six categories (BSI, 2013; California Community Colleges Success Network, 2013). For example, in 2013 the California Community Colleges Success Network began a training series entitled "Habits of the Mind" to equip instructors with strategies that develop cognitive patterns that increase student success.

Basic Skills Instruction

The Basic Skills Initiative established areas of focus for basic skill instruction, with student success being in the forefront in the construction of program elements. Instructional practices include the integration of cognitive development and subject competency. Equal access to higher education is strengthened for students in the components of curricular training that include test taking strategies, study skills training, and the development of self-advocacy

(BSI, 2013; Duncan-Andrade & Morrell, 2008; Holmquist, Gable, & Billups, 2013; Horan, 1991). Morgan (1984) conducted a case study of instructors who encouraged students to challenge barriers to reach success and found instruction that included understanding of student issues made a difference in learning outcomes. Research in higher education continues to challenge instructors to encourage students, to build connections, and to provide opportunities for students to successfully complete higher education degrees (Moore et al., 2011; Park et al., 2013) The Basic Skills Initiative (2013) posits that changes are incremental. According to the Basic Skills Initiative, "Improvement of 5-15% indicates success" (p. 10).

Basic skills instruction is not exclusive to America. Choi (United States Department of Education, National Center for Educational Statistics, 2002) advocated for alternative education internationally and established the Education Research Institute at Ajou University. She is instrumental in organizing conferences and symposium to train educators in the art of lifelong learning for all students. She is dedicated to serving underrepresented students and established learning projects for student groups others believed would fail.

In contrast to Tinto and Pusser (2006) whose model is based on traditional students, Park and Choi (2009) created a model to increase persistence for nontraditional (basic skills) students based on the findings from their study of adult student dropouts who enrolled in job-related online courses. The model created by Tinto and Pusser (2006) promotes establishing connections between student support services, instructional design, and institutional commitment to

increase the quality of effort students give to reach their individual goals. However, Park and Choi (2009) proposed learner characteristics such as age, gender, prior education, learner skills, and employment that were in existence prior to the course influenced persistence. They described how external factors (scheduling, family issues, financial problems) and internal factors (social and academic integration, technological skills, and motivation) need to be in alignment to create an ideal learning environment (p. 209). Park and Choi (2009) found nontraditional adult learners had goals related to entering or advancing in the workplace and enrolled in courses that motivated and related to their personal goals. Of the 147 adult learners, 98 were persistent learners (68%) and 49 (33%) did not complete the courses. Findings showed significant differences relating to organizational support, course satisfaction, family support, and relevance respectively (Park & Choi, 2009).

McCarthy and Vernez (1998) found factors similar to those of Park and Choi (2009) in a study of immigrants that they conducted in California. McCarthy and Vernez (1998) studied immigrants with low educational levels and found that education made a difference in their economic and social impact on California society. McCarthy and Vernez (1998) recommended access to higher education, promotion of naturalization and English as a second language courses for immigrants. They reported 40% of immigrants do not possess a high school diploma, Since 25% of California residents are immigrants, the fact that 40% do not have a high school diploma contributes to the achievement gap and the need for basic skills education in California.

Because basic skills students come to community college programs with a variety of educational needs, California community colleges have developed innovative programs and used untapped resources to support students pursuing their educational goals. Noncredit course work is one resource that is being used to alleviate the basic skill challenges that limit student transition into credit entry-level community college courses.

Noncredit Support

The Academic Senate for California Community Colleges adopted the "Role of Noncredit in the California Community College" in 2009 (Academic Senate for California Community Colleges, 2009), which established opportunity for students and challenges for institutions and instructors. The opportunities California community college noncredit programs bring for students can make a difference in student preparation and college readiness. Students do not pay enrollment fees in noncredit courses. Noncredit students do not receive grades, but possess a record similar to a transcript that lists the courses completed. A current state initiative is piloting a standardized system of progress indicators for noncredit courses (Fulks, 2012). Noncredit students do not earn credits. Career technical students enrolled in noncredit courses might earn a certificate in a vocational or technical discipline (Academic Senate for California Community Colleges, 2009).

In 2006, the California legislature passed SB 361, which established improved equity and transparency in funding for noncredit course work. In 2012 and 2013, the California educational budget challenges led to initiatives that

impacted the structure of noncredit institutions, allowing for independent, stand-alone organizations in deference to continuing education in K-12 districts. The curriculum in noncredit institutions is regulated by Title 5 (§84757), and course outlines of record establish improved pedagogical practices (Academic Senate for California Community Colleges, 2009). Accreditation standards that include student learning outcomes established parameters for improving instructional quality and require student assessment related to learning in noncredit courses.

This study investigated the design of noncredit to credit partnerships developed to increase persistence and success in credit entry-level mathematics. The resources noncredit institutions contribute to the California educational system facilitate basic skill student preparation to increase college readiness.

Fouts and Mallory (2010) explored ways credit and noncredit programs can collaborate and partner to support students and to ensure higher levels of success. The inclusion of collaboration in the administration of programs and between curricular and course designs can help to create connections for students. The Fouts and Mallory study involved nursing practitioners who needed courses that were user-friendly and were designed for working adults. The partnership designed modules for the nursing practitioners and made them available online and in person. Completion was based on the hours expended per course. Credits were awarded if participants persisted toward a certificate. The study found that the noncredit to credit relationship was meaningful to the students and was valued by institutional leadership. However, there was criticism of the program by faculty. Faculties were concerned about the rigor,

instructional quality, and the changes from traditional to innovative classroom structures. Compensation of faculty also was an issue. The study findings included the need for measurable data to demonstrate results. Fouts and Mallory concluded that breaking down the wall that divides institutions can result in a use of resources that will benefit a wider range of stakeholders in community colleges.

A 2011 study by Ganzglass, Bird, and Prince suggested that a review of disconnects in academic systems is needed to improve the development of noncredit and credit partnership programs. Credits are the standard in higher education and meaningful to completion and degrees. For years credits have been debated, and the unit of measurement they provide critiqued. The discussion in Ganzglass, Bird, and Prince (2011) demonstrates the complexities of earning credit in a noncredit to credit partnership. For example, credits, like attendance, are measurements used in funding expenditures. Noncredit courses do not earn credit, and a standard equation to translate hours into credits does not exist. Noncredit assessment systems are varied, which complicates the ability to document student completion. However, the incorporation of a wide range of alternative learning opportunities that may not coincide with traditional, industry standards can be implemented in courses which do not lead to credit. Partnerships that include noncredit and credit institutions need to be designed to incorporate frameworks for completion that are meaningful to the credit counterpart in partnerships. Student learning outcomes demonstrate products of learning, but cannot ensure competency equivalent to examinations or rigorous

assessment methodology. Ganzglass et al. (2011) emphasized the value of consensus in the creation of noncredit and credit bridge programs

Academic Pathways

The historical context of community college education included business and community connections designed to benefit students in their individual quests of meeting academic transfer or work mobility requirements (Bohn, Reyes, & Johnson, 2013). Contemporary community colleges have developed partnerships to connect students with resources, support, and pathways directly linked to outcomes and success. Regional SB 1456, Student Success Task Force groups have met consistently since 2011 to align programs and resources that support community colleges when they are tasked to meet the SB 1456 recommendations (California Community Colleges Student Success Task Force, 2011). Regional meetings include plans for training, shared professional development opportunities, and the creation of curriculum and student service programs. Higher levels of engagement and participatory education are integrated within the student success measures the legislation promotes (Bacca, et al., 2011; SB 1456, 2012).

Tinto (2003) provided an example for noncredit and credit partnerships in his noncredit executive English course. This course, offered on a contract basis for twelve years, yielded positive and successful business English competency. Small numbers of international students achieved the partnership program goal of preparing international students for further academic study. The cohort structure used in the course provided language instruction within a three week

summer session. Students received feedback from instructors and a completion certificate. The open-ended course was created to meet corporate needs and included topic areas which related to the business world.

At the other end of the scope, community college education districts and high schools have developed partnerships to bridge high school students to higher education. The community college served as the connection. There are varied structures in the academic partnerships in this area. For example, Barnett and Hughes (Community College Research Center, 2010) conducted a study of community college and high school partnerships. They found that enrollment in college increased when high school students were linked to a community college program. The community college and high school faculty and leadership developed joint projects that prepared students for college. Collaborative approaches provided students with improved awareness and understanding of college requirements. In addition, the findings focused on elements that improved student persistence and success. They concluded that persistence rates improved as a result of high school students using the library and learning resources. Familiarity with the college campus made a marked difference as students navigated the transition from high school to higher education. Active outreach, consistent awareness, and orientations assisted students in the transition from high school to college.

Contemporary political and educational leaders believe education is a key to economic stability (Baron, 2012; Brown & Niemi, 2007; Clotfelter, 1991; Duncan-Andrade & Morrell, 2008). The Mott Foundation in California provided a

two-year grant for eleven community colleges to assist in training that would result in the successful start-up of small businesses in communities surrounding the colleges (American Association of Community Colleges, 2013). Carducci, Calderone, McJunkin, Cohen, and Hayes (2005) surveyed participants in 227 community colleges to understand how noncredit instruction and programs influenced entrepreneurship and small business training. Seventy-six percent of the community colleges offered both noncredit and credit business related courses. Career and technical programs developed partnerships between community colleges and the corporate or business entities in a community college geographic area. The data indicated that community college partnerships with community services have proven successful in supporting students as they enter the workforce.

Barnett et al. (2006) utilized a National Science Foundation grant to create successful partnerships that benefited student success in the work place and in further academic pursuit. Another design of institutional education partnerships are the school district partnerships similar to the CA Alliance of PreK-18 Partnerships and the CA Academic Partnership Program that was founded in 2004, which are improving student achievement in every sector of academic pursuit. For example, the Long Beach school district partnership led by California State University at Long Beach is breaking down traditional barriers and using resources to impact student success for students from kindergarten through baccalaureate studies (California Alliance of PreK-18 Partnership, 2004).

Community College Partnership Implementation

The CA Alliance of PreK-18 Partnerships (2004) that is sponsored by CA Academic Partnership Program in Long Beach, California is a district designed PreK-18 collaboration recognized throughout the state of California for the comprehensive design and utilization of district resources to ensure success. One goal of this effort was to identify elements that could be duplicated in other districts of California. The study led to seven regional partnership designs and fourteen recommendations to improve student success and achievement throughout the state (California Alliance of PreK-18 Partnership, 2004). The seven partnership programs are in diverse regions of California and serve varied student populations with diverse challenges. Each partnership innovatively constructs bridges to provide students with better access to academic and support programs, personnel, community resources, and facilities in order to alleviate obstacles and limitations in academic pathways. The importance of a unified focus toward student success is one important finding of the partnership committee. The California State University, Long Beach collaboration with Long Beach City College is changing the dynamics of persistence and transfer rates. A concerted effort to place high school students on college campuses has decreased the time students traditionally take to adjust to a new program and find their way. Students within the district learned about the opportunities available to them and how to navigate the barriers. Promotions, marketing campaigns, and campus tours that begin in elementary school have created positive cognitive patterns, guided students in the development of short and long

range goals, and inspired realistic focus (California Alliance of PrK-18 Partnerships, 2004; California Alliance of PreK-18 Partnership, 2004).

One consequence of the Long Beach district partnership has been the impact and influence it has had on the community. The American Association of Community Colleges (2012b) confirmed the relationship between a quality education and the economic and societal elements of a community. A report from the 21st Century Commission on the Future of Community Colleges (2012) urged that, "Educational leaders must reimagine what these institutions [community colleges] are and are capable of becoming" (p. 9). The report communicated "three R's: redesign students' educational experiences, reinvent institutional roles and reset the system to create incentive for student and institutional success" (p. 12). The noncredit to credit partnership that was implemented by a southern CA community college district incorporated a redesign of student educational experiences and reinvented institutional roles to reset the system. A unique quality of this study's partnership was the noncredit to credit partnership. Research-based components and concepts of curriculum and instruction were incorporated into the instructional design of mathematics noncredit course outlines and structure. The noncredit to credit mathematics partnership in one community college modified traditional lecture classroom structures into a lab instructional design. The curriculum was adjusted to establish minimum assessment scores as students moved from one concept to the next. These adjustments ensured students moved through the curriculum with in class tutorial resources and achieved minimal competency of concepts.

A review of existing higher education partnership informs educators that academic achievement of basic skills students correlates with the connections, development, and preparation students receive in the context of future academic requirements and rigor. There is evidence that Tinto's (1993) theory regarding institutional commitment is supported. Institutional commitment that constructs curricular, instructional and service components to increase successful student learning impacts the quality of effort students bring to courses. The quality of effort students give to persist and successfully complete courses leads to transformational learning outcomes. Ballou (2012) agreed with Tinto and discussed what he calls "the value-added" role instruction plays in the long-term success of students. His study set a standard for research by establishing the necessity "to rule out plausible alternative explanations" or variables that may have influenced long term success (Ballou, 2012, p. 4). Ballou stated that the direct relationship of instruction to student success is difficult to measure because there are other measurable factors that impact change dynamics in the lives of students. A combination of influencing factors (variables) may lead to persistence and to success within academic pathways (Ballou, 2012, p. 7). Ballou's (2012) work is important to this research because of his belief that multiple factors influence students and the combinations, links, and bridges educators establish to guide students toward successful academic pathways accumulate to scaffold students. Partnerships, by their nature, involve multiple factors.

Baron (2012) admonished educators to wake up to key educational

challenges and engage in finding solutions using the resources that exist within institutions of learning. In her analysis of the 2012, SB 1456, Student Success Task Force, she stated a conundrum that California educators face: "For so long we've been focused as a state on access only. . . . This is the first major reform that puts success at the center of the higher education agenda" (Baron, 2012, para. 8). The key issues for many educators seem to find root in finances related to budget cuts; Baron (2012) proposed the utilization of the resources within California community colleges as a wealth of opportunity. She suggested using the input of instructors with innovative ideas, technology, and streamlined academic pathways as resources that could help to implement change. De Berly and McGraw (2010) confirmed the benefits of using these types of institutional resources in the findings of their study that examined of the benefits of the inclusion of social components and technology in a curriculum to successfully taught English to second language learners.

Communication and collaboration are common elements in programs that increase student achievement and persistence. Korr (2012) researched the blended design of adult vocational education at Brandman University that bridged noncredit and credit entities. The emphasis of the study was on the individuals enrolled in the program rather than the elements of the institutional partnerships. Korr's findings demonstrated that partnerships focused on the individual student yielded measurable benefits to the institution and its surrounding community. However, he found benefits and drawbacks to the accelerated curriculum design that was used in the program. Although Brandman University found the decrease

in classroom time required to complete the program increased attendance and benefited adult learners who were balancing work, life and learning, Korr (2012) noted the importance of having in place well-designed assessment and online tools to support the instructional challenges the faculty experienced in relation to the limited instructional time. He placed value on the construction of a curriculum designed to reach competency standards that was integrated with flexibility for adult basic skills learners who have families and work. Burgarino (2014) reported similar findings in a study of a unique math program at Pittsburg's Los Medanos College.

Cross (1999) researched the use of learning communities for adult learners and found the social connections learning communities establish make a difference in persistence and success rates. This finding supports Tinto (1998) who stated, "The more students are involved in the social and academic life of an institution, the more likely they are to learn and persist" (p. 2). Tinto found in his study of the Coordinated Studies programs in Seattle that 67% of the students in the Coordinated Studies programs persisted in contrast to 52% of regular students. The Coordinated Studies program designed courses where instructors and students worked together in an interdisciplinary study project. The student incorporated an active learning model designed to develop critical thinking and collaboration skills. Bloom and Sommo (2005) found similar benefits for opportunities for student social and academic engagement in their study of The Opening Doors project. They found that students in a learning community with connections to social, academic and textbook resources achieved higher scores

in courses in the first semester and were more likely to complete the remedial requirements of the program.

Based on the understanding that over half of California's students will matriculate to community college and that the entrance test establishes the academic pathway they will follow, Brown and Niemi (2007) placed a priority on the alignment of curriculum in a partnership program between the local high school district and the community college. Brown and Niemi identified common standards in 94 different placement tests and correlated those standards to curriculum competencies of eleventh graders. Brown and Niemi (2007) found a relationship between alignment of curriculum in high school with the rigor of collegiate courses and community college enrollment assessment. "Alignment of high school coursework and assessments with those in higher education is a necessary step in preparing more students to successfully enroll in and complete certificate and degree programs" (Brown and Niemi, 2007, p 4). Brown and Niemi (2007) found a consistent statistical pattern in the successful completion of basic skills courses and remedial courses to certificate and degree completion in a community college or university. They concluded that improved enrollment in sequential courses is a key to persistence, student success, and completion.

Brown and Niemi (2007) and Baron (2012) acknowledged the impact of the connections that students build and the guidance they receive during enrollment to success in entry-level community college courses. Moore and Shulock (2010) found that community college students who enrolled in and completed math courses early "gained momentum" and "followed successful

patterns" toward completion and transfer (p. 9). The findings indicated that early enrollment in math courses made a difference. Moore and Shulock encouraged policy changes to create better patterns of enrollment (2010).

Educational literature presents multiple components that relate to increased student persistence and eventual academic success. Research regarding basic skills students informs educators of the importance of building outreach programs that assist students in the development of social and academic connections and self-efficacy (Duncan-Andrade & Morrell, 2008; Holmquist et al., 2013), increase early enrollment in foundational courses (BSI, 2013; Moore & Shulock, 2010), and assess students for correct placement (Brown & Niemi, 2007) to increase persistence and success. The strategies to cultivate critical thinking and cognitive development found in other research studies are valuable pieces to the puzzle (Pascarella & Terenzini, 2005). Research provides evidence for the impact bridges and connections between segments of education makes (National Bureau of Economic Research, 2011; California Academic Partnership Program, 2013; Carnegie Foundation, 2011; Cuseo, 2007; Duncan-Andrade & Morrell, 2008; Person, 2014). The current California initiative to research effective ways to establish bridges between the K-12 and community college basic skills will add to this body of research and fill the gap regarding noncredit courses and programs (AB86, 2014; Booth et al., 2013; California Alliance of PreK-18 Partnership, 2004; McClenney, 2013). Community college leaders and faculty persist in their efforts to increase degree completion for all students. This study focused on how a partnership between the noncredit

and credit entities in a community college district increased student completion of one alternative, remedial mathematics course in order to gain access to community college credit math.

Chapter Summary

The literature indicates there are challenges in community college access and completion. The data shows that inconsistent access and persistence impact student achievement and success. California community college educators are tasked with the responsibility of providing educational opportunity, access, and effective outcomes for a diverse population of students with multiple learning and achievement gaps. Institutional and educator goals to continue to increase student access, strengthen persistence rates, and guide students toward academic success have prompted the development of innovative educational programs. The historic dedication and devotion of California educators is evident in contemporary community college leaders as they construct partnerships that utilize resources within the institutions to alleviate barriers for all student groups.

The challenges faced by community colleges initiated the restructuring and reinvention of educational programs to meet current work force needs and academic transfer requirements. A renewed focus on student success in combination with access and college readiness is leading to various connections and partnerships. Student pathways that include student support and training in critical thinking, study skills and academically strong behaviors are demonstrating learning outcomes that lead to persistence, degree completion, and academic success.

CHAPTER 3

RESEARCH METHODOLOGY

A mixed method research design was used to study the impact of a noncredit to credit partnership program within a community college district. The study analyzed the academic pathways community college basic skills students utilized to complete remedial courses and transfer to entry-level credit mathematics courses. This mixed method research study collected data to answer the following research questions:

1. How does a noncredit to credit partnership increase access to the entry-level credit mathematics course for remedial students?
2. What key components of the noncredit to credit partnership contribute to academic success as perceived by students?
3. What key components of the noncredit to credit partnership contribute to effective mathematics instruction as perceived by partnership team members?
4. To what extent do student and team member perceptions about the partnership help to explain how the program impacts access to credit?

Mixed Methods Research

Tashakkori and Teddlie (2003) referred to mixed method research as a "third methodological movement" (p. 5). Mayring, Huber, Gurtler, and

Kiegelmann (2007) called mixed methods research "a new star in the social science sky" (p. 1). The selection of mixed methods research for this study combined the strengths of quantitative and qualitative research to investigate the effective components of a noncredit to credit community college partnership in mathematics. The use of mixed method research methodology in this study provided a comprehensive foundation of quantitative institutional data strengthened with the data from three qualitative instruments (Creswell & Plano Clark, 2011; Hesse-Biber, 2010; Johnson, Onwuegbuzie, & Turner, 2007; Strauss, 1987; Tashakkori & Teddlie, 2003). More specifically the mixed method research in this study integrated the strength of statistics with the voice of stakeholders (Creswell & Plano Clark, 2011; Lui, 2012) to explore how noncredit resources were used to facilitate transfers to credit mathematics and strengthen persistence. This multi-layered approach allowed for a deeper understanding of: (a) student demographics and academic preparation as they are related to instructor and administrative perspectives and (b) the efficacy of partnership program design and components. Quantitative analysis was used to validate the data in correlation with qualitative findings (Patton, 1989).

Research Design

The contextual framework for this mixed method research study followed the 2010 study of Hess-Biber in that quantitative and qualitative data were integrated to strengthen the findings. The mixed method research design benefited from the analysis of data from the quantitative perspective in conjunction with the understanding of perspectives acquired from human input

(Hess-Biber, 2010). This level of research collects broad ranges of data and uses it to inform solutions relating to practical challenges in the field. Hess-Biber (2010) made the point that quantitative data alone will only tell one side of the story and decisions based on one side of any story are not authenticated.

Charmaz (2006) confirmed the value of listening to the "meanings ascribed by participants in the study" (p. 429). The mixed method design was selected for its interactive strengths and the unified focus obtained by using both quantitative and qualitative phases of research (Barber, 2009; Charmaz, 2006; Creswell, 2008; Creswell & Plano Clark, 2011; Hess-Biber, 2010; Reed, Rueben, & Barbour, 2006; Tashakkori & Teddlie, 2003).

Research Methods

This mixed methods research study followed a fixed design. The quantitative institutional database was the foundation for the first phase and findings of this phase were deepened with two sequential exploratory phases. The quantitative first phase consisted of an analysis of the institutional database. The second phase was both quantitative and qualitative and involved a student survey instrument. The third phase was qualitative and incorporated a group interview, an individual interview and a focus group. The instruments of this research method were planned individually and not informed or driven by the previous phase. The instruments combined the benefit of quantitative data with the dynamics of qualitative data to provide a stronger analysis than a singular data approach could yield.

Sample and Setting

The students who participated in this study reflected California community college demographics (California Community Colleges Chancellor's Office, 2012-2014). Students who enroll in the district are a mixture of highly successful high school graduates; students with learning and achievement gaps related to language, ethnic inequities, and poverty; and students who are pursuing various academic goals. The students in this study were those assessed below credit entry-level competency in mathematics. They were required to complete remedial or basic skills courses before enrolling in credit entry-level mathematics. Remedial status put a barrier on either the acquisition of an associate of arts degree, the completion of general education, which is the gateway to a baccalaureate degree, a four-year college/university transfer, or the completion of a certificate that is related to job advancement.

The instructors who participated in this study were involved in a combination of partnership design and classroom instruction. Instructors who participated in the design of this partnership possessed a master's degree or met the California requirements to teach mathematics at the community college level. The specific classroom instructor that participated in the interview represented both the credit and noncredit perspective of the partnership. The participating deans, program managers, and others in leadership positions were professional educators who achieved recognition in the district for innovation and productive construction of academic pathways to benefit student success.

Student success in California community colleges is related to course offerings and to the interplay of the institutions with the communities they serve. In 1960, California set a goal to provide a community college within reasonable distance to afford accessibility for each citizen (Boilard, 2009). The overarching setting for this study was a community college district in the middle of a densely populated California county with impacted enrollment. The district offers basic skills instruction in two credit colleges and an independent noncredit institution. The district incorporates strategic plans to meet the academic and work force needs of the communities that encompass approximately 155 square miles in southern California. Student enrollment in the district at the time of this study was approximately 61,000.

The county's broad socio-economic status ranges from below poverty to the wealthiest districts in the nation. While tourism is a central factor in this sixth largest American populous, the county also possesses the "third largest number of people living in poverty" (Community Action Partnership, 2013, para. 4). The United States Census Bureau (2014) reported 45 percent of the population as White; 34 percent as Hispanic; 17 percent as Asian American with citizens of two or more ethnicities. African American, Indian and Pacific Islanders join other ethnicities to comprise the demographics that reside in this county. Thirty percent of the residents are foreign born and 45 percent speak a language other than English at home (Community Action Partnership, 2013). One hundred and eight million low-income students, 31,000 seniors, and 4,000 persons with disabilities

participated in alternative community programs that met their situational needs in 2011 (Community Action Partnership, 2013).

The county is urban, fast-paced, and boasts a thriving business economy. The county boasts nine two-year colleges, two noncredit institutions, two four-year fine art and design institutions, ten private, and two public universities (Center for Demographic Research, 2013).

The credit community college in this study had an enrollment of 19,604 students in fall 2011. It is one credit institution in a multi-campus community college district. The community college district serves 15 different K-12 school districts in 19 cities. The balance of ethnicity in the district credit institutions and noncredit programs are similar. There is a contrast in the age variance between the credit and noncredit institutions. The highest age group in the credit institution at the time of the study was the 20-24 year olds, with 19 and younger the second largest student group. In the noncredit institution the largest age group was the 50+ bracket, with 40-49 year olds a distant second. The credit college gender demographic reports 51% female and 48% males in contrast to 64% female and 32% males in the noncredit sector.

The noncredit institution in this district is the fourth largest in California (California Community College Chancellor's Office, 2013). The demographics of the district show the comprehensive scope of students served. Impacted classes result from the volume of students served. The wide range of demographics informs the need for diverse pedagogical skills and student support services. Students from all walks of life, ages and educational backgrounds take courses

that require competency in mathematics at the algebra level. The independent noncredit institution had an enrollment of 24,398 in fall 2011. The noncredit institution offers programs in three campus centers and over 50 off-campus sites. The district serves metropolitan and suburban neighborhoods that reflect multiple social and economic status demographics. Students in the district are ethnically diverse with backgrounds that include a range of economic and socio barriers. Underrepresented students are encouraged to participate in multiple student service and assistance programs. Students with a wide range of ages participate in transition and bridge programs. In addition to completing general education courses, students pursue associate of arts degrees, certificate programs, internships, and community leadership partnerships.

The qualities of a California lifestyle relate to the cognitive challenges, social status, and economic pressures each student embraces to achieve success. The county boasts a lifestyle that simulates happiness, but hidden in its streets are varying levels of cultural challenges, crime, and poverty. The juxtaposition of extreme wealth and poverty directly affects educational achievement (Orange County Community Development Council, Inc. 2013). The illusion of leisure intensifies cognitive challenges related to education. Students face the distractions of living in an environment rich in entertainment and fast-paced opportunities. These qualities directly influence persistence and create opportunities that impact student decisions relating to academic achievement (Pascarella & Terenzini, 2005; Tinto & Pusser, 2006). Tinto (2003) acknowledged the influence of societal characteristics within the cognitive

components that lead to student success. The "voices" of society play an important role as students select academic pathways. Students in this study lived in the context of these challenges and overcome barriers relating to past decisions.

Program Description

California community colleges are impacted by competitive economic ideals and a fluctuating educational budget. The district in this study has experienced impacted classes and a tight budget. District leadership investigated the possibility that a partnership program could address these challenges. Noncredit courses were investigated as an alternative pathway to credit basic skills mathematics courses for remedial students. The awareness that noncredit was a resource was an underlying reason for the construction of the mathematics partnership. The noncredit to credit partnership, Math Co-Lab, was designed to help to resolve issues of student access to courses. Students who were on waiting lists for basic skills mathematics in the credit institution were able to enroll in basic skills mathematics in the noncredit institution. The construction of the partnership included curriculum, student support services and enrollment components. Each component was designed to enable remedial students to complete required courses and develop skills necessary for the rigor of credit courses. The partnership joined the resources of the noncredit institution with those of the credit institutions to provide an alternative remedial course pathway and broaden student access to credit courses in the district. The Math Co Lab course was designed to prepare students for the entry-level credit mathematics

basic skills course (Elementary Math – M-20). The vision for the program included dual enrollment in noncredit and credit courses, streamlined and guaranteed transfer into credit mathematics courses, and in-class tutoring and counseling.

This study researched the noncredit to credit partnership course constructed by the noncredit dean and credit math and science department dean, the basic skills program manager, two credit mathematic instructors and one noncredit math instructor. Construction of the program was overseen by the president of the credit institution and the provost of the noncredit institution. The instructors researched computer-driven math programs and selected the Plato software program for use in the program. Plato provided flexibility for instructors to write assignments and lessons using the scope and sequence of the credit mathematics course curriculum. Plato also allowed the construction of modules to build fundamental competency in the required math concepts and to prepare students for the rigor of credit courses. Annual improvements to Plato included instructional improvement, curriculum updates, enhanced accessibility, and the incorporation of cognitive development components.

The course was designed to accommodate higher enrollment with the use of computer-based instruction. Services provided by the noncredit institution were available to address the significant challenges faced by basic skills students. The credit and noncredit entities agreed that completion of this course would serve as an alternative pathway to credit entry-level mathematics. The credit faculty and dean were explicit regarding the intervention programs already

in place for remedial students in the credit institution. The plan for the noncredit Math Co-Lab to co-exist with the credit program included the opportunity for students to use the existing intervention programs providing tutoring and a computer lab in the college library. The unified goal the noncredit and credit planning team established was to construct an alternative pathway that developed student persistence skills and thought processes. The noncredit faculty and dean understood that the course would require specialized training of noncredit faculty. The expectations included instruction for competency in mathematics, instruction in study skills, and a part time counselor to assist in the orientation and accountability measures the students would require.

The Math Co Lab design was constructed to provide mathematics instruction and to provide training in test and study skills, critical thinking, and student behaviors that support persistence and success in academics. Students enrolled in the course were given access to student services in both institutions. Students established degree pathways with a counselor and transferred to the credit institution after completion of the Math Co Lab course.

The partnership design allowed students to accomplish academic or work related goals in an unconventional, flexible program. Figure 1 shows the alternative pathways in this community college math partnership program. Appendix A provides a course flow chart that establishes context for the alternative noncredit Math Co Lab pathway.

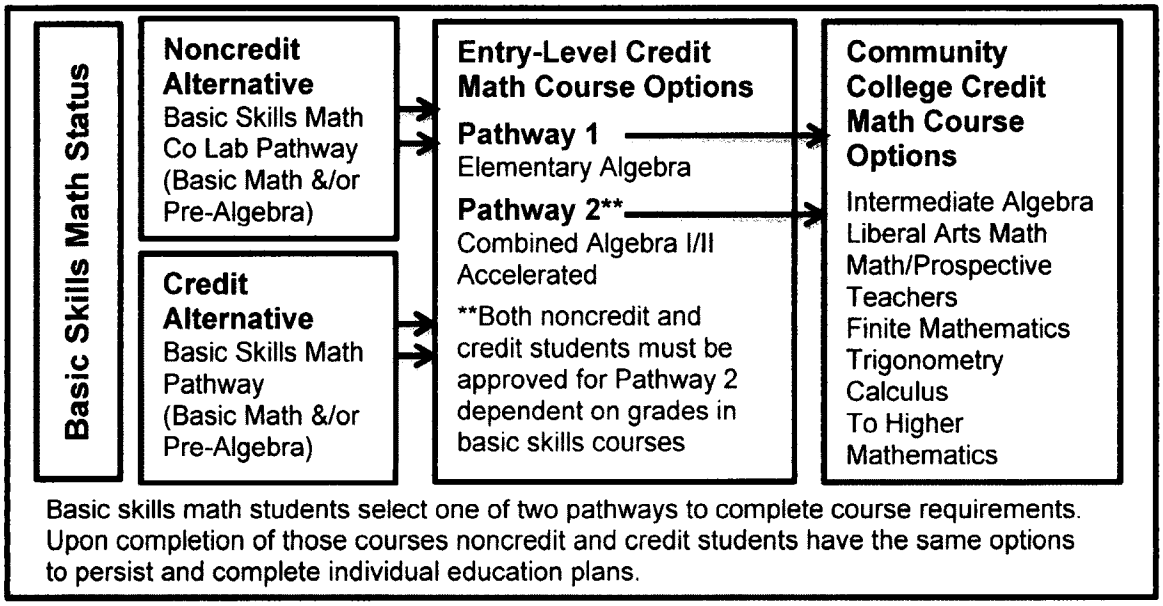

Figure 1. Alternative Community College Math Pathways.

The alternative Math Co Lab course was designed to meet the requirements in the following courses: Basic Mathematics [M-10], two years below credit entry-level mathematics and Pre-Algebra [M-15], one year below credit entry-level mathematics. A part time counselor was assigned to the program. He promoted the program based on the credit enrollment cycle and circulated flyers and email invitations to the alternative program. The program was recommended to students who assessed below credit level mathematics and who were seeking enrollment in the impacted basic skills courses in the credit institution. The program was also promoted to students in the noncredit institution who were completing the high school diploma program or returning to earn a certificate. The counselor proctored orientation sessions each term and began the training process for students during the orientation with tips for success, time management, general rules, behavior guidelines, and structured accountability. The program was utilized by students from a variety of age ranges

and ethnic and cultural groups. More females than males were enrolled in the program.

Students in the Math Co Lab course were required to complete a specific number of weekly hours and progress benchmarks. The counselor maintained communication with each student to keep them informed of hours and progress. He encouraged and motivated all students and worked one-on-one with students who fell short of the requirements. He informed each student of the warning system used for students who do not meet requirements. The system issued one warning for the first offense. The second warning locked the student out of the computer until they met with the counselor. The main goal for this meeting was to open a dialogue with the student, listen for legitimate reasons, and provide guidance with possible solutions and problem solving strategies. A secondary goal was to train students to remain focused, manage time, and meet expectations. Students were dropped from the program if the lack of commitment became a pattern beyond a third warning. Students were given the opportunity to re-enroll if life circumstances changed.

Prior to enrollment in the Math Co Lab, students were required to sign a formal intent form that stated that they agreed to complete the course and enroll in an entry-level credit mathematics course. Students were encouraged to balance dual enrollment courses in credit with the required attendance and target dates. Students were guaranteed enrollment in the credit entry-level course after successful completion of the noncredit remedial requirements offered through Math Co Lab. The counselor indicated that signing the intent form brought

students to a moment of commitment regarding hours of attendance, target dates, and the agreement to enroll in credit mathematics.

As was stated previously, after successful completion of the Math Co Lab course, students were guaranteed enrollment in an entry-level course in the credit institution. The credit institution offered students two options. Students could enroll in Elementary Algebra [M-20] or combined Algebra I/II (accelerated) [M-41]. The majority of the students selected Elementary Algebra [M-20]. The accelerated course was available only to students who achieved high scores in the Math Co Lab course.

The partnership met a district goal to increase transfers from the noncredit institution to the two credit institutions in the district. The partnership program was given the 2013-2014 district innovation award that included monies that provided funding to develop a data collection system for noncredit transfers, create joint instructor work teams, and publish a student pamphlet to provide contacts and information regarding alternative pathways to degree completion. The innovation project included a fall district-wide forum that evolved into a series of joint noncredit and credit instructor planning groups in English, reading, and career and technical education. This research study of the partnership fills a gap in the literature regarding noncredit courses as a resource and the construction of innovative alternative programs.

Overview of the Study

The study consisted of three phases. Phase one of the study collected quantitative data from an institutional database. The second phase of the study

provided quantitative and qualitative data from a survey of Math Co Lab students who participated in the program between 2011 and 2013. Phase three collected qualitative data from students, instructors and administrators using a group interview, individual interviews and a focus group.

The district-wide October 2013 Building Connections Forum informed this research project with input from district instructors and educational leaders regarding the partnership design. The forum did not add to the data in the research. The structure of the forum design and the components of this research study initiated a district system to collect data from noncredit programs. In addition, the forum led to the development of groups comprised of noncredit and credit instructors in other disciplines. This strengthened the pragmatic impact of this study in the field.

The study included community college students between 18 and 56 years old that earned assessment scores below entry-level mathematics and enrolled in partnership mathematics courses. The ethnic makeup of students in the study mirrored the ethnicity rates in the surrounding communities (U.S. Census Bureau, Orange County, California, 2014). The ethnic and cultural diversity of the student bodies enrolled in the institutions was reflected in the ethnic and cultural diversity of the participants enrolled the study (See Table 2 and Table 3).

The explicit aim of each research phase was to clarify the components of the community college noncredit to credit program that facilitated student success in credit community college mathematics. The study demonstrated the value of mixed method design because it gave voice to various stakeholders in

relationship to the quantitative data. The perspectives stakeholders provided strengthened the analysis of the data and led to pragmatic results in the program.

The sources of data used in quantitative and qualitative components of the study were organized to correlate with the research questions before the collection of data. The purpose was to design statistical procedures related to each research question. Table 1 shows data collection in reference to research questions.

Table 1

Data Collection in Reference to Research Questions

Research Question	Quantitative Data (Institutional & Survey)	Qualitative Data (Survey)	Qualitative Data (Interviews & Focus Group)
Increase student access and persistence	Demographics, Course Enrollment Survey 4-7, Likert	1-12 Likert	1-10 Ed leaders 1-10 Faculty 1-11 Student
Key components perceived by students	Enrollment Course Selection	6-12 Likert	3-10 Ed leaders 1-11 Student
Key components perceived by partnership team members	Enrollment Partnership	6-12 Likert	3-10 Ed leaders 1-10 Faculty
Extent of explanation of impact to credit access	Enrollment Perceptions Survey 4- 8, Likert	1-12 Likert	1-10 Ed leaders 1-10 Faculty 1-11 Student

Phase One

Phase one of this mixed method study was an analysis of quantitative data. The data were retrieved from the institutional database, using a query designed to isolate partnership program students. Data fields were selected that enabled both demographic and academic pathway analysis.

Sample. The quantitative data included the demographics, enrollment, persistence and course completion for students entering community college between fall 2011 and spring 2012. There were 338 students included in the original institutional Math Co Lab program database. Gender, age and ethnicity data was added to the student information from the institutional database and information that would allow for personal identification of the students was removed prior to analysis. Credit and noncredit data were normalized with common codes and structure to enable analysis. Null data were removed prior to analysis. Useable data for 276 (81.65%) participants were established as the quantitative data set for phase one of the study. Organization of the data included separation of complex data into multiple fields (i.e., terms and courses) and coding data (i.e., grades, course numbers, noncredit and credit, demographics, and achievement). Grades (A-F and null) were translated into binary achievement (Pass or No Pass). No Pass achievement included grades F and null. Pass included A, B, C, and D grades. Normalized data included references to the original data source to strengthen analysis.

Tables 2-4 show the student participant demographics in the quantitative institutional database sample.

Table 2

Student Participant Gender Demographics - Institutional Database Sample

Gender Demographic	*N* = 276	Percent
Female	178	64.49
Male	91	33.97
Decline to State	7	2.54

Table 3

Student Participant Age Demographics - Institutional Database Sample

Age Demographic	*N* = 276	Percent
18-25	152	55.07
26-34	59	21.38
35+	65	23.55
Decline to State	0	0

Table 4

Student Participant Ethnicity Demographics - Institutional Database Sample

Ethnicity Demographic	*N* = 276	Percent
Am. Indian/AK Native	1	0.36
African Am./Black	19	6.88
Asian Am./Asian	13	4.71
Central/South American	14	5.07
Mexican Am./Hispanic	116	42.03
Native HI/Pc. Islander	2	0.72
White/Caucasian	83	30.07
Other/Declined to State	28	10.14

Instrumentation. The researcher collaborated with the institutional research office to establish an institutional database. Database fields included demographic information, enrollment, withdrawal, and course grades for Math Co Lab students from fall 2011 through spring 2012. Institutional data was utilized to locate descriptive data relating to student demographics, persistence, and success in credit mathematics courses. Normalization of the data for credit and noncredit students included coding for enrollment in sequential terms, grades, and successful completion.

Procedures. Quantitative data was received in an Excel spreadsheet and compiled, coded, and analyzed. I collaborated with the institutional researchers in the credit and the noncredit sectors of the district to ensure data provided a

well-formed sample of the students in the Math Co Lab program. I completed training to use the district database in order to add the demographic data for the sample group. Following addition of demographic data, all personally identifiable information was removed from the data sample. SPSS was used to analyze the data. SPSS is data analysis software developed by IBM for the purpose of coding, grouping, and testing variables for effective analysis. Data was stored in a protected environment in one location with limited mobility and was locked in a safe when research was complete.

Analysis. I conducted descriptive statistical analysis for the 276 participants that included frequency, descriptive, and crosstab tests. Data were analyzed for commonalities and outliers relating to the enrollment and persistence of basic skills mathematics students. The data were analyzed along a variety of metrics. To evaluate persistence, the pass/fail rates of students in all terms were analyzed using frequency and crosstab tests. A subsequent test of attempted completions was run using a frequency test. A report of demographics was prepared using descriptive and frequency tests. A crosstab correlated the length of time in the program with the highest level of mathematics completed. The academic pathways of students were analyzed using a frequency based on initial mathematics course attempted and credit level course attempted or completed.

Phase Two

Phase two of this mixed method study was a survey of students (See Appendix B). The survey included questions that elicited demographics, enrollment patterns, persistence, academic backgrounds, and perceptions of the partnership and program.

Sample. Thirty-seven students completed the survey (34 electronic and 3 printed copies). One student left blank the approval to use question, leaving 36 surveys to comprise the survey phase of the study. The demographics were skewed toward females (n = 29, 80.55%), which differed from the phase one frequencies. Forty-seven percent (n = 17) of the respondents were in the 18-25 age group, which differed from the phase one frequencies. The ethnic group with the highest group of participants in the study was Mexican American or Hispanic, which is similar to the phase one frequencies (see Tables 5-7).

Table 5

Student Participant Gender Demographics: Survey Instrument

Gender Demographic	N = 36	Percent
Female	29	80.55
Male	6	16.67
Decline to State	1	2.78

Table 6

Student Participant Age Demographics: Survey Instrument

Age Demographic	N = 36	Percent
18-25	17	47.22
26-34	9	25.00
35+	9	25.00
Decline to State	1	2.78

Table 7

Student Participant Ethnicity Demographics: Survey Instrument

Ethnicity Demographic	*N* = 36	Percent
Am. Indian/AK Native	0	0
African Am./Black	1	2.78
Asian Am./Asian	5	13.89
Central/South American	0	0
Mexican Am./Hispanic	17	47.22
Native HI/Pc. Islander	1	2.78
White/Caucasian	7	19.44
Other/Declined to State	5	13.89

Instrumentation. The survey was created using a Google form instrument with a participation window of six weeks. Survey data did not include any form of identification. The 22 question survey included nine Likert structured questions that related to academic preparedness and prompted the following responses: *Strongly Agree, Agree, Neither Agree nor Disagree, Disagree, Strongly Disagree or No Opinion.*

In addition, survey included questions that elicited students' perceptions of the key components of the partnership program preparation them for academic success in the entry-level mathematics course. Open-ended questions provided an opportunity for students to voice their individual perceptions relating to the partnership program. Most students completed the survey in less than 17 minutes.

Procedures. Students were given the option to either complete an online survey or a paper survey (See Appendix B). The promotional campaign for the survey included personal invitations to participate from the counselor of the Math Co Lab program, the instructors in the credit basic skills mathematic courses, and the current students of the Math Co Lab course. E-mail invitations (see

Appendix C) were sent to all students who qualified for the study. Hand-delivered flyers (see Appendix E) were distributed in the quad of the credit mathematics department and in the noncredit reception area. A second round of promotion included invitations and hand-delivered flyers with the QR code for a two-week window in which the survey could be completed. The QR code enabled students to also complete the survey on mobile devices. Survey participation was voluntary and anonymous. Feedback regarding motivation, effectiveness of training, and level of preparation was encouraged.

Survey data were recorded into SPSS and used to develop a code book. Results included quantitative data that characterized students' perceptions of components that impacted success in mathematics. Data were coded exactly as stated unless reasonable interpretation validated a minor change. Reasonable interpretations were used to analyze the results and evaluate incidents of missing data. In some cases a missing data value code was developed. For example, students who did not state gender on the survey were coded with NG (no gender) in the analysis.

Analysis. The survey instrument facilitated analysis of both quantitative and qualitative data. The quantitative data from the survey was collected and placed into SPSS and analyzed using statistical testing for frequencies of chosen academic pathway, reasons for selection of academic pathway, highest mathematics course completed in high school, perceived level of preparedness, and key components of the partnership program that affected success. The

survey included collection of demographic data specific to the participants and were also analyzed and compared to the results from phase one of this study.

The survey instrument also asked students to select three of eight key program elements from a list. The directions prompted students to select elements they perceived made the highest impact on their mathematics course success. This data were then quantitatively calculated for analysis by scaling and ranking the responses.

Qualitative data analysis was conducted using two methods: direct analysis of open-ended questions and indirect analysis by associating multiple quantitative responses. Responses to the open-ended questions were compiled into similar concept groups. The data were analyzed to find key components, curricular, instructional, training, and/or support areas that students perceived made an impact or prepared them for successful completion of credit mathematics.

Phase Three

Phase three of the study was planned to consist of the collection of data in a group interview with students, an individual interview with an instructor, and a focus group with educational leaders. The interviews were designed to collect data in an open environment with a protocol that prompted discussion and feedback (See Appendix F). The same protocol was used in both individual and group sessions. .Scheduling focus group opportunities proved to be a challenge. To enable maximum participation, additional group and individual interviews were utilized.

Sample. This study included one group interview, one individual interview and one focus group, representing eight partnership program participants. Input from more than seventy additional partnership participants that engaged with the researcher informed the research study, but were not included in the data analysis. Stakeholders exhibited interest in the study but found it difficult to meet the scheduled focus groups or interview sessions.

The group interview, individual interview, and focus group adhered to the research protocol (see Appendix F). The group interview included three students. The individual interview involved one instructor that represented both the credit and noncredit institution. The final instrument was a focus group that involved four educational leaders in the district.

The group interview included three students who had participated in the Math Co Lab course. Students responded to an invitation to participate in a forum. Five students indicated interest in participating in the forum, and three students attended the scheduled session. The protocol included open-ended questions and opportunities for students to engage with each other as they evaluated the efficacy of the partnership program. The students were at varying levels of achievement in their educational pathway. A majority of the students expressed an overall goal of career advancement.

The individual interview included one mathematics instructor. The unique qualities of this instructor were his dual faculty position in the district as both a credit and noncredit instructor in the discipline of mathematics. His experience

as an instructor in other community college programs gave him valuable insight into noncredit and credit remedial students.

The focus group included four educational leaders who responded to an email invitation. The administrators who participated had all played a leadership role in the development of the partnership program and have subsequently served in leadership roles in the Math Co-Lab partnership.

Students, instructors and administrators became aware of the research project and requested opportunities to participate in the project outside of the protocol. Consequently, a wide variety of individual and group interviews and a forum of students, instructors, and administrators were held and informed this research project, but were not included in the analysis. A description of these interactions follows.

Two student participants requested the opportunity to add input into the study and the researcher conducted a shorter group interview with these two students using the protocol developed for the focus group. Additionally, other students stopped by or provided informal spontaneous responses to some of the prompts. These responses were not included in the statistical reports, but the insights helped to inform the findings of the research by confirming the perspectives provided in the student group interview.

Over sixty credit and noncredit instructors attended a fall forum and participated in four round table focus group discussions using a similar protocol as this study. Although the statistical data was not included in this research the group discussions provided insights that helped to inform the findings of the

research by confirming the responses of the instructor who attended the individual interview.

I attended instructor meetings in the credit and noncredit programs in parallel with this research project and prompted discussions in these meetings using specific prompts from the protocol. Additionally, other instructors participated in dialogue with me regarding the partnership program. The insights gained were not used in the statistical data or analysis of this research project. Responses in these interactions confirmed the insights and perspectives of the instructor who completed the individual interview for the study.

Three researchers, four managers, and additional administrators participated in individual interview sessions using the same questions. Data collected were not used in the analysis of the study, but they did inform the findings. The ideas shared in all sessions were similar and supported the responses provided in the focus group setting with the four educational leaders.

Instrumentation. Qualitative data were collected from noncredit and credit participants. The interactions with students, instructors, and administrators provided conceptual understanding of individual student obstacles to learning and academic pursuit. The protocol provided opportunity for students, instructors, and leaders to reflect and voice meaning, value, and criticism relating to the noncredit and credit partnership construction and outcomes in an open feedback environment.

The group interview, individual interview, and focus group were conducted in person and lasted approximately 90 minutes each. The protocol included 10

open-ended questions relating to the noncredit to credit community college partnership program components and perceived benefit. The protocol provided opportunity for individual insight. Data were analyzed to find components that were perceived to facilitate success, alleviate barriers, and/or enrich student readiness and persistence.

Procedures. Because more than 60 students, instructors, and administrators participated in the initial October 2013 forum, participation in scheduled interviews and focus groups for this study was limited. Participants believed the round table discussions in the forum provided an effective venue for group responses and believed the ideals they had shared in the forum could be used in this research project. In response to limited participation the researcher scheduled a second opportunity to participate, used the focus group protocol questions to conduct a group interview with students and an individual interview with an instructor. The second invitation resulted in an increase in administrative interest, which led to the educational leadership focus group included in the study. To provide opportunity for input, the researcher met with all groups and individuals who expressed interest. Data from these additional sessions provided insights that informed the findings, but were not included in the analysis.

The data were collected using professional recording devices (video recorder, tape recorder and Scrip Pen) and were then documented in a transcription. The video recorder collected audio exclusively to protect the anonymity of the participants. The transcription was coded with keywords. These keywords were used to find key variables and emergent perceptions on the

components of the program that students, instructors, and/or administrators believed made an impact on student persistence and success. Excel spreadsheets were developed from the keywords, which enabled statistical analysis for frequency and comparison across populations (i.e., student, instructor and administrator). The research instruments, recordings, and transcriptions were protected with confidentiality that included separation of names from study information, written and verbal guarantees their names would not be used in the study and that all information would be stored in a password-protected file or a locked cabinet.

Analysis. Group interview, individual interview, and focus group data were analyzed and interpreted using a collection process modeled after the Atlas$_{ti}$ qualitative statistic software. Sessions were documented into a transcription. Each response in the transcription was coded into one or more variables, which related to key components of the partnership program. Data were coded exactly as stated unless reasonable interpretation validated a minor change. Variables were then analyzed to compare the frequency and find emerging elements of preparation and perceived value. Variables were prioritized according to frequency. Transcriptions from the group interview, individual interview, and focus group were coded into a total of 411 assigned keywords that formed a set of 71 unique codes. These unique codes were then analyzed for frequency. Data analysis utilized Excel formulas and statistical tests and were evaluated using SPSS descriptive tests of frequency between students, instructors, and administrators (IBM SPSS, 2012; Hoffman, 2012; Lui, 2012).

The final stage of data analysis evaluated similarities and interdependency in the variables.

Analysis of the group interview, individual interview, and focus group data revealed common variables perceived by students, instructors, and administrators as predictors for success. Different terms with similar meaning were used and different perspectives were represented between the groups. Data analysis resolved these differences into a codified set of key components.

Mixed Method

Analysis of data included coupling of quantitative components with the depth of qualitative perceptions. The analysis revealed benefits for partnerships that facilitate access and persistence in credit mathematic courses. Data from this research study were analyzed in reference to published research and alternative programs implemented in other California community colleges. This broad scope data analysis led to a deeper understanding of alternative academic pathways and program design that strengthens persistence rates and student success.

The components of research shared by Hesse-Biber (2010) served as the model for this research. Her emphasis on merging the practical with theoretical informed the construction of each instrument and the design of the mixed method. Collecting ideas and insights from varied sources and methods constructed realistic and field related understanding with measurable and statistically supported data (Creswell & Plano Clark, 2011; Hess-Biber, 2010; Lui, 2012).

Procedures. In addition to the data analysis conducted in each of the three phases, a comprehensive analysis was completed. This subsequent analysis incorporated data from all phases. A meaningful narrative was formed based on the qualitative and quantitative data regarding students, instructors, administrators, partnership design, and completion rates. Interdependence of data from the different phases of this research study confirmed and strengthened the literature promoting partnerships in community colleges, student service programs, and the structural and curricular design of developmental programs. The data was used to analyze concepts that relate to community college mathematics partnership programs and the utilization of noncredit as an alternative course pathway.

Data management. The California State University at Fullerton Institutional Review Board approved the instruments, questions, and the three phases of this mixed method research study. Every effort was made to value the time of instructors and to respect the input provided by the participants about their shared experiences and perspectives. Confidentiality and anonymity were ensured. Anonymous data files were used from the noncredit research office for analysis and were reviewed in relationship to the district focus on transfers from noncredit to credit mathematics.

Human subjects. The students, instructors, and educational leaders from noncredit and credit community college basic skills programs who participated in this study received the respect and dignity of expected in professional academic research. The individual and corporate insights and perspectives that were

obtained in this research were protected to the extent required by law. All information was used exclusively for this research study and was stored in a secure and confidential manner. I valued the privacy of all individuals and established careful use of technology that maintained secure and private use. All encounters with participants were concluded with gratitude and respect.

Data analysis and interpretation. The goal of this study was to understand the essential qualities of academic partnerships that lead to persistence and academic success. The opportunity to use sequential quantitative and qualitative phases was the fundamental reason for selecting a mixed method research approach (Creswell & Plano Clark, 2011; Hesse-Biber, 2010; Reed, Rueben & Barbour, 2012). Using both the qualitative and quantitative components available in mixed methods research validated data and findings (Creswell, 2012; Creswell & Plano Clark, 2011; Hesse-Biber, 2010; Tashakkori & Teddlie, 2003). The three phases used in the study supported the identification of numeric and narrative formats that identified key factors in the noncredit to credit community college partnership program that were related to student persistence and success (Lui, 2012).

This research study does not establish findings that relate to every demographic or institution. The data will provide insight into use of noncredit as a resource. It will also strengthen contemporary research in how to meet the diverse needs of community college students with effective student services, academic course pathways, and instruction.

Validity of the Study

Reliability. The reliability of each instrument and process was endorsed by institutional researchers and the president, provost, and dean. The administrator who oversees instruction at the credit institution in the mathematics partnership program completed the first data design and method check. Two community college institutional researchers worked directly with me to design the study and to collect data. A preliminary data design check was performed by the credit college president, noncredit provost, and deans involved in the creation of the mathematic partnership. Data analysis underwent a final check with a research assistant in the California State University, Fullerton Center for Research on Educational Access and Leadership.

Validity. Approved research protocol and Creswell's (2008) verification procedures were utilized to ensure validity. Engagement was ensured by persistently pursuing participants from every entity (administration, budget, instructors, students, program construction, curriculum, and researchers) associated with the project. The research was validated through verification of the data, peer reviews, and debriefs. The clarification of possible bias led to systematic data checks by the institutional researchers in the district, including the noncredit researcher. Discussions with the two deans, Math Co Lab counselor, and provost provided definitions and clarifications of data collection. Educational leaders outside of the noncredit institution provided guidance as to the perspectives of basic skills and remedial education in California community

colleges. These procedures follow the concepts of research validation by Creswell (2008); Lui (2012); and Tashakkori and Teddlie (2003).

Valid research techniques that lead to trustworthy and scholarly findings were incorporated throughout the project (Lui, 2012; Tashakkori & Teddlie, 2003). The integrity of research design and components of data collection were strictly adhered to. The data collection procedures for this mixed method research project incorporated ideals within guidelines of traditional mixed method research design. Every effort was given to ensure anonymity, confidentiality, and adherence to protocol (Hoffman, 2012; Lui, 2012).

Role of the researcher. I held multiple roles in this study, including independent researcher, manager, career educator, and instructor. I currently serve in the noncredit institution of this study as a manager in the areas of student learning outcomes, professional development, and student scholarships. I have participated in a number of management and professional development committees and working groups within the district. My experience as an instructor includes structuring partnerships to streamline student academic pathways. The concept of an educational partnership that will scaffold and bridge students to sequential steps in education are the foundational rationale for my study of the noncredit to credit mathematic partnership of this study.

I believe that all students learn at higher levels of instruction and I place value in instruction that includes training students in skills that develop learning capacity, academic behaviors, cognitive patterns, and self-awareness in balance with subject competency. I agree with Dewey's (1897) statement that, "The

teacher is engaged, not simply in the training of individuals, but in the formation of the proper social life" (p. 2). As an instructor, I trained students to apply individual strengths and weaknesses to goals beyond comfort zones and persist until they acquired the skills needed to succeed. I believe in multiple levels of review, including reviews at the course, program, and organizational levels. In my current position, I developed tools and training in the area of classroom assessment. I have trained instructors to develop strategies of systematic assessment related to learning outcomes. I collaborated with institutional researchers to develop a system of data collection and analysis regarding district-wide student achievement and transfer.

I was not involved in the original design of the mathematics partnership program. However, I did participate in the research team of the partnership committee. I participated in the initial forum and subsequent meetings regarding partnership evaluation. I was also involved in the development of informational materials for students to strengthen connections with student services, transitions, and persistence. I organized opportunities for dialogue; check points for review and analysis of data; and review sessions with two researchers, the administrators and the deans of the Math Co Lab partnership. I applied my belief in high levels of communication to establish avenues of academic dialogue within the district.

Chapter Summary

Literature and field experiences promote noncredit to credit community college partnerships as a resource for alternative programs that open access for

all students, including those who possess achievement gaps, improve student success, and strengthen persistence rates. The mixed methods research design examined how a noncredit to credit community college partnership program impacts access to and persistence in credit mathematics. An integration of qualitative and quantitative research facilitated the investigation of policies, practices, and the organization and impact of a noncredit and credit partnership

CHAPTER 4

FINDINGS

In this chapter, the findings of this mixed methods study are presented using the framework of the three research phases. The study, which examined the outcomes of various components of a noncredit to credit mathematics partnership, answered the following research questions:

1. How does a noncredit to credit partnership increase access to the entry-level credit mathematics course for remedial students?
2. What key components of the noncredit to credit partnership contribute to academic success as perceived by students?
3. What key components of the noncredit to credit partnership contribute to effective mathematics instruction as perceived by partnership team members?
4. To what extent do student and team member perceptions about the partnership help to explain how the program impacts access to credit

Phase One

The institutional database sample found students from each ethnicity, gender, and age were successful in completing the Math Co Lab and entry-level credit basic skills mathematics courses (see Tables 8-10).

Table 8

Gender Demographics, Completion of Math Co Lab and Credit Math Course

Completers by Gender	*N* = 276								
	n	%	Basic Math	%	Pre Alg.	%	Credit 1*	Credit 2*	%
Female	178	64.49	99	35.87	122	44.20	108	17	45.29
Male	91	32.97	58	21.01	72	26.09	53	16	25.00
Decline to State	7	2.54	4	1.45	4	1.44	3	0	1.09

Note. *Credit 1 - Elementary Alg. - Credit entry course; *Credit 2 - Algebra I/II - Accelerated credit entry course.

Table 9

Age Demographics, Completion of Math Co Lab and Credit Math Course

Completers by Age	*N* =276								
	n	%	Basic Math	%	Pre Alg.	%	Credit 1*	Credit 2*	%
18-25	152	55.07	75	27.17	98	35.51	103	16	43.12
26-34	59	21.38	36	13.04	45	16.30	25	8	11.96
35+	65	23.55	50	18.12	55	19.93	36	9	16.30
Decline to State	0	0	0	0	0	0	0	0	0

Note. *Credit 1 - Elementary Alg. - Credit entry course; *Credit 2 - Algebra I/II - Accelerated credit entry course.

Table 10

Ethnicity Demographics, Completion of Math Co Lab and Credit Math Course

Completers by Ethnicity	*N* = 276								
	n	%	Basic Math	%	Pre Alg.	%	Credit 1*	Credit 2*	%
Am. Indian/AK Native	1	0.36	1	0.36	1	0.36	0	0	0
African Am./Black	19	6.88	13	4.71	13	4.71	6	3	3.26
Asian Am./Asian	13	4.71	9	3.26	9	3.26	9	2	3.99
Central/So. American	14	5.07	8	2.90	8	2.90	7	1	2.90
Mexican Am./Hispanic	116	42.03	53	19.20	53	19.20	52	9	22.10
Native HI/Pc. Islander	2	0.72	2	0.72	2	0.72	3	0	1.09
White/Caucasian	83	30.07	62	22.46	62	22.46	47	8	19.93
Other/Declined to State	28	10.14	21	7.61	13	4.71	13	1	5.07

Note. *Credit 1 - Elementary Alg. - Credit entry course; *Credit 2 - Algebra I/II - Accelerated credit entry course.

Institutional data that tracked 276 noncredit Math Co Lab students showed that 59.42% (*n* = 164) of the students enrolled and successfully completed Elementary Algebra (credit entry course M-20) between fall 2011 and spring 2012. Tables 8-10 show enrollment and successful completion data for the noncredit Math Co Lab and credit entry-level courses in reference to the demographic data. Tables 11-13 show enrollment and successful completion of the noncredit Math Co Lab course and credit mathematics courses from fall 2011 to spring 2012 organized by terms. Elementary Algebra (M-20) and the combined and accelerated Algebra I/II (M-41) courses meet the credit entry-level mathematics requirement. Once a student has completed one of these courses, they can complete university transfer and degree pathway mathematics.

Table 11

Math Course Enrollment, Success and Persistence: Basic Skills Math Courses

	# of students enrolled in term & # of students that passed (P) course							
	1 (P)	2 (P)	3 (P)	4 (P)	5 (P)	6 (P)	7 (P)	%P*
Basic Math	161							58.33
(M-10) 2L	(161)							
Pre-Algebra	40	161						71.74
(M-15) 1L	(37)	(161)						

* %P indicates percentage of students who passed based on *N* = 276.

Table 12

Math Course Enrollment, Success and Persistence: Credit Entry-Level Math

	# of students enrolled in term & # of students that passed (P) course							
	1 (P)	2 (P)	3 (P)	4 (P)	5 (P)	6 (P)	7 (P)	%P*
Elementary Alg.	51	46	123	54	15	1 (1)		59.42
(M-20) credit entry	(35)	(32)	(56)	(30)	(10)			
Accelerated **Alg. I/II**	1 (1)	8 (7)	15	10 (9)	4 (4)	1 (1)		11.95
(M-41) 1L			(11)					

* %P indicates percentage of students who passed based on *N* = 276.

Table 13

Math Course Enrollment, Success and Persistence: Credit Math

	# of students enrolled in term & # of students that passed (P) course							
	1 (P)	2 (P)	3 (P)	4 (P)	5 (P)	6 (P)	7 (P)	%P*
Intermediate Alg. (M-40) 1L		31 (19)	34 (15)	40 (29)	24 (13)	8 (4)	2 (1)	29.35
Plain Geometry (M-30)				1 (1)				0.36
Practical Math (M-38)					2 (2)		1 (1)	1.09
***Liberal Arts Math** (M-100)			1 (0)		1 (0)	2 (0)	1 (0)	0
Finite Math (M-115)				1 (1)	1 (1)	1 (0)		0.72
In. Prob.& Stats (M-120)			4 (3)	4 (2)	3 (3)	2 (1)		2.90
College Alg. (M-141)			3 (3)	1 (0)		1 (0)		1.09
Trigonometry (M-142)				2 (1)				0.36
Sur. Calculus (M-150)					1 (0)			0

* %P indicates percentage of students who passed based on *N* = 276.

The findings from the institutional data demonstrate the effort students are making to complete mathematic courses that earn credit. The data suggest that incremental success allowed students to find fulfillment as they progressed through the academic pathways to meet their individual goals.

Throughout the three phases of the study, the definition of success diverged between students, instructors, researchers, and administrators. Students perceived success as completion of a course and movement toward a degree. Instructors perceived success as attainment of skills and competencies. Institutional researchers defined success as continued enrollment in subsequent courses. For the purpose of this research study I defined success by unifying the ideals of each participant group with persistence leading to achievement of mathematic credit toward a degree. This definition indicated that the Math Co

Lab enabled success because it served as a gateway to the credit mathematic courses.

Success for the purpose of this study is defined with three levels:

- Level one success was enrollment in entry-level credit mathematics achieved in one of two ways:
  - completion of Elementary Algebra [M-20] (2 levels below university transfer), or
  - completion of Algebra I/II [M-41] (1 level below university transfer).
- Level two success was the completion of the credit entry-level mathematics course.
- Level three success was the completion of at least one sequential credit mathematics course.

The data shows that between fall 2011 and spring 2012, 71.38% (n = 197) of the sample achieved level two success within seven terms. Of the 197 students, 83.24% (n = 164) completed Elementary Algebra and 16.75% (n = 33) completed the accelerated Algebra I/II. Between fall 2011 and spring 2012, 29.34% (n = 81) achieved level three success by successfully passing Intermediate Algebra. The highest level mathematics course successfully completed by a Math Co Lab student between fall 2011 and spring 2012 was credit transfer Finite Math (n = 2, 0.72%). Table 14 shows the completion rates based on levels of success.

Table 14

Course Pathway in Reference to Success Levels

$N = 276$	Specific course completion and success levels									
	Basic Math	Pre-Algebra	Elem. Algebra	Combined Algebra I /II	Practical Math	Intermediate. Algebra	Lib. Art. Math	Finite Math	Probability & Stats	College Alg. and Above
Successful Completion	161	198	164	33	1	81	0	2	9	6
Percentage	58.33*	71.74	59.42	11.96	0.36	29.35	0	0.72	3.26	2.17
	Basic Skills Remedial		**Level 1 & 2 Success**		**Level 3 Success**					
			71.38%		**35.87%**					

Note. Students assessed at Pre-Algebra Level did not take Basic Math.

The data revealed variance in the success and persistence rates of basic skills mathematic students in university transferable mathematics courses. None of the five students who enrolled in Liberal Arts Math (M-100) successfully completed this first University of California, California State University transfer course. The data shows 290 enrollments in Elementary Algebra, which reflects repeated attempts to pass the course. The data show 59.42% (n = 164) of the 290 attempts passed Elementary Algebra and achieved level 2 success. The qualitative data provided glimpses into the reasons students dropped courses or transferred to credit mathematic courses. Students felt comfortable in the math lab setting, but they were not sure they were ready for a traditional mathematics lecture course. The qualitative student group interview revealed fears students held regarding asking questions in class, taking tests, and meeting the rigorous requirements of the credit mathematics courses.

A comparison of alternative programs with the partnership program is problematic because the credit institution in the district is a part of the partnership program. The two institutions developed the alternative pathway using noncredit resources to meet the needs of the district's remedial students. The credit institution maintained the established intervention program and made the services available to students in both credit and noncredit mathematics courses. The credit and noncredit departments were unified in their focus to impact student success, increase transfers, and strengthen persistence. The credit mathematics department added the dynamic of the accelerated Algebra I/II course to enhance remedial student pathways for degree and transfer success.

However, data from the fall 2009 semester, which was before the noncredit partnership began, creates a historic context. Table 15 shows a 56.75% (n = 332) successful completion rate for credit basic skills mathematics students (N = 585) in Pre-Algebra [M-15] during fall 2009. Pre-Algebra [M-15] is the remedial course one year below credit entry-level Elementary Mathematics [M-20]. Two-hundred-and-thirty-eight of those students enrolled in Elementary Algebra [M-20] in the spring or summer semester (40.68% of original cohort). One-hundred-and-four (17.78% of the original cohort) passed Elementary Algebra [M-20], which is the entry-level community college mathematics course and the gateway to college transfer mathematics courses. Students who entered community college with an assessment that allowed them to enroll in Elementary Algebra [M-20] persisted to Plain Geometry [M-30] or Intermediate Algebra [M-40] at 22.99% (N = 254) (Institutional Research Database, 2014).

Table 15

Comparison of Student Success in Alternative Math Pathways

	N	Successful completion of Pre-Algebra (1 level below credit entry)	%	Enroll Elem Alg. L. #1 Success (the credit entry course)	Pass Elem Alg. L. #2 Success	%
2009 Credit Remedial Program	585	332	56.75	238	104	17.78
2011 Fall -2012 Spring Noncredit Math Co Lab Student Sample	276	198	71.73	290	164 M-20 33 M-41 197 Both*	59.42 11.96 71.38*

Note. * Denotes the sum of both credit entry-level pathways (traditional or accelerated courses).

The Math Co Lab course opened in fall 2011. From fall 2011 through spring 2012 the noncredit mathematics partnership course (Math Co Lab) provided access to students. Completion rates of the Math Co Lab were comparable with those of basic skills mathematics courses.

Phase Two

The survey used in phase two of the study collected data relating to the components students valued in the Math Co Lab partnership program. The existence of the Math Co Lab course provided additional enrollment opportunities for students who were assessed below entry-level mathematics. The partnership was designed to provide services and resources for students to succeed in the Math Co Lab and beyond. The survey instrument also elicited student feedback regarding the characteristics of the partnership that were effective in facilitating student success. These key components represented the unique qualities of the

partnership program that are not available in regular basic skills courses or the intervention program in the credit institution.

Table 16 compiles the student survey responses on program components that students valued. The findings show 72.22% (*n* = 26) of the students valued the in-course tutor and 58.33% (*n* = 21) students valued the resources provided in the Math Co Lab. The course materials were valued by 44.44% (n = 16) of students and 33.33% (*n* = 12) valued the one-on-one counseling component of the Math Co Lab structure. Students shared how the counselor provided an example of success by sharing his academic pathway toward a degree. The students valued his willingness to share his story and saw him as a role model. The fact he earned a degree to enable him to work with students impressed the students. One student shared, "I have that sense that he would be there, and it makes me feel that it's OK that if you're having a hard time, that it's OK. That don't worry about it because he actually shares his experience that he wasn't Mr. Successful or anything like that. It makes you feel like, OK, you know, it's not about you have to be perfect and you have to be an 'A' student—it's fine if you're taking it light—it's fine. He makes you feel that comfort."

The survey data indicated an association between high school mathematic preparation and the current mathematic level of a student. To evaluate a statistically significant association between the highest mathematics level a student achieved in high school and the mathematics level a student achieved in college, a cross tabulation of the survey results was completed. The analysis

showed higher mathematic levels achieved in high school was associated with level enrollment in community college mathematics.

Table 16

Student Survey Responses: Valued Program Components

	N = 36 Students selected three components they valued in the program	
Valued Program Component	N	Percent
Tutor	26	72.22
Lab &/or Campus Resources	21	58.33
Classroom Structure	17	47.22
Textbook/Course Materials	16	44.44
Counselor	12	33.33
Friends and Family	6	16.67
Orientation	1	2.78

Table 17

Highest High School Math and Current Mathematics Level

N = 36		Current Mathematics Level							
		No answer	Basic Math M-10	Pre-Algebra M-15	Elementary Alg. M-20	Intermediate Alg. M-40	Combined Alg. II/I M-41	Lib. Arts Math M-100	Total
Highest	Gen/Basic Math				5				5
High	Pre-Algebra			1					1
School	Algebra I	1			1	1	2	1	6
Math Course	Algebra II	1			2	4	2		9
	Geometry		1		3	2	2	2	10
	Trigonometry					2	3		5
Total		2	1	1	11	9	9	3	36

Phase Three

Student Group Interview Responses

In the qualitative group interview instrument of this study, Math Co Lab students shared how the noncredit course opened access to and prepared them for successful completion of the higher mathematics courses. One student shared how she couldn't get into a basic mathematics courses at the credit college and heard about the Math Co Lab and enrolled right away. Her words, "I am really grateful. . . . Yah. Get a better education and keep going in my education" was a response to the prompt regarding if the Math Co Lab made a difference in helping her reach her goal. She stated she now had degree plans and was working with the counselor to select the degree that best fit her strengths.

In addition, the students shared behaviors and habits they acquired as they completed the basic skills courses in the Math Co Lab. One student shared her struggle with organization and time management. Another shared, "One I struggle with the most probably is time management—especially with children and family." One student shared, "The teachers, they even had you plan your classes for the next semester and choose what major you are going to be and the classes for that major. They just have everything for you, the books and [everything]." But other students responded to the student by saying: "That's kind of what I was looking for, but no, I wasn't counseled like that" and the lab teacher "was pretty good at explaining things step-by-step, but that was it."

Group interview discussions indicated the Math Co Lab students perceived the training and subject content prepared them to meet the rigor of community college credit mathematics courses. Students related how the structure of the Math Co Lab pathway prepared them with critical thinking skills. One student shared she was originally upset she had to pass the foundational math chapters with 80%. But after she enrolled in the next two credit mathematics courses, she realized the foundation it gave her to support success at a higher level. A second student shared, "I'm into Math 20 so it was pretty good because once I got there I thought it was going to be really challenging—I was really nervous about it. . . . I'm still there and I'm doing pretty good. Normally I would get Cs and Ds . . . and I have a B. I have been passing all my tests, and I'm like three points from an A." The third student shared, "I'm very grateful that the little steps . . . that's what made all the difference."

Motivation. Qualitative data showed a relationship between motivation and the three levels of student success. Students discussed the importance of setting realistic goals that motivated them to complete the mathematic courses required to earn a job certificate, degree, or transfer to a university. One participant shared how the counseling component of the Math Co Lab partnership program motivated her with a simple phrase. She, a single parent, basic skills student trying to earn her engineering degree, focused on the idea of "the golden opportunity." To this student, the golden opportunity meant that the Math Co Lab was an ideal opportunity for her to succeed. Another student shared how life motivated her with "the need to earn an acceptable salary." She

hoped to enter the medical field and realized math was foundational knowledge that she needed. She shared that establishing both short term and long range goals had helped her persist.

The students discussed the obstacles they faced balancing life responsibilities with achieving their goal to complete community college mathematics. When asked what three skills or competencies they believed impacted their success one student shared, "I guess just commitment and making sure [you] have a goal so you can achieve that goal." In the discussion that followed that statement another student shared, "I don't know about you, but for me, you feel a sense of direction as opposed to when you don't have goals."

Students shared that job loss, being a single parent, gaps in their knowledge of math concepts, and math anxiety played a role in their decisions. One student shared, "The first semester is really depressing . . . really stressful, at least for me" and the other group interview participants agreed. The discussion about stress moved to the strategies participants used to motivate them to persist. One shared she kept telling herself, "Just a little bit more, then it's just a little bit more, and it just ends up being OK. I got an A, and I'm all right." One student shared, "Self-doubt, that happens a lot, and you're just questioning yourself so much and then the next thing you know, you're just like it wasn't that bad. You just have too many fears sometimes."

Connections. The partnership program was designed to promote self-awareness and cognitive development within an alternative academic pathway. In addition to the Math Co Lab course, the partnership provided students with

access to a dedicated counselor, student support services, and instructional resources available on a flexible schedule. The additional resources were designed to provide students with academic and professional skills beyond competency in mathematics. Table 18 shows the combined list of components the students, one instructor, and administrators valued in the partnership design used for the Math Co Lab.

Table 18

Valued Partnership Components

N = 411	N	%
Communication	20	4.87
Pedagogy	19	4.62
Training	16	3.89
Program Review	12	2.92
Noncredit alternative	10	2.43
Partnership/Collaboration	10	2.43
Technology	8	1.95
Accessibility	6	1.46
Assessment	6	1.46
Staffing	6	1.46
Structure	6	1.46
Curriculum	5	1.22

Students shared how they developed individual behaviors that they needed to help them be successful. For example, students shared how accountability, the course structure, and target dates framed the Math Co Lab curriculum and helped them to succeed. The group interview data provided evidence for the development of time management skills. Students indicated that they learned to balance life with academic pursuit based on supplemental training that was provided in Math Co Lab. During their enrollment in Math Co Lab, social connections with their peers were established and continued to

develop. Student group interview discussions also revealed awareness of study skill training. The students appreciated the study skills strategies they have developed and expressed an interest in additional training, including technological training, test-taking skills, and study skills that would help prepare them to learn from a lecture and timed test.

The students realized they had been given a working foundation in basic mathematical concepts that would strengthen their ability to progress in higher level mathematics classes. Students discussed the critical thinking that was required for mathematical competency. The student group interview participants shared the impact the orientation and bridge sessions made in their transitions to credit mathematics courses.

The group interview revealed instructor characteristics that impacted their performance. Students shared that instructors who taught with kindness and respect motivated them to risk making mistakes when they answered questions. The students shared how much they valued instructors who were patient and engaged with them. The group interview prompted students to openly share both positive and negative instructional components. Students' advice for instructors included: "Never make a student feel they're asking ridiculous questions," and "Teach students all possible techniques and solutions for math problems." Students valued instructors who made it a practice "to check in with each of their students." Students stated the benefit of practice sheets and how instructors who "teach with passion" made a difference.

Learning to ask questions was another skill that the students found valuable. In the group interview and survey open-ended responses, students discussed the importance of ignoring the anxiety of raising your hand for help. They discussed the value of trusting the instructors. Students shared how they valued the patience of instructors as they asked questions or tried to work out math calculations. One group interview discussion defined instructor behavior in relationship to answering questions patiently and working through challenges to find mathematical solutions. Students shared how acquiring the skill of asking questions removed an obstacle in their pathway to success. Once they were able to feel confident enough to ask questions and seek help, they developed self-awareness and understood that the need for assistance was not a sign of failure. This important understanding enabled them to establish goals. Students in the group interview indicated the formation of goals was a determining factor in their persistence.

Students in the group interview also shared advice for peers and future students that included: "Pay attention;" "keep on top of the assignments;" "finish the required math;" and "don't get cocky." They shared how noise control and clean desks were valued commodities in the lab.

The student group interview highlighted student support programs, in-class tutoring, and the input of the Math Co Lab partnership counselor as components that helped to ensure academic success. For example, students shared that knowing the counselor would call them if they missed class made them come to class even when they had to adjust their schedules. Students

stated that the orientation was motivating and the one-on-one time with the counselor was inspiring. Students shared that the knowledge of the counselor's personal history gave them hope they could succeed. Although math was a difficult area for the counselor, he shared strategies that enabled him to successfully complete math and earn a degree. Students related his individual struggle with their own personal struggles. The data revealed the students had synthesized the counselor's tenacity and determination into a goal to "keep the focus."

Student group interview discussions revealed two distinctions between noncredit and credit courses. The first was the acquisition of financial aid. Student financial aid became a challenge with dual enrollment in noncredit and credit courses. Students were required to meet minimum enrollment requirements in the credit institution for financial aid. The noncredit units cannot be included for financial aid requirements. However, students in the group interview shared how they learned to plan classes to overcome financial aid restrictions. Students discussed the importance of selecting credit courses that would not require a lot of homework. The noncredit Math Co Lab course attendance requirements created scheduling and time management challenges. The second distinction was the physical location of the Math Co Lab. Although noncredit institution shares the same campus location with the credit college and this is a benefit for the partnership, the students felt the distance between the noncredit Math Co Lab, which is on the opposite side of the campus, from the

credit classrooms was difficult. They experienced parking challenges and time restraints due to the scheduling of their individual courses.

Students made the following suggestions for program improvement during the group interview. First, students believed they would achieve at higher levels if their course selection after completing Math Co Lab was limited to one to three courses. They explained they became confused when they had to select their next math course because it was difficult to discern which course would best help them reach their individual goals. One student mentioned the need to drop a course in her schedule because the workload couldn't be managed with her work schedule. They indicated they would benefit from personal counseling at each juncture. Second, participants in the group interview suggested incorporation of the following elements into academic counseling: (a) information regarding available student support programs and individualized academic planning, (b) information on available alternative and interconnected learning opportunities, and (c) coaching on student behaviors/skills that lead to success.

The top twelve components student group interview participants referenced regarding key components for student success are shown in Table 19. These are ranked by frequency from 142 references aggregated into 35 key components.

Table 19

Student Success Key Components - Student Group Interview

N = 142	N	%
Motivation	19	13.38
Preparedness	16	11.26
Social Connectedness	13	9.15
Pathways	9	6.34
Planning	9	6.34
Self-Awareness	9	6.34
Training	6	4.23
Accountability	5	3.52
Finances	5	3.52
Communication	4	2.82
Pedagogy	4	2.82
Technology	4	2.82
Time Management	4	2.82

Note. Components were shared in a student group interview. The discussions yielded 142 references to key components. Twenty-four components received at least two references by a group interview participant.

Individual Instructor Interview Responses

The partnership program was designed with significant input from instructors regarding curriculum, pedagogy, and assessment. The instructor interviewed as part of this research study represented both the credit and noncredit institutions. As a partnership program instructor, he worked with students, instructional staff, counseling staff, and administrators to provide training and assess program components.

Table 20 shows the key components the instructor identified in the interview as valuable for student success. Preparedness was the top component he shared and the administrative focus group also confirmed this component as essential. The instructor discussed methods of pedagogy beyond the curriculum in the Math Co Lab and hoped to develop supplemental curriculum to teach

students critical thinking skills, test preparation, and how to gain facts from a lecture.

Table 20

Student Success Key Components - Instructor Interview

N = 62	N	%
Preparedness	12	19.35
Motivation	8	12.90
Pedagogy	6	9.68
Accountability	4	6.45
Pathway	4	6.45
Training	4	6.45
Curriculum	3	4.84
Technology	3	4.84
Articulation	2	3.23
Individualized	2	3.23
Tutoring	2	3.23

Note. Components were shared in the instructor interview. The discussion yielded 62 references to key components. Eleven components received at least two references.

The instructor shared how he works "one-on-one with students to help them understand how credit math instructors will grade assignments and tests." This is a need that is also supported by the development of progress indicators in noncredit programs in California (Academic Senate for California Community Colleges, 2009). In addition, the instructor shared how he created "supplemental materials to assist students in the difficult segments of the math curriculum."

Another instructional tool shared in the instructor interview was collaboration between the noncredit instructors in the lab. The lead instructor in the Math Co Lab and the instructional assistants communicated to ensure that students' individual learning styles and areas of mathematical weakness were addressed. Test strategies became a training topic in response to discussions about the math anxiety students exhibited in the lab. Coaching students to be

self-aware of individual learning styles and mathematical abilities emerged as a strategy through instructor discussions as well. The instructor revealed plans to incorporate into the curriculum "a mini lecture series to train students in the art of learning from a lecture." Data from the individual interview revealed instructors and administrators perceived these areas of academic rigor would increase effectiveness within the Math Co Lab.

The Math Co Lab also includes preliminary, sustaining, and post academic skill development and cognitive development. The instructor interview and administrator focus group described pedagogical adjustments that were implemented based on student assessment. For example, the evaluation of a lack of study skills after the first term led to the enhanced orientation and study skill training within the Math Co Lab. Bridge orientation sessions were added to prepare students for the academic rigor of the credit mathematic courses.

Although the instructor valued the flexibility of the structure of the Math Co Lab, he discussed the weaknesses of flexible scheduling. Flexible scheduling did not provide opportunities to develop study skills relating to academic rigor. Flexible scheduling limited the ability to train students how to synthesize information from a traditional lecture format. Flexible scheduling created challenges to meaningful measurement of learning trends students apply to mathematics. The instructor expressed the importance of students progressively developing study skills and learning strategies independent of in-course tutors, one-on-one counseling, and the technological curriculum. He also shared the importance of building the noncredit instructional components students need to

develop both the skills and the motivation to pass community college credit courses. Coaching students to understand and utilize feedback from instructors and the grading system were valuable skills students need to acquire according to the instructor. The instructor voiced the need for noncredit courses to incorporate lectures, assignments, and tests that prepare students for the rigor of credit courses. The instructor explained the benefit of knowing the math concepts and competency each course required. This knowledge provided him with the ability to prepare students for the next course and establish curriculum and instruction that allowed students to build a foundation of math and study skills. He revealed his belief in students when he said, "Students will get a rhythm."

Administrator Focus Group Responses

The administrator focus group revealed that specific components of the Math Co Lab were essential to student success and persistence, including learning modules with supplemental curricula, integrated student support services, tutoring, and instruction in academic behaviors. Administrators discussed the value of presenting mathematic theory integrated with the pragmatic use of concepts. They agreed that students are more likely to retain applied mathematics concepts and persist when they use the math they learn. The administrators also discussed the value of accommodating multiple learning styles, but realized students would need more time to fully explore the methods, curricular components, and student services involved.

Table 21 highlights twelve of the 207 key components the administrators referenced in their focus group discussions. Preparedness and self-awareness were the top components the administrators identified.

The list of key components in Table 21 is similar to the key components shared in the student group interview and in the interview with the instructor. The administrators shared the value of instruction surrounding these key components in conjunction with subject competency.

Table 21

Student Success Key Components: Administrator Focus Groups

N = 207	N	%
Preparedness	26	12.56
Self-Awareness	16	7.23
Communication	16	7.23
Motivation	11	5.31
Program Review	11	5.31
Planning	9	4.35
Pedagogy	9	4.35
Social Connectedness	9	4.35
Assessment	6	2.90
Pathway	6	2.90
Structure	6	2.90
Training	6	2.90

Note. The administrator focus group discussion yielded 207 references to key components. Thirty components received at least two references.

The administrator focus group also discussed various aspects of funding. The ability to incorporate into the program a technological curriculum, a lab setting, flexible course hours, and modified staffing was cost beneficial to the institution. The provost shared, "I want our faculty and staff to just know, either through the way we communicate or [the way we] act, that we want the good work that they're doing to occur. If they need a different type of support that we haven't had in the past, then they're not afraid to ask." This demonstrates the

level of institutional support Tinto and Pusser (2006) described in the institutional departure model. The level of funding given to programs makes a difference in the ability of instructors to meet the student needs within the program.

The modified staffing used by the program included a counselor, a tenured instructor, assistant instructors, and clerical and record-keeping staff. One of the deans in the program shared the importance of each member in the partnership understanding their role in promoting the success of the students. Reflecting on the importance of program members, she stated that members should be aware of "how all of these pieces fit together to support this project; . . . being passionately committed to fulfilling a role that is uniquely defined; . . . [and being] committed to the outcome and also being willing to accept the potential not to succeed." She acknowledged the anxiety faculty felt about being involved in a new program in her statement, "They think they will be blamed if it doesn't work." She added, "Changing the culture where failure is not looked down on, but not trying new things is looked down on, [that is] a different measure of what it means to be a faculty member."

Another discussion topic in the administrative focus group was the ability for noncredit courses to build mathematical concepts successfully in incremental steps. Because of time and structure restraints, students enrolled in credit courses can move to a sequential mathematical concept without reaching competency. The discussion included the following as an example of the value of noncredit courses as compared to credit courses: A student in a noncredit course who receives a "D" grade on a test is required to restudy the concepts

using a supplemental curriculum, is provided accessible instructor and tutor resources, and the opportunity to retake the test until successful completion (80% passing score). A student in a credit course who receives a "D" grade is allowed to move to the next chapter or concept without achieving 80% competency.

Administrators agreed that program flexibility must be available along with accountability, learning strategies, and well-defined parameters. Asking basic skills students to discipline themselves, incorporate time management, learn strategies, and work hard within an open lab setting to complete a course is incongruent with the typical study skills and habits basic skills students possess. The administrators expressed a desire to return to the topic of giving credit for a noncredit lab course in future discussions. In commenting on the need to make program changes when needs are identified, one administrator stated, "In our first semester we said, 'Congratulations, you're in credit. . . . Good luck—don't forget about resources." . . . The success rate wasn't nearly as good as when we said let's at least give them an orientation; let's walk with them and show them the resources; . . . make sure they know they're welcome to come back and follow up with them." In response to this clearly defined need, the deans, counselor, and instructors designed and implemented an orientation program to assist students in the first semester of credit mathematics.

The administrative focus group acknowledged the design of the Math Co Lab as an effective alternative pathway for students reentering higher education. The administrators acknowledged the alternative noncredit pedagogy and

curriculum as a valuable link for students with language, cultural barriers, and learning gaps.

The combined Algebra I/II course became a topic of discussion, because transition into this accelerated credit course is dependent on high achievement in the Math Co Lab. The administrators discussed the diverse learning needs within the Math Co Lab and the importance of supplemental and differentiated curriculum necessary to enable students to achieve their goals.

The administrative focus group also addressed the primary goal of basic skills courses. The administrators shared how the Math Co Lab design trained and developed basic skills students for academic rigor and established a foundation of mathematic skills. Administrators acknowledged that the instructors and deans supplemented the partnership program with curricular components to strengthen basic skills and decrease course drops and withdrawals when students transferred to credit mathematics courses. The administrators perceived that the program components that supported a successful transition into credit mathematics were preparation, self-awareness, progressive study skills, and the ability to persist.

Administrators validated that students in the Math Co Lab were persisting and successfully meeting goals and completing credit mathematics courses. The administrators emphasized that students in the noncredit program are trained to manage time, meet the responsibilities of a mathematics course, and follow through on assignments and course requirements. The administrators

recognized training was in place in the Math Co Lab curriculum to address the areas of critical thinking and problem solving.

The administrators realized the perception of success was a significant factor in building the program. One need for accountability one administrator shared was as follows: "Perception. You know to be an advocate, noncredit has not had the opportunity to look at the data year to year in the same way as credit, and our feet were not put to the fire like on the credit side with regards to accountability. You know it will be interesting to see once we know." Another administrator shared "The process statewide of developing our own accountability systems and measures of success . . . and we need to develop them in a way that would truly tell our true story. . . . It's just a different perspective."

Mixed Methods Analysis

In survey, interviews, and focus group responses, students and instructors shared preparation, accountability, flexible schedules, and one-on-one counseling as factors that support student success. The qualitative data indicated students and instructors perceived students' high school mathematics preparation and the development of study skills as important. The individual interview, group interview and focus group also emphasized the value of one-on-one counseling and academic guidance provided as a part of the partnership program. The counselor received high praise and value in 90% of the conversations and was listed as a perceived pivot point in academic achievement. Students shared in the survey and group interview the value of

cost and flexibility in the Math Co Lab structure as key factors in their persistence. The percentage of students who completed the two credit entry-level pathways with a passing grade (N = 197, 71.38%) shows level 2 success and indicates persistence of students who used the Math Co-Lab partnership pathway to complete basic skills requirements.

A comparison of the components found in the survey with the top key components found in the student group interview demonstrates similarity between findings. Students in the survey and group interview valued similar components as keys to their success. The survey asked students to select from a list of components and the group interview prompted open-ended responses. As is shown in Table 22, the similarity found in both qualitative instruments strengthens the findings of concrete key components basic skills students perceived as making a difference in successful community college mathematics achievement.

The parallel between the students' perceptions and the instructor and administrator perceptions validate the construction of the mathematic partnership program. Although the terminology used in the individual interview, group interview and focus group varied, the core ideas, concepts, and components regarding the training students need to receive are evident. Instruction that includes training in these key areas was supported in each stakeholder group.

Table 22

Comparison of Key Components from Student Instruments

Student Group Interview	*N* = 142	%	Student Survey	*N* = 36	%
Motivation	19	13.35	Tutor	26	72.22
Preparedness	16	11.26	Lab &/or Campus Resources	21	58.33
Social Connectedness	13	9.15	Instruction	19	52.78
Pathways	9	6.34	Classroom Structure	17	47.22
Planning	9	6.34	Textbook/Course Materials	16	44.44
Self-Awareness	9	6.34	Counselor	12	33.33
Training	6	4.23	Friends and Family	6	16.67
Accountability	5	3.52	Orientation	1	2.78
Finances	5	3.52			
Communication	4	2.82			
Pedagogy	4	2.82			
Technology	4	2.82			
Time Management	4	2.82			

Note. The student group interview yielded 142 references to key components in open-ended discussions. Twenty-four components received at least two references. The student survey components are responses to a list of 8 key components listed with a prompt to select 3 components they perceived valuable in the preparation the Math Co Lab training provided.

Academic Success

The key components students perceived were valuable were related to the development of cognitive skills, student habits, and critical thinking. Students in the partnership program described turning points they experienced in the structure of the Math Co Lab. At these points, the available resources, partnership program design, and student coaching supported their academic success.

Students shared there were moments when they gained self-awareness and knew what it would take to be successful. The students defined this self-awareness as the knowledge they gained, the skills they understood, or the courage to try something they were once afraid to try. They clarified those specific moments as an intersection that changed their understanding of effective

study skills, confidence, and/or the self-awareness it would take to reach success. The students shared that once they changed their thought patterns, they were able to make progress as demonstrated by increased levels of proficiency, persistence and successful learning outcomes. This confirms Tinto and Pusser's (2006) concept of the "quality of effort" students develop through the process of building connections and responding to effective guidance and instruction. .

Professional Success

At least 90% of the students shared how difficult it was to keep life, school, and work balanced and how they valued the flexible scheduling, the instruction, and guidance from the counselor. They shared that the counselor gave them practical ways to meet these challenges. Students shared how they became more aware of the reasons they achieved levels of success, but they exhibited not certain as to the exact study skill that made a difference. Students reported multifaceted factors in their ability to persist and complete courses. Students believed they were acquiring a range of study methods, academic behaviors, and habits of the mind they believed would make a difference in their ability to reach goals. The students were more confident and believed they would persist because of the instruction they received in the Math Co Lab, the orientation they received, and the work they did with the counselor (California Community Colleges Success Network, 2013).

When asked how they managed the challenges they faced in mathematics or rose above their fear of mathematics, students shared that they established a

schedule that set aside certain hours each week to work in the mathematics lab and meet the target dates set in the curriculum. Students noted that time management, tenacity, belief in their ability to succeed, and a focus on completion eventually became a part of their work and life management skills. Students expressed a desire to incorporate the components of the noncredit structure and directed learning environment into credit mathematic courses, other disciplines of study, and in their work environment.

Qualitative data from the group interview and survey indicated students transferred to credit mathematics with specifically defined goals. Student goals included earning a degree, completing general education requirements, or obtaining a job advancement certificate. Students shared in the group interview how time with the counselor and guidance from the instructors in the Math Co Lab helped them clarify their goals. One student shared that she wanted to achieve a degree, but she wasn't sure she was capable. When she heard the counselor share the academic pathway he had traveled and how he overcame the obstacles he faced, she realized she could achieve her goal. Other students shared they came hoping to at least advance in their jobs but as they completed the courses in the Math Co Lab were inspired to persist in their academic pursuits by their instructors

Social Connectedness

Students related how the Math Co Lab assisted them in the development of the initial confidence they needed to connect to clubs and other social programs. These social connections established a bridge between mathematics

and career and occupational goals. One student in the group interview shared how joining the Science Technology Engineering and Mathematics (STEM) club on campus opened her mind to a career in engineering. STEM is a community college support program that encourages study and persistence in the area of science, technology, engineering, and math (CDOA, 2014). She shared the club hosted outside speakers in various careers within the STEM disciplines. She enjoyed meeting other students that possessed a common goal.

Other examples of opportunities for social connectedness discussed in the instructor interview and administrative focus group and acknowledged in the student group interview were Puente and the Extended Opportunity Programs and Services (EOPS). Students were aware of these programs and shared varying levels of involvement. Students shared the Math Co Lab counselor consistently shared invitations and campus events available to students. Students mentioned the benefit of becoming socially connected in these areas and encouraged each other in the group interview to join one of the programs.

Elements of Partnership

This research confirmed elements of the Tinto and Pusser (2006) model of institutional departure. The theoretical model highlighted four components: (a) institutional commitment, (b) integrated instruction, (c) diverse student service offerings, and (d) student effort and participation in the learning experience. Tinto and Pusser (2006) suggested these four components would develop a foundation for students and lead to the quality of effort students would need to invest in their individual education. The combination of quantitative and

qualitative data in the three instruments documented the planning and implementation of a partnership program that incorporated these components. One of the academic leaders in the district stated the reason they developed the noncredit alternative Math Co Lab course was a definitive institutional commitment to "develop effective pathways for community college mathematics completion" (Bandyopadhyay, 2011). The model supports student academic preparation and the cognitive development of academic attitudes and habits that inspire the quality of effort that leads to persistence. The model establishes the connections and self-awareness that synthesizes instruction and linkages to negotiate academic pathways toward success. The institutional data, individual interview, group interview and focus group indicated that enrollment in the noncredit program was associated with achievement in credit mathematics and academic success.

Unified Focus. The similarity of key components identified in the individual interview, group interview, and focus group is significant. The blended findings show similarity in components despite the perspectives unique to students, instructors, and administrators. The responses in all three phases included multiple components with varying ranges of frequency. For example, the instructors discussed components of planning and process in addition to the key components students would need to apply to reach success. The students focused on key components they perceived helped them establish learning strategies and utilize skills and community college services they needed to reach success. The instructor voiced ideas involved in instruction, curricular design,

and learning strategies. Common elements in the interviews and focus group revealed the importance of creating connections for students. The connections envisioned by participants prepared students with mathematical concepts and the student behaviors and skills that supported the highest levels of persistence and success.

Different stakeholders discussed multiple components and prioritized them in slightly different order, but all found common key components that impact persistence and success. The commonality of the key components strengthens the design of the noncredit alternative basic skills pathway.

The research included the opportunity to attend a Math Co Lab planning session that involved instructors, the counselor, the two deans and the program manager. The discussions included various issues that arose, challenges in curriculum, logistics, and technology, and the needs of the lab. The meeting provided insight into key components that were discussed by a mixed group of stakeholders. Table 23 shows key components this mixed group discussed in the process of planning and working through details in a routine collaborative meeting setting.

Table 23

Key Components - Routine Math Co Lab Planning Meeting

N = 22	*n* =	%
Preparedness	5	22.73
Flexibility	3	13.64
Accountability	2	9.09
Individualized	2	9.09
Motivation	2	9.09
Procedures	2	9.09
Staffing	2	9.09
Support	2	9.09

Chapter Summary

The quantitative and qualitative data of this study point to noncredit courses as a resource and effective alternative for the instruction of basic skills mathematics in a community college. The data show that the noncredit program affected student access to basic skill mathematics, persistence in credit mathematics, and successful completion of community college credit mathematics. Qualitative discussions evidenced key components of effective instruction and curriculum that strengthen student persistence and success in mathematics as perceived by students, instructors, and administrators. The data collected key training and support components from current stakeholders of the partnership program. Mathematics preparation, academic counseling, tutoring, flexible scheduling, and cost were included as valued components. Effective instruction and curriculum that ensured mathematical competency in conjunction with training students in time management, critical thinking, study skills, and learning strategies emerged as key components. The findings of this research reflected transfers from noncredit to credit mathematics and the development of connections that prepared students for the rigor of sequential courses.

A discussion of the findings is presented in Chapter 5, including interpretations of the findings and implications for policy, practice, theory, and future research. The chapter concludes with a summary of the dissertation.

CHAPTER 5

DISCUSSION

California community college educators systematically investigate and develop methods and programs to improve student access and strengthen persistence (Houck, 2004; Lascu, 2011; Moore et al., 2011). There are two main goals in their efforts. The first goal is to maintain the increase in enrollment achieved in the last decade (Boilard, 2009). The second goal is to develop and implement methods and programs that strengthen academic persistence and success (SB1456, 2012). Persistence for the purpose of this study was the term-to-term re-enrollment of students in mathematics. Success was defined in this research in three levels. Level one success was enrollment in entry-level credit mathematics (Elementary Algebra [M-20]). Level two success was completion of the credit entry-level mathematics course (Elementary Algebra [M-20]). Level three success was the successful completion of at least one sequential credit mathematics course. The findings of the study are related to basic skills instruction, student support and connections provided in an alternative noncredit academic pathway. Additionally, the findings provide information about the levels of persistence and success students achieved from fall 2011 through spring 2012.

The literature established a concrete foundational belief that student success and persistence include social, emotional, and motivational components

(Pascarella & Terenzini, 2005; Tinto & Pusser, 2006). Student success is supported by a comprehensive institutional commitment (Tinto & Pusser, 2006), a broad array of professional development opportunities (Bailey, 2014; Fouts & Mallory, 2010; McClenney, 2013), and regional collaborations (AB86, 2014; Booth et al., 2013; California Alliance of PreK-18 Partnership, 2004).

The findings of this research addressed the problem of persistence and success for basic skills students in credit mathematics. The research focused on the use of noncredit courses as a community college resource to prepare basic skills students with the academic behaviors and subject competency needed to enroll in credit level mathematics courses. The instruments used in this study collected quantitative and qualitative data to investigate the preparation components of a noncredit program and the achievement in credit mathematics courses of basic skills students who were enrolled in the program. The findings demonstrate how students' preparation for academic rigor and their connection to student services influence persistence that leads to college success.

The findings in this study also add insight into how noncredit courses reinforce the programs community colleges have developed to support the academic success of basic skills students. The findings of this study revealed elements of a noncredit course in partnership with sequenced credit courses that connected students and strengthened persistence in credit mathematics courses. The findings of this research fill a gap in the literature regarding noncredit courses as an alternative pathway and establish a foundation for further study.

Interpretations

Analyses of the findings in this study clarified how the use of a noncredit math partnership course developed students' academic preparation and prepared them for the rigor of sequenced credit mathematics courses. Educational leaders and instructors collaborated to develop a basic skills noncredit math lab that incorporated student services, training in academic skills in conjunction with the mathematics curriculum. This partnership ensured competency in fundamental mathematics, strengthened persistence and facilitated success in credit mathematics courses. Interpretations of this study integrate quantitative and qualitative findings to inform and establish a foundation for noncredit and credit partnership construction that includes student support elements.

Phase One

Phase one of the study reviewed institutional data that documented basic skills students' progress by their success in completing noncredit mathematics and credit mathematics courses at different levels. Specifically, the quantitative data revealed how a noncredit to credit community college partnership addressed the education of students who were required to take basic skills courses but were placed on a waiting list.

The alternative pathway was successful because it opened access for 197 (71.38%) students into credit math. Of the 276 students in the institutional database sample, 164 (59.42%) enrolled and successfully completed the credit entry-level Elementary Algebra ([M-20]) course and 33 (11.96%) students gained

access and passed the combined entry-level Algebra I/II course (M-41). Interpretation of the data revealed a need to review the curricular content of Liberal Arts Math (M-100), which is the first University of California and California State University transfer course. The data indicated that the five Math Co Lab students who attempted this course did not pass. This finding prompted a review of the curriculum sequence to create Math Lab curricular components that support competency in Liberal Arts Math. The finding also prompted a review of the academic skills, critical thinking, and test skills students needed to be prepared for the rigor involved in success completion of Liberal Arts Math.

Phase Two

Kuh and Kinzie (2010) established the context for the interpretation of the perceptions of students that were analyzed in phase 2 of this study: "Students learn more when they are intensely involved in their education and have opportunities to think about and apply what they are learning in different settings" (p 11). The findings of this research placed value on the instruction and support students perceived led to success in credit mathematics. Students valued the in-class tutoring and flexibility of the Math Co Lab and realized they had to be active in the learning process. Student perceptions clarified the value of accountability in reference to the support the in-class counselor provided to them. The survey findings revealed 33.33% (n = 12) of the students valued the one-on-one counseling component because the counselor made them accountable by consistently recording work they completed by the established target dates.

The data also clarified the value of program components that support student success for basic skills students. Examples of two important components are in-class tutors and counselors. The data in phase two led to the understanding that effective curriculum and instruction in an alternative pathway course includes subject competency integrated with training in study skills, test strategies, critical thinking, organization, and time management.

Phase Three

Phase three data clarified instructional components the stakeholders observed and valued in the Math Co Lab. The participants in the group student interview, the instructor interview and the administrative focus group all valued the active learning model the lab used. All of the participants shared that they saw value in students' understanding how the concepts of math fit into their individual lives and work environments. For example, the students shared how this style of instruction allowed them to comprehend the subject material at higher levels and retain the subject content for future mathematics courses. Participants also shared the value they placed on the flexible scheduling the Math Co Lab allowed. Students shared how the flexibility allowed them to maintain work hours while they made progress toward their individual academic goals. The inclusion of instruction in study skills, time management, and accountability was mentioned in all three groups and valued because these skills are commonly associated with student persistence. The instructor interviews and administrative focus group discussions revealed how the Math Co Lab program coached students to set short and long range goals. The administrative focus

group valued the counseling components that assisted students in the development of self-awareness and social connectedness. Contemporary literature reports similar findings and components relating to college success (Booth et al., 2013; Pascarella & Terenzini, 2005; Tashakkori & Teddlie, 2003; Tinto & Pusser, 2006).

Administrative support influences collaboration and the construction of effective courses and programs (Tinto & Pusser, 2006). The findings disclosed the value of administrators listening to instructors and students and the value of instructors listening to students because opportunities to communicate facilitated higher levels of understanding and enabled collaboration and decision-making (Booth et al., 2013; Houck, 2004). The administrative focus group included discussions as to how open dialogue with the instructors enabled them to better understand how to support classroom instruction and program development. Both deans involved in the planning of the Math Co Lab shared how they valued the opportunity to collaborate with the instructors in the planning process (Bocala, 2012).

The underlying focus on the students was a consistent factor within the data and findings of this research. Basic skills students required the additional dynamics of academic training purposefully integrated with subject competency to achieve academic success. The interviews and focus groups revealed the importance of the development of student services, connections to programs, financial aid, and social opportunities to student success. The literature supports connections that benefit students (Chickering & Schlossberg, 2001; Tinto, 2003;

Tashakkori & Teddlie, 2003), the utilization of noncredit as a resource (Bacca et al., 2011) and recommendations related to student success (SB1456, 2012).

The data from this research showed the value of incorporating instruction of learning strategies and test taking skills within the mathematics course curriculum. The findings indicated this training enabled successful completion of credit college mathematics courses. The frequent mention of flexibility in reference to the partnership course gives credence to course and curricular construction that allows students to schedule classes around responsibilities in their individual lives. The data supports the value of collaboration between stakeholders, including the student basic skill population, to construct effective alternative pathways that strengthen persistence and success in credit mathematics.

Mixed Methods

The student and team member perceptions provided knowledge of how the Math Co Lab course impacted success in credit mathematics. Interpretations of the data strongly suggested that the training students received in the noncredit course established a foundation for success in credit mathematics courses. Students mentioned that they developed the skills necessary to understand mathematic concepts when they transferred to the credit mathematics courses. Students shared the value of curriculum that prepared them for the rigor of credit mathematics and the competency levels they needed to progress in higher mathematics. Data from the qualitative instruments served to further support the construction of alternative courses that streamline completion of remedial

courses. The interpretation of the data indicated that basic skill students persist and achieve when they understand how to study, how to manage their time, and how to think critically, and when they have developed subject competency.

Implications

Findings of this study have implications for policy, practice, and future research. While the data collected for this research consistently led to more questions, the data confirmed academic partnerships as a viable method to provide effective alternative pathways for basic skills mathematic students. The research supported noncredit to credit courses as a resource and alternative pathway.

Implications for Policy

The results of institutional quantitative data collected in phase one have implications for the development of partnership policies that support access and achievement for every age, gender, and ethnicity (Wilson, 2009). Policies in community college should include the development of alternative course pathways that provide access to a broad scope of basic skills courses. The policy should initiate dialogue between credit and noncredit instructors to ensure instruction designed to prepare students for the rigor of credit courses. The policy should include planning and implementation of alternative course pathways. Since the data consistently demonstrated that the noncredit alternative partnership resulted in comparable access and persistence for all students, policies should be established to provide resources that effectively promote the alternative courses to all students. Policies should be established to

train staff, instructors, and counselors with the knowledge of the various pathways and to understand how students will transition to credit math courses.

The Phase two student survey findings identified key components of course instruction. The key components mentioned by all stakeholders were tutoring, academic resources, flexible classroom structures, counseling, and support from family and friends. Community college leaders should initiate policies that (a) support funding to include counselors and tutors to strengthen the success of basic skill students; (b) enable instructors to design flexible course structures (hours, location and established due dates); (c) establish systematic opportunities for students to connect with peers; and (d) launch orientations and early intervention programs to reduce student departure.

The results of the interviews with stakeholders in phase 3 found that to best serve basic skills students instructors must have knowledgeable of the scope and sequence of the math curriculum. Instructors must be clear about the necessary concepts that students must master at all levels. Policies that support the design, rigor, and transition from noncredit to credit are critical.

The implications of the mixed method results are related to concepts provided in Fouts and Mallory (2010). Sharing resources in both credit and noncredit courses can result in more efficiency and greater benefit to all stakeholders. Additionally, policies that incorporate "Habits of Mind" (California Community college Success Network, 2013) and the recommendations of the Student Success Task Force (2012) for noncredit and credit mathematics courses and student support services is imperative.

Educators must be lifelong learners in order to meet the challenges of contemporary educational tasks with current pedagogy and instructional technology (Loughran, 2006). Dewey once said, "If we teach today's students as we taught yesterday's we rob them of tomorrow" (Goodreads, Inc., 2014). The findings from this study suggest that the systematic practice of meaningful assessment can lead to informed decisions and purposeful program and course development. This study found data provided a valuable framework that could be used to inform the effective use of resources in program and course development; therefore, policies should be established to incorporate course and program data into the decision-making process.

Implications for Theory

The implications for theory resulting from the findings of this study directly align with the philosophical perspective of constructivism and the theoretical models of student departure and dependency theory discussed in Chapter 2. Tinto and Pusser (2006) provide a theoretic perspective in the four components of their institutional departure model. This theoretic viewpoint connects institutional commitment, integrated instruction, support services, and student engagement to strengthen learning outcomes. The constructivist and dependency theory provide a lens for basic skills instruction that leads to active engagement of students. Students that incorporate individual background variables, particularly their cultural wealth, to the learning experience achieve at higher rates, meet goals, and apply concepts to work and academic pursuits. Given this, programs designed to support students in remedial classes who are

aspiring to enroll in credit classes should be aligned with theory that supports learners from a holistic standpoint and considers learning from a constructivist lens. This philosophical tenet supports the learner as an active participant in the learning process, able to bring all of themselves into the experience.

Implications for Practice

The findings from the institutional quantitative data collected in phase one of this study have implications for practice that include the improvement of communication between faculty in noncredit and credit courses. In order to best serve students there must be on going communication and collaboration at all course levels. Adoption of methods to effectively serve the diverse student population within California community colleges is necessary. The Math Co Lab was a partnership designed to increase access to basic skills mathematics courses for all genders, ethnicities and various ages. Because of this diversity, best practices must embrace the use of technology with instruction to increase accessibility, reinforce subject content, and teach study skills. In the classroom, instructors should use active learning methodology. In support of classroom success, counselors must inform students of the alternative pathways they can follow to reach individual goals.

In phase two, student survey findings supported the incorporation of strategic key components into course instruction. It is beneficial for instructors and counselors to incorporate tutoring, counseling, and academic resources in the design and implementation of basic skill courses and programs. Staff, instructors, and counselors should receive yearly instruction related to the

incorporation of effective tutoring and flexible classroom structures. In most cases, more attention and resources should be distributed to these efforts to assure student success.

The findings from the interviews with stakeholders in phase three suggested that instructors who were invested in the development of sequential subject content curriculum and instruction saw higher persistence and success rates in their students. Because transition from basic skills courses to credit mathematics courses revealed students were not prepared for the rigor of credit mathematics courses, instructors need to better understand the challenges students face in the transition from basic skills courses to credit mathematics courses. Instructors must design curriculum that meets sequential course expectations in subject content and study skills. Instructors in the basic skills courses need to prepare students with the essential foundational and study skills, test-taking strategies, and critical thinking habits that lead to successful learning.

These instructional improvements should initiate systematic professional development and the assessment of learning outcomes. Institutional administrators must establish expectations that instructors consistently participate in professional development. Administrators must develop institutional cultures that include collection of measurable data to assess learning outcomes (Hughes, 2012; Loughran, 2006).

As a result, systematic professional development and assessment of teaching outcomes should be implemented. There may need to be a shift in

teacher expectations by leaders and student expectations by instructors yielding and cultural shift in teaching and learning (Hughes, 2012; Loughran, 2006).

The implications of the mixed method results are related to practices that involve collaboration of credit and noncredit basic skills instructors that includes consistent dialogue regarding course sequence and curriculum. Practices that lead to sharing of resources that keep a focus on student achievement are vital. In summary implications for study findings will allow for a more robust educational experience for all stakeholders.

Implications for Future Research

Data provides important information about the effectiveness of partnership programs. Future research should revolve around the eight recommendations of the Student Success Task Force Initiative which include: (a) increasing college and career readiness; (b) strengthening support for entering students; (c) incentivizing successful student behaviors; (d) aligning course offerings to meet student needs; (e) improving the education of basic skills; (f) revitalizing and re-envisioning professional development; (g) enabling efficient statewide leadership and increasing coordination among colleges; and (h) aligning resources (Student Success Act, 2012, p. 6-8). Data should be collected to determine the outcomes of these recommendations. Research should include assessment to determine how partnership program structures and instruction that integrates study skills with subject content increases student success (California Alliance of PreK-18 Partnership, 2004; Bailey, 2014; Person, 2014). Brown and Niemi (2007), Moore and Shulock (2010) and Duncan-Andrade and Morrell (2008) have begun

research to establish a foundation of thought regarding alternative methods and instruction to impact access, persistence and success for all students. Future research that builds on this foundation is recommended.

Future research in the area of community college assessment and placement tests is important because it will impact basic skills students and the pathways they take to complete degrees (Carnegie Foundation, 2011; California Assessment Initiative, 2014). The California Assessment Initiative is currently developing a common assessment for community colleges (Center for Community College Student Engagement, 2012). Future research of professional development programs that lead to consistent instructional improvements, assessment, and technology also hold promise for improving basic skill student achievement (Campus Technology Forum, 2014; Lascu, 2011; Online Education Initiative, 2014).

The data of this research indicated that there is merit in using noncredit courses as an alternative pathway to credit mathematics. The data is not conclusive. Future research to validate partnership design for noncredit to credit bridge courses will strengthen programs that lead to community college student degree completion. Future research using student learning outcomes and enrollment data to measure the extent Math Co Lab students persist term by term and reach academic goals will impact the understanding of the effectiveness of the program curriculum. This future research will clarify how a noncredit resource impacts student subject matter competency and provides the training needed to meet the rigor of credit mathematics courses.

Researching components of success, priority enrollment, the use of developmental and/or acceleration programs, and attendance requirements in reference to basic skills noncredit pathways will inform decision-making and partnership design in basic skills mathematics courses. Consistent review of effective instruction methods, accountability, tutoring, and support services will inform stakeholders regarding optimum course and program impact and funding. This research study supports the Boilard (2009), Carnegie Foundation (2011), and Fouts and Mallory (2010) research that promote systematic investigation of methods to address the academic barriers basic skills students face. The technological aspects of curriculum and communication are an additional area of future research that will impact basic skill students (Campus Technology Forum, 2014; Online Education Initiative, 2014). The Center for Community College Student Engagement (2012) in partnership with the Columbia University Teacher's College published a foundational report discussing promising practices and successful strategies community colleges can incorporate in the area of partnerships. The report includes predictors of student success that lead to transfer, persistence and completion of degrees (see Figure 2).

This research project provides a foundation for future research in the construction of noncredit partnership programs that develop connections for basic skills students. Longitudinal data will strengthen the ideas and concepts of this research. The construction of the mathematics partnership in this study is unique because it includes an independent noncredit institution within a community college district; however, the ideals of a noncredit institution are

applicable to noncredit segments within a credit community college department. Future research will continue to provide important information of how noncredit to credit partnerships impact access, persistence, and success in credit mathematic courses.

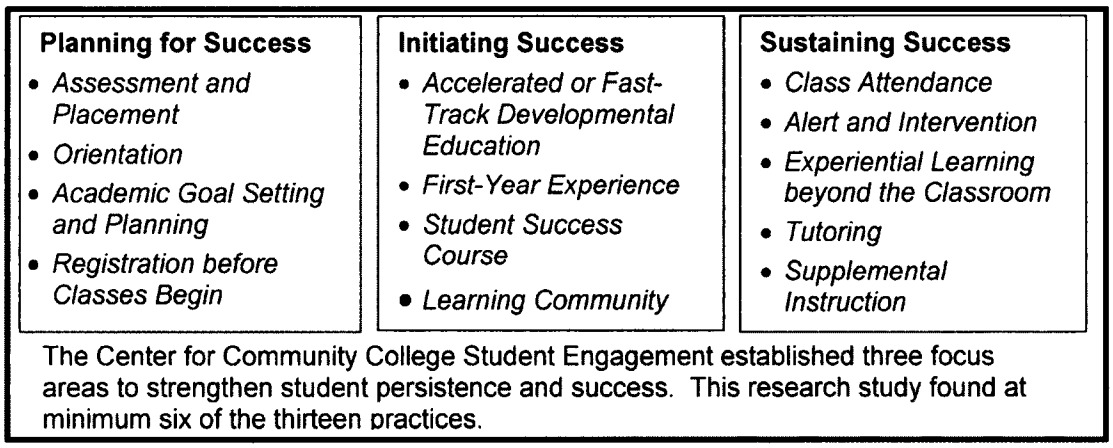

Figure 2. Promising Practices for Community College Student Success (The Center for Community College Student Engagement, 2012, p. 8).

The Community College of Denver developed an accelerated program entitled *Fast Start* that was designed for students to complete two semesters of remedial work in one semester (Bautsch, 2011). Kingsborough Community College in New York is successfully training freshmen using learning communities and cohort designs that provide academic and social context integrated into academic achievement (Bautsch, 2011). Cerritos, MiraCosta, Cypress, and Mount San Antonio colleges in California are piloting accelerated and partnership courses to prepare students for successful completion of credit mathematics and English (California Community Colleges Success Network, 2013). The promotion of available student services at these California community colleges is making a difference in streamlining the transition between

remedial and credit bearing courses. The California Community College Success Network provides professional development and networking opportunities to enable college instructors to share ideas and implement training and key preparation components that lead to student success. California Assembly Bill 86 legislation established a framework for regional and district collaboration to develop effective partnerships that enrich the opportunities California basic skills students have to reach educational goals. The results of this study recommend that institutions consider developing partnership endeavors modeled those described in this study

Recommendations

Based on the results of this study in which key components of the partnership components were identified, the following recommendations are offered:

Student Access, Persistence, and Success

It is recommended that there be a consistent effort to design and implement programs that ensure access to credit mathematics using alternative resources, including noncredit resources. The barriers students overcome to achieve in higher education can be decreased with the development of effective instructional and curricular elements, effective training, and building connections to student support services.

Effective Instruction

The implementation of effective curriculum and instruction best practices for basic skills mathematics courses is necessary to achieve student success and persistence. Based on the findings of this study, it is recommended that the curriculum in noncredit basic skills courses incorporate training in cognitive development and study skills into the mathematic curriculum to prepare students for the rigor of credit mathematics courses.

Key Components

The findings of this research support the development of curriculum and training that impact students' competency in basic mathematics by training students in the study skills and student behaviors that prompt a higher quality of effort from students. Noncredit and credit courses should include a balance of pedagogy and training that scaffold students and links them to student services and social connections that increase persistence and success. Training, coaching, and the skills, discipline, and independence students need to achieve in an academic environment are essential components of an effective program. Helping students understand grading systems, implement test strategies, and develop skills in the noncredit course environment prepares students to succeed in the learning environment of credit courses. Training students to synthesize a lecture, read with comprehension, and critically think in courses as they develop stronger attendance and engagement practices impacts successful completion of courses. Coaching students toward self-awareness and in specific individually synthesized skills will strengthen persistence and success. Noncredit institutions

can promote innovative and successful instructional activities through the use of professional development opportunities that incorporate student learning outcomes.

Noncredit as a Resource

This research recommends reliance on data-driven decision-making processes to develop effective academic partnerships. Measurable data should inform decisions regarding the structure, curriculum, and training components of basic skill courses. The findings of this research support the development of systematic assessment processes and a culture of inquiry. Systematic data collection will lead to the more effective development of the multidimensional components of basic skills mathematic instruction.

The construction of a comprehensively designed noncredit to credit partnership includes the development of connections to student support services, campus clubs, social connections, and training. These connections ensure higher levels of persistence and lead to success. This recommendation will require unified effort from all stakeholders. The state of California is acknowledging the importance of noncredit courses through the allocation of funding for career development programs (Bohn, Reyes, & Johnson, 2013). Bohn, Reyes and Johnson (2013) state, "Course completion rates (otherwise known as retention rates) have improved over the past twenty years, with the sharpest increases occurring during the budget crises of the past few years. . . . Retention rates have increased for all types of courses, with students in basic skills courses posting the most impressive long-term gains" (p. 29).

Finney, Perna, and Callan (2014) state, "Helping people get a postsecondary education is a national challenge that will be won or lost primarily at the state level" (p. 14). The state has designed initiatives and funding for community colleges to develop consortia's with local high schools and community programs to develop programs that build connections for students (AB86, 2014). The Student Success Task Force recommendations reflect the concepts of integrating instruction in subject matter with guidance in academic pathways and study skill instruction (SB 1456, 2013). McClenney (2013) puts this responsibility on institutional leadership and believes that local policy impacts student success and completion of certificates and degrees. Tinto and Pusser (2006) state, "A model of policy formation for student success begins by defining the goals for student success in a particular political context and assessing the political dynamic in which those goals are embedded" (p. 31). Ehrenberg and Eisner (2000) share that political accountability allows policies to shape institutions and institutions to shape policies. Unifying the efforts will increase persistence and achievement of basic skills students.

Summary of the Dissertation

The challenge to provide access and effectively serve community college students in California motivates educators to continually review and to use resources that can facilitate student success. This research investigated the noncredit component in one southern California community college district as a resource to facilitate access, persistence, and successful completion of mathematic courses. The research collected quantitative data that demonstrated

basic skills students' persistence and access in credit mathematics from fall 2011 through spring 2012. The study collected qualitative data to understand the key instructional components that prepared students to meet academic challenges with self-awareness, critical thinking, and effective learning strategies. The research demonstrated the impact student services make in assisting students as they overcome obstacles to successful learning.

This study identified key components that prepared and improved the probability of student success in college level courses. Bautsch (2011) reported that, "58% of students who do not require remediation earn a bachelor's degree, compared to only 27% of students enrolled in remedial math" (p. 2). It was the perception of the stakeholders in this study that the preparation of basic skills students for the rigor of credit mathematics is a key component to success. The participants identified other key components for preparation for credit mathematics. These included training in study and test taking strategies, the skill and ability to ask questions in class, the development of critical thinking skills, the ability to problem solve, and the integration of organizational skills into subject matter competency. The findings of the study suggest that student preparation improves persistence and success. It is recommended that training in these areas be incorporated into the curriculum of remedial courses in order to prepare students for the rigor of credit mathematics. Students requested the same partnership design for remedial and entry-level courses in English and reading.

The findings of this research reflect the ideals in current California community college initiatives. The future of California students depends on the

unified effort of educators to construct partnerships to strengthen student access, persistence, and learning success. In addition, the findings of this study align with the findings in previous literature and add to the literature additional insights into the effectiveness of noncredit as a resource for alternative basic skills pathways. The findings of this study support the best practices of California community colleges as they meet the needs of basic skills students and develop courses and programs to increase access, persistence, and success for all students.

This study is a foundation for future research in the area of noncredit alternative pathways. Further research is needed that examines state and national initiatives that are piloting different types of remedial course structures to improve the success rates of remedial students. The findings of this study indicate the development of partnerships lead to stronger connections that result in student persistence and success.

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APPENDIX A

MATHEMATIC COURSE FLOW CHART

	Code	Course Title
Noncredit Credit Course	ABE 125	Math Co Lab (The noncredit/credit partnership course) Meets Basic Mathematics & Pre-Algebra remedial and Basic Skills course requirements (1 & 2 levels below credit entry-level math)
Basic Skills Remedial	MATH 10	Basic Mathematics (2 levels below credit entry-level math)
	MATH 15	Pre-Algebra (1 level below credit entry-level math)
Matriculation Test Level 1	MATH 20	Elementary Algebra (The credit entry-level mathematics course)
Matriculation Test Level 2	MATH 30 MATH 38	Plain Geometry Practical Math for Life
Matriculation Test Level 2	MATH 40	Intermediate Algebra
Matriculation Test Level 1	MATH 41	Combined Algebra I & II (The accelerated course)
Matriculation Test Level 1	MATH 100	Liberal Arts Math
Matriculation Test Level 3	MATH 110	Math for Prospective Teacher
Matriculation Test Level 3	MATH 115	Finite Mathematics
Matriculation Test Level 3	MATH 120	Introduction to Probability and Statistics
Matriculation Test Level 3	MATH 141	College Algebra
Matriculation Test Level 3	MATH 142	Trigonometry
Matriculation Test Level 4	MATH 130 MATH 250	Survey of Calculus Multivariable, Calculus, Linear Algebra, Differential Equations

APPENDIX B

STUDENT SURVEY

Building Connections: A Study of Student Success in Mathematics

17 minutes to impact student success in mathematics

Thank you for choosing to participate in the survey. We appreciate you and the time you will give to help educators understand the resources you, as a student, value in your journey to academic success.

Thank you,
Your time is highly valued and your input respected.

Please color in the appropriate box

I agree to participate in this research study							
Gender	Male		Female				
Age	18-26		27-35		36+		
Ethnicity	American Indian/Alaska Native						
	African American/Black						
	Asian American/Asian						
	Puerto Rican						
	Mexican American/Hispanic						
	Native Hawaiian/Pacific Islander						
	White/Caucasian						
	Other						
Registration Status and Pathway to Credit Mathematics	Began community college as a credit student and completed credit remedial math courses						
	Began community college as a credit student and completed the noncredit remedial math courses						
	Began community college as a noncredit student and completed the noncredit partnership math course.						
	Registered in credit, but completed the noncredit partnership program as a dual enrollment student						
	Began community college as a credit student and was assessed at Math 020 where I currently am						
Student Status Check all that apply	Returned to college after break of 1 year or more						
	Returned to college for job advancement						
	Concurrent enrollment college with high school						
	Concurrent enrollment community college credit and noncredit						
	Attending college after earning high school diploma						
	Attending college after high school certificate of completion						
Highest Mathematics Course in High School	General or Basic Mathematics						
	Consumer Mathematics						
	Pre-Algebra						
	Algebra I						
	Algebra II						

APPENDIX B—STUDENT SURVEY CONTINUED

Building Connections: A Study of Student Success in Mathematics

Highest Mathematics Course in High School continued	Geometry	
	Trigonometry	
	Pre - Calculus	
	Calculus	
Current Mathematics Level	Math 020	
	Math 040	
	Math 041	

Why did you choose your academic pathway?	
Noncredit courses are less expensive	
Noncredit courses are more flexible	
I have been out of school for a while	
I learn better in a lab setting	
The idea that I can attend credit and noncredit at the same time	
I needed to be enrolled in at least 12 units	
I preferred to be a credit student	
I preferred to be a noncredit student	

Please rate your academic preparedness

Question	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Does Not Apply
My college course(s) prepared me for entry-level mathematics						
The academic pathway (credit remedial Math 010 &/or Math 015) prepared me for future academic success						
The academic pathway (noncredit open Math lab) prepared me for future academic success						
Looking back I wish I would have taken a remedial math course						
The student services I received (i.e. orientation, guidance and/or counseling) prepared me for successful completion of entry-level mathematics						
I would recommend the academic pathway I chose to other students						

Cypress College

Building Connections: A Study of Student Success in Mathematics

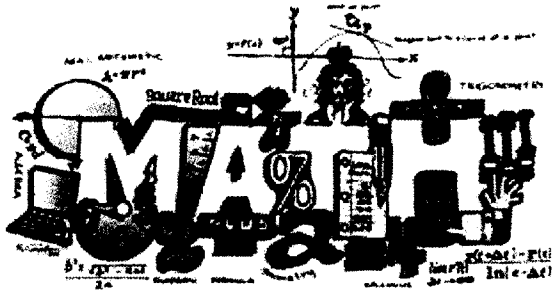
I plan to complete credit entry-level mathematics and achieve an AA degree						
I plan to complete credit entry-level mathematics and achieve a job certificate						
I plan to complete credit entry-level mathematics and transfer to a university						
I learned effective study and time management skills in the remedial courses I completed						

What are the three most important components of your mathematics course pathway that most prepared you for success in entry-level mathematics? (Only three answers, please)		
	Instruction	
	Textbooks	
	Classroom Structure	
	Counselor	
	Tutor	
	Lab Resources	
	Orientation	
	Friends and Family	

Did you take Math 020?	Yes		No	
Why or Why not?				
What advice would you give other students to help them reach academic success in credit mathematics?				
What advice would you give instructors to help them assist students to successfully complete entry level credit mathematics?				
Are there ideas, perspectives or insights you would like to share regarding transferring to entry level credit mathematics?				

APPENDIX C

STUDENT SURVEY INVITATION



17 Minutes to Impact Student Success

You are invited to participate in a survey conducted by Cathryn Neiswender, CSU Fullerton Graduate Student & NOCCCD employee.

Cathryn appreciates you and the time you give to help educators understand the resources you, as a student, value in your journey to academic success.

Thank you.
Your time is highly valued and your input respected.

17 minutes
to impact student success

25-question anonymous survey to share your experiences.

All questions are optional.

Your responses will provide insight into practices and resources that lead to student success in entry-level mathematics.

The anonymous results will be available online two months after the closing date of the survey.

Building Connections: A Study of Student Success in Mathematics

School of Continuing Education

Cypress College

APPENDIX D

SURVEY EMAIL INVITATION

Your perspective is highly valued...
Your ideas will make a difference

My name is Cathryn.
I am a conducting a research project regarding
student success in mathematics.

I believe you have
valuable insights and ideas.

I appreciate the counselors and instructors
that helped me contact you.
I do not know your name or your email address.

You were selected because you registered or
enrolled in Math 010, 015, the Math Co-Lab,
020, 040, 041, or 100.

Please complete a short survey to assist educators
as they support students in the completion
of mathematics courses.

It will not take you long. It is easy to complete.
It doesn't ask your name and is anonymous.

The first question asks for your agreement;

Every other question is voluntary and you can stop
the survey at any point.

Click here to complete the survey:
http://tinyurl.com/kbbfvos

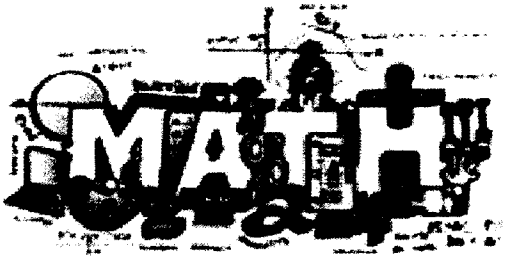
Another opportunity to share your ideas
is a focus group.
We will meet in Room 118 by Parking Lot 4 on
February 12, 2014 from 10-11 a.m. or 3-4 p.m.
Please join us as we discuss successful
completion of mathematics.

Thank you,
Cathryn

Your success is important to us

APPENDIX E

SURVEY FLYER



LET YOUR VOICE BE HEARD

Complete an
Online Student Survey

on math course requirements.

http://goo.gl/ATieR8

All questions are optional.

The survey is anonymous.

It will take no more
than 17 minutes.

Thank you
Your input is valuable

Building Connections:
A Research Study of Student Success in Mathematics conducted by
Cathryn Neiswender, NOCCCD employee

APPENDIX F

FOCUS GROUP PROTOCOL

Bridgeworks Administrative, Instructor, Student Focus Group Protocol

Welcome

Thank you all for joining the Building Connections Faculty Focus Group. I am Cathryn Neiswender a student at CSUF and employee of North Orange County Community College District. Your participation in this focus group will allow us to understand faculty perspectives relating to key components and elements of academic partnerships which enable students to successfully achieve credit college entry-level mathematics.

As with any research there must be a consent form for each participant. I am thankful you have volunteered to participate in this focus group and hope you will be comfortable with signing the consent form. Please be ensured the consent forms will be kept in a locked file cabinet separate from the transcription of the focus group session. No personal information will be included in the dissertation and research records will be kept confidential to the extent allowed by law.

Our topic is...

If noncredit-to-credit academic partnerships facilitate student success in entry-level mathematics.

You were selected because you are a faculty member who participated in a partnership designed to assist students in academic pathways for the successful completion of credit college entry-level mathematics. You were selected because you are a faculty member who teaches a remedial mathematics course, a member of the instructor team which designed the noncredit-credit mathematics partnership course, or an instructor or counselor working with students in accelerated or remedial programs.

Guidelines

All questions are optional and individual responses will remain confidential

There is no right or wrong answer, only differing points of view and perspectives

Every perspective is valued in the planning/implementation of successful partnership programs.

The focus group session will be recorded.
Please use first names to address another person.
Please speak one at a time and respectfully listen as others share their perspectives
Please feel free to disagree with others and share your personal point of view
Please turn off your phones or pagers. If you cannot and if you must respond to a call please do so as quietly as possible and rejoin us as quickly as you can.

My role as moderator will be to guide the discussion and listen. It is a privilege to provide opportunity for each of you to share your perspectives. I encourage everyone to talk with each other as team members focused on student success in higher education mathematics.

If you do not feel comfortable with a question you are not obligated to share a response.

Participants may decide to not participate in the focus group at any time during the session.

Bridgeworks Administrative, Instructor, Student Focus Group Protocol

Opening Question

What preparation and skills do students need to achieve successful completion of credit college entry-level mathematics to advance in academics, job or career? (7 minutes)
What was your original goal when you registered to attend community college? Is it still your goal? If it changed - why?

What is one word that describes your academic history – pathway – achievement before registering to attend Cypress or SCE?

Follow-up Questions
What obstacles do you perceive limit students from achieving academic goals and dreams? (7 minutes)

What key components are necessary in remedial, developmental or partnership courses to prepare students for successful completion of credit college entry-level mathematics courses? (7 minutes)
What key components are necessary in a noncredit to credit partnership which is remedial, developmental or basic skills in nature that will effectively prepare students for successful transition to and completion of credit college entry-level mathematics courses? (10 minutes)
What are three skills or competencies you believe students must know to achieve successful completion of credit college entry-level mathematics and then advance in college or a job? (7 minutes)

Did you receive instruction in those areas in the courses you completed? Did you feel ready to achieve success in credit entry-level mathematics courses? (7 minutes)

Which of those components best prepared your students and helped your students successfully complete the credit college entry-level mathematics course? (7 minutes)

What led you to choose the courses you completed or are in the process of completing? Did the Math Co-Lab meet your needs and prepare you for success in credit mathematics? (7 minutes)
What is important to understand about the noncredit dynamics of the partnership? (7 minutes)

What instructional, curricular, support or service did you incorporate to ensure higher levels of student success? (10 minutes)

Rigor in the noncredit courses has been voiced as an area for improvement? What do you consider elements of rigor that need to be incorporated in noncredit transfer courses?

What areas of student support, curricular design or instructional skill will you incorporate for the next cohort of students? (3 minutes)
What student support services did you use that made a difference in your successful completion of credit college entry-level mathematics? (5 minutes)

How have your instructional strategies changed since the launch of the partnership? What results have you observed from these changes?

Bridgeworks Administrative, Instructor, Student Focus Group Protocol

How have your strategies changed since the launch of the partnership? What results have you observed from these changes?

What areas did you feel did not effectively prepare students? (5 minutes)

What student support services did you use that made a difference in your successful completion of credit college entry-level mathematics? (5 minutes) If a prompt is needed - tutoring, counseling, academic advising, etc.-

Have you progressed toward your goal as you hoped and find yourself with new goals to complete your degree, advance in your job, or? (7 minutes) possible follow-up – have you enrolled in courses to help you reach those goals?

What courses did you take while you were completing your math courses?

What advice or insight would you want to share with future students? (5 minutes)

Are there concepts, insights, perspectives we did not discuss today you feel are vital to understanding how a noncredit to credit partnership increases student access to higher education, strengthens persistence and subject competency and lowers the impact of achievement gaps related to credit entry-level community college mathematics? (5 minutes)

Thank you

Thank you so much for participating today. I will transcribe our session remembering my promise to keep responses with confidentiality. Your consent forms will be kept in a locked cabinet separate from the transcription of our session. I appreciate the time and valuable insight and perspectives you have shared. I wish each of you future success.

(Timing is approximate and may need adjustment)

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