EFFECTIVENESS OF CONTEXTUAL APPROACHES TO DEVELOPMENTAL MATH IN CALIFORNIA COMMUNITY COLLEGES

by

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DEDICATION

This dissertation is dedicated to Doctor James Meznek in honor of his tireless work in improving community college education. His encouragement for me to reach for higher goals throughout my career has enriched my life through education and the relationships it made possible.

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EFFECTIVENESS OF CONTEXTUAL APPROACHES TO DEVELOPMENTAL MATH IN CALIFORNIA COMMUNITY COLLEGES

Abstract

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The purpose of this research was to document the types of contextual approaches used in developmental education in the California community colleges and compare the effectiveness of those contextual courses to standard basic skills courses. The study used a mixed method design to identify colleges and courses using basic skills math instruction in the context of an occupational program. Survey respondents reporting contextual basic skills math courses provided course materials as evidence of contextualization and the basic skills math level. Logistic regressions were used to analyze student level data from the California community college system office database for contextual and non-contextual basic skills math courses identified at 34 of the responding semester colleges.

Contextualization of pre-algebra mathematics was shown to increase the likelihood of successful remediation, accelerated entry into college-level coursework, and success in college-level and transferrable coursework for students in the California community colleges. The increased likelihood of success in college-level courses for

students in the contextualized instruction group was evident in both the initial semester when the math course was taken and the subsequent semester. Contextual math instruction was found to be most effective for Black, Hispanic, and Other Non-White students. While there was no significant difference for White students, Asian students were more likely to pass standard basic skills math courses than they were contextual math courses.

The research also documents the scarcity of this effective format of remediation in the California community colleges. The research suggests that recent policy changes may be contributing to this scarcity. Policies and practices to direct students into standard math sequences that meet transfer course prerequisites are not only increasing the scarcity of these types of innovative ways to provide engaging remedial coursework but are moving students into remediation that almost guarantees limited success at the community college.

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CHAPTER I.

INTRODUCTION

The United States is experiencing unprecedented demographic, economic, political, and societal changes. Demand for workers with higher order information skills who can reason through complex processes in jobs requiring some postsecondary education has shifted from 20% in the 1950s to what some estimate as high as 80% at the turn of the 21st century (McCabe, 2000). Additionally, federal and state governments and institutions implemented policies promoting equal opportunity in education. As policies provided for expanded access, the student population became "increasingly diverse in every way: more students of color, more English language learners, more first-generation college students, more adult students, more students from low-income families" (Boswell & Wilson, 2004, p. 8).

With a college education becoming an imperative for economic and social success (Bailey & Morest, 2006; Mumper, 2003), colleges and universities in the U.S. are experiencing increased demand for higher education (McCabe, 2000; Roueche & Roueche, 1999). However, with that increased demand, greater numbers of students unprepared for college-level work have been flowing into higher education. Although some national figures suggest that only 29% of entering college students and 41% of entering community college (CC) students are unprepared for college-level work (Boylan & Bonham, 2007; Merisotis & Phipps, 2000; Oudenhoven, 2002; Phipps, 1998), others estimate percentages as high as 90% entering CCs need some remediation (Bailey &

Morest, 2006; Spann, 2000) and many are entering with no more than sixth-grade level skills in reading, writing, or mathematics (Tinto, 1998). Policies being implemented across the nation are redirecting the under-prepared away from four-year colleges into the CCs to address concerns about the perceived high costs of remediation in four-year institutions (Merisotis & Phipps, 2000; Oudenhoven, 2002; Phipps, 1998). While open access is at the heart of what community colleges are about, the increased demand for remediation challenges community college systems to retain and educate this growing under-prepared student population.

Community colleges have begun to identify and implement effective developmental education practices in areas such as (1) assessment and placement, (2) curriculum design and delivery, (3) support services, and (4) evaluation of those practices. Some of the evolving practices to address these four areas at community colleges involve multiple strategies. Some of the evolving practices in areas of assessment and placement are the use of valid multiple measures for effective assessment and placement, alignment of assessment tests to course content and course task requirements, and content-specific testing that measure both (1) knowledge and skill deficiencies and (2) extent of those deficiencies. For curriculum design and delivery, strategies include integrated academic and occupational curriculum and pedagogy, constructivist pedagogy, learning communities, packaged courses, paired courses, supplemental instruction sometimes paired with accelerated learning groups. Standard practices are also evolving with more effective ways to provide tutoring, learning laboratories, technology, and counseling and academic advising. Evaluation strategies

include assessment of student learning outcomes and classroom assessment techniques and research to identify effective basic skills placement and practices.

Although the evolution of developmental education has reached a point where efficient yet effective practices are emerging and the literature on developmental education research is beginning to highlight better ways to serve students in need of developmental instruction and services (Bailey & Morest, 2006; Boylan, 1999; Center for Student Success [CSS], 2007), research also suggests that effective developmental education practices are not predominant in community colleges (Bailey & Morest, 2006; Boylan & Saxon, 1999; Grubb & Associates, 1999). While mandatory assessment and placement in remedial education for low scoring students is common practice across institutions, there is little agreement on who a remedial student is, what remediation is, or even what college-level work is (Perin, 2006). And, although the benefits of effectively designed developmental education are well documented in the literature, too many remedial students never successfully transition into college-level work (Perin, 2001a, 2001b). The passive learning, abstract and unconnected content, and skills and drills methods of instruction used by many community colleges, that did not work for these students in high school, often alienate, frustrate, and bore students to the point where they see no reason to continue their educational pursuits in higher education (Bailey & Morest, 2006; Grubb & Associates, 1999; Perin, 2001b, 2006).

The Problem

Certain forms of developmental education such as linked courses and hybrid (i.e., fully integrated) courses, where foundational academic skills are studied in context and applied academic learning occurs, have been identified as practices that students find

engaging (Grubb & Associates, 1999). And, limited research cites these student engaging practices as more effective for certain populations (Bailey & Morest, 2006; CSS, 2007). Perin and Charron in their chapter "Lights just click on every day" (Bailey & Morest, 2006, chap. 7) argue that most existing research either lacks the specificity required to be replicated or addresses populations or practices that do not inform community colleges generally. Grubb (2001) calls these types of research the "black box" evaluation. He proposes that to inform community college practitioners we need to look at the different aspects of developmental education such as instructional methods and the way students are assigned to remedial programs and how those impact the progress of students. He argues that we need to find the reasons programs are effective or ineffective.

The problem this study addresses is whether innovative practices such as, contextually based linked and hybrid basic skills and developmental education courses, that are consistently cited as more engaging to students, do indeed provide for better retention and persistence than standard basic skills instruction. Additionally the study will examine whether the contextualized courses are more effective in moving students into mainstream credit level study and provide them with sufficient skills to succeed in subsequent courses in California community colleges. The study will begin to unravel how different models of contextualization and linking of content and skill building impact student success. The study will also identify criteria to measure the effectiveness of basic skills and developmental education courses taught where vocational, career, or academic content has been integrated through a linked or a fully integrated hybrid model.

The Purpose

The purpose of this study is to examine the extent and effectiveness of using contextualized formats for delivering basic skills instruction, where academic skills are integrated into content areas, in California Community Colleges (CCC).

Significance

California policymakers have expressed an intent to provide $33 million in ongoing funds to increase the effectiveness of basic skills instruction in California's community colleges. The funds were distributed in 2006 and although the ongoing funds were removed from the January 2007 budget, those funds were restored in the May revision. The CCC system office, also known as the Chancellor's Office, which represents the system of two year public colleges in California, was encouraged to request an increase of the funds to $60 million for 2008. In preparation for the release of those funds, the state of California has invested $750,000 with the system office to examine effective practices in basic skills organization and instructional practice. The system office contracted with the Center for Student Success to develop workshops and accompanying materials to help colleges plan to increase the capacity and effectiveness of basic skills instruction. Planning workshops were completed by fall of 2007.

The Chancellor's Office recently released the research on effective organization and instructional practices in basic skills developed by the Center for Student Success (CSS). In the literature review of the paper (CSS, 2007), both contextual learning and learning communities are mentioned briefly in the paper. However, both instructional practices were identified as areas needing more research documenting effectiveness of the instructional methods. This study responds to that call for more research and

provides timely information on selecting effective practices that will affect student success. This research will help both basic skills practitioners and college administrators effectively use the dollars the state is providing to enhance basic skills and developmental education and expand those practices found to be effective in increasing student learning and retention.

Research Questions

This study will seek to answer the following research questions:

1. What is the extent of implementation of the various forms of contextualized developmental education courses in California community colleges?
2. How does the effectiveness of these forms of contextualized instruction compare to stand alone developmental education programs in terms of student retention, progress, and persistence?
3. Are these forms of contextualized instruction more or less effective for specific populations within the community colleges? .

Definitions

A number of terms will be used in this study that will require specific definitions. Although the terms may appear to be commonly used, their definitions are specific within the context of the study. The definitions have been grouped into four areas of: general terms, instructional practices, student characteristics, and student success measures.

General Terms

Remedial and Developmental education--To understand the issues involved in preparing students for college level work in postsecondary institutions, it is helpful to illuminate the difference in terminology and philosophy between remedial and

developmental education. [1] While remediation suggests efforts to address individual skill deficiencies sufficiently for eligibility to enter a course or program (Roueche & Hurlburt, 1968) often covering instruction that has or should have been provided in the past (Grubb & Associates, 1999), developmental education is often described as more complex and organized efforts to develop the cognitive and affective talents of the student. Developmental education includes non-cognitive factors beyond academic performance such as locus of control, attitudes toward learning, self-concept, and ability to seek help, etc. and may even be without reference to eligibility for enrollment. Higbee, Arendale, and Lundell (Kozeracki, 2005, chap. 1) add that developmental education, unlike remedial education that focuses on deficiencies, focuses and builds on students strengths. Boylan, Bonham, and White (1999) argue that remedial courses are at one end of the spectrum of services and instruction within developmental education. Boylan and Bonham (2007) add that developmental education frequently offers skills not typically offered in high school but that are required for success in college such as study skills, learning strategies, and critical-thinking. Examples of course titles in these type of developmental courses might be "study skills and strategies, freshman seminar, student success, or critical-thinking" (p. 2). Although educators, researchers, and policymakers often use the two terms interchangeably, this research will use the terms as just defined.

Research based benchmarking--Although there are different forms of benchmarking used in higher education, Dowd (2005) identifies three forms of particular interest to community colleges: performance, diagnostic, and process benchmarking.

[1] Grubb and Associates (1999) identify three terms used in the literature that include "remedial," "developmental," and "basic" education that have different histories and philosophies. In the California Community Colleges the term "Basic Skills" is commonly used. A number of other terms are also used in the literature such as "preparatory," "pre-college," and "pre-collegiate."

Performance benchmarking is a straightforward and often superficial comparison of performance indicators typical of federal and state accountability systems using states or institutions within or across states as benchmarks. Much of the hostility towards performance benchmarking in accountability systems results from a lack of consideration of input factors such as differences in student preparation, motivation, and aspirations or process indicators reflecting resources. Diagnostic benchmarking adds identifying areas that need improvement and applies educational research and theory as a framework to examine and understand student outcome data. Diagnostic benchmarking often uses surveys of student attitudes and behavior and campus climate.

Benchmarks used for comparison in diagnostic and process benchmarking often include: 1) national norms, 2) peer institutions, and 3) college priorities and practices that align with institutional missions. Process benchmarking is often more complex and expensive and "involves an in-depth comparative examination of a specific core practice" (Dowd, 2005, p. 3). Dowd identifies three significant features of this last type of benchmarking: (a) outcomes, (b) treatment conditions, and (c) teaching strategies used. Process benchmarking is closely aligned with the assessment initiative and provides administrators and faculty with ways to evaluate various teaching methods and student services. She also notes that developing a culture of inquiry that uses benchmarking will require ongoing professional development and increased dialog about the barriers students face. Recent pressures from the Federal government through educational legislation[2] to evaluate and improve education using *Rigorous Evidence* and *Scientifically Based Research* may be one of the influencing factors to move from performance

[2] Federal legislation includes the Elementary and Secondary Education Act, now known as No Child Left Behind; the Higher Education Act; and the Carl D. Perkins Vocational and Technical Education Act, now known as the Career and Technical Education Improvement Act.

benchmarking toward process benchmarking. Dowd notes that as faculty and administrators become involved in in-depth analysis and inquiry of student outcomes important to them, they often become change agents and facilitate change across their campuses.

Additionally, other forms of benchmarking are being used to improve educational programs. The regional accrediting commissions, such as the Accrediting Commission for Community and Junior Colleges of the Western Association of Schools and Colleges (WASC), have revised accreditation standards based on requirements in the Higher Education Act for assessing and reporting student learning outcomes. Pressures on colleges from WASC to integrate the assessment of student learning outcomes into the planning and budgeting process provides another opportunity to use research based benchmarking as a vehicle for making improvements in education and may provide additional impetus to define, assess, evaluate, and improve student learning and student learning outcomes (Grubb & Badway, 2005).

Instructional Practices

Contextualized curriculum--Contextualized curriculum delivers reading, writing, English language, math, or critical thinking skills in the context of a content course (Grubb & Krouskouskas, 1992; Perin, 2001). Integrated instruction, bringing together academic and content curricula, facilitates the contextualization of academic skills. Contextualized curricula help students link content and skills from different areas. It demonstrates those connections and shows relationships between academic skills and occupational or academic content for students rather than leaving it to the students to figure out on their own. Applied academic courses are the most prevalent model.

Typical titles of these types of courses advertise their focus to application of the academic area such as technical math and business English. Although contextualization of academic skills is not limited to occupational education, this study will focus on contextualization through academic-occupational integration.

Hybrid courses--Hybrid courses in this study will indicate fully integrated contextualized instruction within a single course where basic skills and content are integrated within the curriculum delivered and have equal emphasis (Grubb & Krouskouskas, 1992; Perin, 2001).

Infused occupational courses--Another form of contextualized curriculum is where occupational courses are infused with academic skill building modules (Grubb & Krouskouskas, 1992). The primary focus of the course remains occupational but academic skills such as writing and math are included in the curriculum.

Linked courses – Linked, tandem, or paired courses are those courses that have aligned curricula (Grubb & Krouskouskas, 1992) developed through collaborative efforts of faculty from different content areas transfers the "burden of integration" (p. 34) from the student to the faculty. For the purposes of this study, linked courses examined will be those that link basic skills instruction to occupational content. Linked courses would include (a) courses linking content, practice, and assignments; (b) courses that are linked based on the use of the content course in examples for the basic skills instruction and have curriculum designed to support instruction in each of the linked courses; and (c) courses that are linked based only on the use of the content course examples for the basic skills instruction.

Learning communities--Although there are many types of learning communities with various levels of curricula integration (Lenning & Ebbers, 1999), the study will look at student learning communities defined as "curricular cohort learning communities" (p. 23). Learning communities, also known as course clusters, are cohort based and typically include three or more linked courses with aligned curricula (Perin, 2001) although Tinto (2000) describes numerous combinations including multiple subjects in a single-six hour course, linked courses, cluster courses, and coordinated courses. Common elements of learning communities usually include co-registration, *shared knowledge* where there is a shared coherent curricular experience, *shared knowing* where students construct knowledge together, and *shared responsibility* where students are responsible to each other and each student must contribute to the learning of the group. Learning communities typically promote social integration that increases the ties of the student to the campus community (Tinto, 1998) and are often designed to meet the needs of beginning students and developmental education students.

Student Characteristics

Economically disadvantaged status--Students identified as receiving need-based financial aid will be considered economically disadvantaged. For the California community colleges, students with household incomes at or below 150% of poverty qualify for registration fee waivers through the Board of Governor's Grant (California Code of Regulations, Title 5 section 58620).

English as a second language status--Students who enroll in at least one English as a second language (ESL) course during their academic career will be considered an English as a second language student (CCC, 2000a). Students enrolling in an ESL course

at one college will be considered ESL if found at any other college as concurrently or subsequently enrolled.

Full or part time status--For the purposes of this study, students will be considered fulltime only if they attempt twelve or more credit hours in each primary term (e.g., fall or spring) during their entire enrollment period at the college. Students attempting less than twelve credit hours in any primary term will be considered part time.

Vocationally oriented status--Courses within the California community colleges are coded based on their position within occupational programs. Students enrolling in at least one course above the introductory level that are coded as clearly or advanced occupational will be considered vocationally oriented (California Community Colleges [CCC], 1984).

Student Success Measures

Persistence-to-completion--Student persistence to program completion will include those students who either complete the requirements for a transfer program, attain a certificate or degree, or transfer to a four-year university. Additionally, credit units accumulated will be examined as an indicator of persistence.

Progress--Progress will have two measures that cover both subsequent semester enrollment and successful course completion in subsequent semester course enrollments. Many high-risk students stop-in and stop-out frequently. Bandura (1997) describes how as students gain self-efficacy and believe they can succeed, they will not only be more likely to succeed in the current term but will be more likely to re-enroll in or "persist" to the subsequent term. Term to term persistence is measured by evaluating the relationship of terms attempted to the number of terms where the student enrolled in the adjacent

semesters. Additionally, success during the subsequent semester within the same discipline area provides an indicator of adequate preparation (Perin, 2006).

Successful course completion--Although the community college system in California uses a number of definitions for successful course completion, this study will use the definition where students who earn a grade of A, B, C, CR (credit), or D as described in the *California Community Colleges Management Information System Data element dictionary* (2000) will be considered successful course completers (Bahr, 2008; CCC, 2000b).

CHAPTER II.

LITERATURE REVIEW

Educators in colleges and universities across the nation face substantial groups of students unprepared for college-level work and yet innovative, effective, and efficient efforts to meet the needs of those students were often found only in isolated pockets of institutions (Badway & Grubb, 1997; Grubb & Associates, 1999). The evolution of developmental education and the growing body of rigorous research over the past half century has identified many effective solutions to the problems developmental educators face. This study examines whether the California community colleges have implemented any of those effective solutions identified by research and whether those implementations were effective for the students of the community college system. This chapter first provides the case for research based decision-making and suggests the need to make effective use of limited resources in meeting the needs of the under-prepared students coming into higher education. A description of how the needs of the workforce and the labor market are changing the needs of students coming to community colleges follows that brief introduction. The chapter then describes the current responses of educational institutions to that changing need. Finally, the literature on effective developmental education practices is presented to make the case for the need to for this study and prepare the reader for the details of the study that follow in subsequent chapters.

Educators and policymakers have difficult choices ahead: the impact of those choices will determine our nation's future. Whether those choices are driven by research

based information that can inform change to improve outcomes, and how they could be, or whether they will continue and expand current practices based on costs alone will be discussed in this chapter. Educators and policymakers must not only be decision-makers but must become agents of change if they are to be able to meet the changing demands of the nation.

The nation faces increasing demands for highly skilled workers in an increasingly complex and global economy (Gray & Herr, 2006). Although policymakers have long recognized that to meet this need we must commit to fully developing the talents of all our citizens, recent studies estimate that more than 25% of U.S. workforce is functionally illiterate unable to perform such simple tasks as filling out a form, reading a bus schedule, or making change for small purchases (Roueche & Roueche, 1999). The task of raising the competencies of the nation's workforce falls on the educational system and with estimates of labor market demand suggesting that up to 80% of jobs require some postsecondary education, however, the education system has been unable to meet the educational demands (McCabe, 2000). Colleges and universities in the United States have experienced increased demand for higher education and along with it greater numbers of students unprepared for college-level work (McCabe, 2000; McCabe & Day, 1998; Roueche & Roueche, 1999). Those students coming unprepared to postsecondary education often lack not only the reading, writing, and math skills necessary for success in college level work but they also lack the foundational skills required to learn them (Grubb & Associates, 1999; Perin, 2006).

Although the need to develop the skills of entering college students has existed since the seventeenth century (Arendale, 2004), recent shifts in labor market demand

place pressures on education systems to develop those skills more effectively. The shift in demand from 80% of workers who can simply complete discrete steps of larger processes, often learned in high school, to 80% of workers who have the ability to reason through complex processes, one of the objectives of postsecondary education. This increased demand for workers with higher levels of technical skills and the ability to adjust processes based on current situations increases the demand four critical thinking skills (Gray & Herr, 2006; McCabe, 2000).

This shift to demand for workers who can apply critical thinking skills will require that we not only continue to increase access to postsecondary education but that we become more effective and efficient in developing the skills of those students that come under-prepared (McCabe, 2000). However, recent studies of remedial and developmental education practice paint a dismal picture for the future of many of those who enter higher education unprepared (Attewell, Lavin, Domina, & Levey, 2006; Bahr, 2008; Grubb & Associates, 1999; McCabe, 2000; McCabe & Day, 1998; Roueche & Roueche, 1999).

That and other research (Stansbury, 2001; Tinto, 1998) has identified, however, policies and practices in a number of colleges and universities across the nation that are effectively moving developmental students into college level work and rewarding employment. Some of that same research questions why, with such substantial amounts of effective remedial education practice identified and often observable even on their own campuses, has the educational community failed to use these research based solutions and practices for revision of ineffective remedial programs and services. The perfect storm of increasing demand for developmental education and services, changing labor markets,

and constricting fiscal support mandate that educators and policymakers no longer ignore either developmental education or research that can improve its effectiveness.

In the next section a brief description of the rapid evolution of the labor market that resulted in demands for increased proportions of workers with higher order information skills will be illuminated against a backdrop of rapidly changing demographics of the nation as well as the economic, political, and societal changes that impact the educational system. With this as a foundation, subsequent sections will identify: first, how the educational system has responded to the developmental needs of students; second, how we might improve those responses by using research based benchmarks of promising practice and ongoing assessment, evaluation, and research to improve success in moving students into college level work; and third, what policies and promising practices could be implemented that would result in systemic change to help colleges increase their capacity to meet the demands of students, educators, the economy, and society.

The Changing Nation

The increased demand for higher education, along with the greater numbers of under-prepared students flowing into higher education, is due to a number of forces (McCabe, 2000; Roueche & Roueche, 1999). Those forces pushing for increased numbers of highly skilled workers coming out of educational institutions rise from demographic, economic, political, and societal changes that are unprecedented in the history of the United States. The student population is becoming "increasingly diverse in every way: more students of color, more English language learners, more first-generation college students, more adult students, more students from low-income families" (Boswell

& Wilson, 2004, p. 8). While the nation faces increasing demands for highly skilled workers to meet the demands of an increasingly complex and global economy, the educational system, designated to prepare that workforce, has been unable to keep up with the demand in the face of these changes (McCabe, 2000).

In the second half of the twentieth century, concerns over both equality and the continual increases in the complexity of work since World War II prompted policymakers to fund dramatic increases in access to higher education (Boswell & Wilson, 2004; McCabe & Day, 1998). During the 1960's, the U.S. spent more on constructing institutions of higher education than it had in the previous history of the nation (Mumper, 2003). Policies implemented at federal, state, and institutional levels promoted ideas of universal access and equal opportunity in education and in society at large with the civil rights movement and related social policies such as desegregation and then affirmative action. As access to higher education was broadened to include students from lower income families, the need for remedial education to make up for the substandard primary and secondary schools they attended began to grow leading institutions to develop remedial programs meeting that need (McCabe & Day, 1998; Mumper, 2003).

Some critics of remedial education suggest that the students needing remediation are responsible for their academic deficits and argue that those students had their chance in elementary and secondary school to learn the skills necessary for success in higher education (Oudenhoven, 2002). However, recent research suggests that in the two-tiered system of K-12 that persists in the U.S., many low income students were never offered the chance to learn them (Carroll, Fulton, Abercrombie, & Yoon, 2004). Unlike the teaching and learning environments in schools available to most affluent families, low-

income students are often faced with substandard K-12 schools that inhibit learning in deplorable conditions that promote teacher and student dropouts. Additionally, Boylan et al. (1999) make the point that their research showed that only 43% of American high school graduates took college preparatory courses yet 62% went on to college. The 19% of high school graduates who attended college without taking college preparatory courses does not account for the many adult learners have been out of school for 10 or 20 years. The remediation offered in higher education may be the first time the students have encountered the material.

Even with these critical differences in preparation still in existence in the early 21st century, there is evidence that today's students learn more in high school than did the students in their parents' generation. In "Crossing the Divide," Carnevale and Fry (2000) point out that seventeen-year-old students in 1996 scored over six points higher than did students in 1971 on the National Assessment of Educational Progress. Educational programs that trained for occupations in the nineteen-sixties and early seventies, however, must now teach the complex skills needed in the 21st century in the same occupations. And, because of the increasing complexity of work, jobs in those occupations now require some postsecondary education at a minimum. Additionally, as job skill requirements change, currently employed workers, often after many years out of school, turn to college to get more training just to keep those jobs (Gray & Herr, 2006; Sanchez, Laanan, & Wiseley, 1999). The 2004 report "Crisis at the Core" (ACT), however, reports that only 22% of 1.2 million students tested in 2004 met all three College Readiness Benchmarks and under-represented minorities were one and a half times more likely to fall below the benchmarks than the total population.

With Carnevale and Fry's (2000) estimate that minority undergraduate enrollments in postsecondary institutions are expected to grow to 80% of new students by 2015, we can expect the growth in under-prepared students to continue in California. A survey of placement test results in California community colleges (CSS, 2005) indicates that 70% of California community college students were placed in remedial level mathematics and 42% were placed in remedial level English. The most recent (Fall 2006) results of the California State University's (2006) Early Assessment Program indicate that even students eligible for the California State University, the top 30% of high school graduates, are in need of remediation as only 62.5% of entering freshman were proficient in mathematics and 54.7% were proficient in English.

While there is some consensus about the growing need for developmental education, there is little consensus on who should provide it. Recent shifts in social policies have begun to undue the social policies of the 1960s that advanced equal opportunity in higher education (Bastedo & Gumport, 2003; Malveaux, 2003; Mumper, 2003). Beginning with the 1996 Hopwood case in Texas, where the courts ruled that the University of Texas Law School could not use race conscious admissions policies to achieve a diverse student body, the federal courts and then the states have forced institutions to implement race-blind admissions policies (Mumper, 2003). Additionally, four-year institutions are increasingly deferring students who lack any one of the skills to do college level work, too often low income minorities from substandard secondary schools, to community college (Mumper, 2003). A number of states have now banned remedial education at four-year institutions as others increase pressure to do so (Perin, 2006).

In 1981, the Reagan administration began an effort to reduce federal spending on social programs proposing large cuts in Pell grants and guaranteed loan programs (Mumper, 2003). Although unsuccessful, the administration was able to slow the growth of the programs and restore the cap on eligibility for loan programs. Federal funds once used for grants were held static and new funds flowed to meet the increasing demand for student loans. This was only the beginning of the shift of financial support, and the access it provided, from the neediest to middle and upper-middle income students. As tuitions continued their rapid rise through the mid-nineties and high student debt began accumulating, policy-makers instituted tax credits to help relieve the increasing debt burden. Although tax credits may have helped relieve the financial burden for middle-income students, low-income students received little benefit as they could no longer afford the higher tuitions without grants and already had little or no tax liability. As the purchasing power of grants eroded, low-income students were forced to attend lower cost institutions such as community colleges even though they may have qualified to attend the more selective institutions.

Although most four-year colleges are open access institutions, open access is at the heart of what community colleges are about (Phelan, 2000). The dilemma that community colleges face over access and success challenges the essence of the democratic tradition of the community colleges (Perin, 2006). While increasing numbers of students unprepared for college level work come to the doors of community colleges (Perin & Charron, 2003; McCabe, 2000), the question arises of whether students who need remediation can compete with those who are deferred for small amounts of remediation. Moreover, those who qualify at more selective institutions but select lower

cost community colleges over higher cost four-year schools put additional pressure on the funds available for developmental education. Low income students, often minorities from low income neighborhoods with substandard schools, who come to the doors of community colleges unprepared for college work are increasingly finding the door shut as the more prepared navigate the education system and take the critically constricted available slots (Boswell & Wilson, 2004; Mumper, 2003). Grubb, Badway, and Bell (2003) and others researching community colleges (Brint, 2003; Perin & Charron, 2003) argue that in fact community colleges really serve students from the economic and academic middle. With rising pressures on state budgets, state governments are increasingly encouraging university eligible students to begin their studies at a community college due to their lower cost to the state. Yet, universities in states that have abandoned affirmative action depend on community college transfers to maintain diversity their institutions (Dougherty & Kienzl, 2006).

Malveaux (2003) suggests that there has also been a shift in public perception about the benefits of higher education from one of public good that adds value to society to private benefits of individuals through increased earnings. With this declining acknowledgement of education's public benefit comes a reticence of public investment. The social benefits of increasing diversity on our campuses are being dampened as mainstream support for higher education decreases. In a time when knowledge has become a determining factor in wealth of nations amid increasing constraints on both immigration of highly skilled workers and higher education funding, some suggest that the U.S. may lose the ability to compete in a global economy(Bastedo, & Gumport, 2003; Carnevale & Fry, 2000; Carroll, Fulton, Abercrombie, & Yoon, 2004; McCabe, 2000;

Malveaux, 2003). And, they argue, if current trends continue the U.S. may become a two-tiered country with a permanent underclass.

The rising enrollment demands amid declining state revenues that result in reduced or static public investments in higher education "jeopardize the democratic traditions upon which community colleges were founded" (Phelan, 2000, p. 1). Both the state and institutions of higher education face difficult policy choices that place open access and student success at the center of the policy addressing the availability of quality developmental education and higher education generally. Those policy decisions have a clear impact on the life choices of students affected by limited access to developmental education. And, as increasing numbers of under-represented ethnic groups and lower SES students are tested into constricted numbers of remedial courses, concerns over the effectiveness of developmental education, as well as concerns over social justice and social stratification that will impact the society, are increasing the complexity and importance of those policy decisions (Boswell & Wilson, 2004; Dougherty & Kienzl, 2006; Mumper, 2003; Perin & Charron, 2003; Phelan, 2000; Spann, 2000).

The evolution of developmental education has reached a point where effective practices are emerging and the growing body of research is beginning to document better ways to serve students in need of these evolutionary changes and innovations in pedagogy and services (McCabe & Day, 1998). Nevertheless, because developmental education is often seen as a solution to the specific problem of dealing with under-prepared students, few regard it as valuable often including students, instructors, and policymakers (Grubb & Associates, 1999; McCabe, 2000). With this second-class status and limited funding priority, educators tend to "continue practices that are old,

inexpensive, and easy to administer" (McCabe, 2000, p. 44). The pressure to expand developmental activities without providing proportionate funding simply results in expanded class sizes, more lecturing, less writing, and increased use of part-time instructors (Grubb & Associates, 1999).

Boylan and Bonham (2007) recently noted encouraging signs with a number of states beginning to recognize the need and benefit of developmental education. Developmental education initiatives in Texas, Kentucky, and California have provided evidence that states are no longer ignoring or eliminating developmental education. Along with recognizing the importance of developmental education however, states are asking colleges to be efficient and effective in its delivery. California recently invested $33 million in an effort to improve and expand developmental education. The governor and legislature have provided intent to continue the funding annually but state budget difficulties put these funds at risk. Whether efforts to expand effective practices identified by the research can continue in this economic and political environment will depend on the hard decisions being made by state policymakers and educators in community colleges as budgets become increasingly constricted.

Policymakers continue to legislate increased accountability to motivate educators to be more efficient. Pressures of external accountability on educational institutions to make students outcomes data public, intended to motivate colleges to increase productivity, are often treated with superficial responses and hostility (Dowd, 2005; Grubb & Badway, 2005). Efforts over the last decade by regional accrediting commissions to integrate the assessment of student learning into the planning process, if embraced by college administrators and faculty, hold promise for developing a culture of

inquiry that might apply effective practice identified by research to improve the learning outcomes of developmental students. As will be seen in the next section, however, colleges responding to this increased need, while balancing access, student success, and standards, are often driven by concerns over financial and human resources rather than effective educational practice (Grubb & Associates, 1999; Perin, 2006).

Responding to the Need for Developmental Education

This section will first describe how the educational system has responded to the developmental needs of students. Due to the increasing trends for developmental education to be the purview of community colleges, this section will focus the discussion predominantly on community college developmental education. Second, a discussion of how the effectiveness of remedial and developmental education can be improved by using system, institutional, and faculty research identifying promising practice and how it can be used as a process of benchmarking to improve the movement of students into college level work will be provided. Lastly, a discussion of policies and practices that might result in systemic change that could help colleges meet the demands of students, educators, the economy, and society are presented.

Developmental Education

The need to develop students' skills to prepare them for the rigor of college-level work has been documented as early as the seventeenth century at Harvard where tutors were provided to strengthen under-prepared students studying Greek and Latin (Arendale, 2004; Merisotis & Phipps, 2000; Phipps, 1998). As early as 1750, educators at Yale University recognized the need to develop student's skills in areas that were below average in reading, writing, and arithmetic to prepare them for college level work.

Even in the homogeneous group of students attending universities at the end of the nineteenth century, more than 40% of first time students participated in pre-collegiate programs and in the beginning of the twentieth century, it is reported that "over half of the students enrolled in Harvard, Princeton, Yale, and Columbia did not meet entrance requirements and were placed in remedial courses" (Merisotis & Phipps, 2000, p. 69).

During the period of dramatic increases in access and diversity that the community colleges provided in the last half century, increasing numbers of students came under-prepared in one or more of the basic reading, writing, and mathematics skills areas. Colleges responded by placing the under-prepared students in remedial programs. Current figures for students in remedial and developmental education have hovered around 30% over the last few decades. Data from the National Center for Education Statistics reported 78% of higher education institutions enrolling freshman and all community colleges offered remedial education in Fall 1995 (Merisotis & Phipps, 2000; Phipps, 1998). However, nearly all research discussing the amount of remediation reported in institutions suggest that the amount reported is understated. In any case, Merisotis and Phipps (2000) put it quite succinctly with:

> In short, those halcyon days when all students who enrolled in college were adequately prepared, all courses offered at higher education institutions were "college-level," and students smoothly made the transition from high school to college simply never existed. And they do not exist now. (p. 69)

For three centuries, addressing the needs of under-prepared students has been a core function of higher education in the United States and will continue to be for the foreseeable future.

Although there is evidence that developmental education is not new, there is also evidence that the demand for developmental education is increasing and will continue to

do so (Boylan, Bonham, & White, 1999; McCabe, 2000; McCabe & Day, 1998; Roueche & Roueche, 1999). Given policy discussions of the last three decades of the twentieth century and the number of state policies limiting and reducing remediation in higher education as well as shifting remediation to community colleges, one might assume the reforms were being driven by increased costs due to increases in size or scope. When looking at the history of developmental education, however, it becomes clear that the percentage of under-prepared students in higher education was lower at the end of the twentieth century, 29% of entering freshmen, than in the beginning when over 40% were considered unprepared for college-level work.

Estimates of the cost for remediation top out at around $1 billion which is less than 1% of the $114 billion cost of higher education (ACT, 2004; Boylan, 1999; Breneman, 1998; Phipps, 1998). Estimates of the economic benefit of remediating the under-prepared in the U.S., however, are dramatic. Increased tax revenues range between $80 billion (Carnevale & Fry, 2000), if African Americans and Hispanics had the same distribution of college education as Whites, and $87 billion (Spann, 2000), if just one of three remedial students were to earn a bachelor's degree. Attewell et al. (2006) argue that a large proportion of the minority graduates in the high school class of 1992 would never have received degrees were they not allowed to attend four-year institutions because they were unprepared for college level work.

The costs of not providing sufficient and effective resources to meet this demand are high. Denying the under-prepared access to four-year institutions and limiting remediation in community colleges will not only deny access to hundreds of thousands of citizens in California alone wasting vast amounts of talent and energy but those denied

access or forced into ineffective remedial programs are likely to end up unemployed or incarcerated. The prospects of the "American dream" of family, home, and prosperity, without the opportunity for a good education, will go unrealized for those denied access. Those talented but under-prepared who are denied access, instead of providing a new resource for society, will undoubtedly be faced with low wage, low benefit employment that cannot sustain a family. Some suggest that the real cost of not providing access and not funding remedial or developmental education sufficiently will result in the nation experiencing a downward economic spiral that will be increasingly difficult to recover from (Mumper, 2003; Phipps, 1998).

While the costs of remedial and developmental education are a relatively small part of higher education costs and the estimated benefits substantial, the cost of not providing it are also substantial. "If you think the cost of education is high -- try ignorance" (Derek Bok cited in Roueche and Roueche, 1999, p. 29). Some would argue, however, that ineffective remediation not only reduces social and economic benefits but it increases the costs to those students who come to colleges under- or un-prepared who enter remediation but never enter college-level work (Perin, 2006).

Increasing Effectiveness of Developmental Education

Studies in the 1960s found that students were often no better off after remediation (Clark, 1960; Roueche & Hurlburt, 1968; Roueche & Roueche, 1999). By 1971, Cross had identified remediation as a "high-risk" activity for the "new" diverse student population (Bauer & Casazza, 2005). Grubb and Cox (Kozeracki, 2005, chap. 9) report as late as 2005 that "Dropout rates in remedial courses are high, student dissatisfaction is high, and even students who complete developmental coursework do not complete

programs at the rates of their peers“ (p. 93). In that same volume, Malnarich (chap. 5) reports that the average first year attrition rate at community colleges reported in 2004 is about 45 percent. In California, a July 2005 report from the Center for Student Success indicated that while successful completion rates for basic skills courses were around 60%, the rate for elementary algebra was less than 50%. Additionally they report that students who began the math sequence in arithmetic have only a “10% probability of attempting transfer-level mathematics” (p. 6). Grubb and his associates (Grubb & Associates, 1999) suggest that much of this attrition in remedial courses is related to student boredom with the skill and drill activities, termed drill and kill, that are common in the remedial model. If the goal of remedial education is transition into college-level work and those goals are not being met by such a large percentage of students or certain populations of students, the opportunity arises, and political necessity demands, to improve on the process of initial assessment, developmental activities, and student exit into and continued support in college-level courses. The fine grained aspects of process benchmarking combined with research on effective practice and the student learning assessment cycles forwarded by Grubb and Badway (2005) has the potential to move colleges from reporting information about what happened and describing why it happened to improving how it happens. Boylan et al. (1999) also argued that key components to effective developmental education include both implementation of classroom assessment techniques and regular formative and summative evaluation of program activities.

Attewell et al. (2006) present research on college remedial education using the National Education Longitudinal Study data known as the NELS:88[3]. When reviewing Adelman's 1999 research in *Answers From the Toolbox* which indicated a lower likelihood of graduation for those needing remedial coursework (39%) than those who did not take remedial courses (69%), Attewell et al. noticed that Adelman also found that college remediation ceased to predict graduation once prior secondary school academic performance was added to the model. To investigate this finding further, the authors examined whether students who take remedial coursework upon entering college have greater difficulties graduating than students with similar skill levels that do not take remedial coursework.

Controlling for prior academic skills and performance in high-school, Attewell et al. (2006) were able to isolate the effects of remediation on students entering college in 1992. They found that the gap in graduation rates reflected pre-existing skill differences in high school. "Taking remedial classes [in community colleges] was not associated at all with lower chances of academic success, even for students who took three or more remedial courses" (p. 915) when controlling for entry skill levels. In addition, passing remedial coursework in community colleges increased the likelihood of graduation when compared with equally prepared students who never took remediation.

Attewell et al. (2006) research, like that of Adelman (1999), also indicates that there is a relationship between remedial coursework and greater time to degree for

[3] The NELS:88 consists of a national representative sample of eighth grade students in 1988. Detailed baseline information was collected about the students' family and academic background. The Educational Testing Service developed a mini-SAT for the study group that assessed skills in reading and mathematics. The students were tested in the 8th, 10th, and 12th grades along with the collection of additional survey data. After the 1992 scheduled school graduation date, high school transcripts were obtained for approximately 85% the cohort. Students who entered college provided detailed information about the institutions they attended and the degrees obtained. Recently college transcripts were added that included a taxonomy of college remedial courses.

remedial students when compared to other students who did not take college remedial coursework. However, when an additional semester or two is considered against the alternative of not graduating at all and losing access to the increased employment and economic opportunities that come with a college degree, remedial coursework seems worth the time and money. Furthermore, Boylan et al. (1999) point out that passing remedial coursework increases the probability of persistence in school significantly over those who fail to complete the coursework. More importantly, as Boylan (1999) also points out, not all students who come under-prepared for college-level work need a series of remedial courses. Boylan et al. (1999) argue that students falling in the upper third of the development and education placements would benefit from as alternative strategies rather than a full length remedial course. These alternatives to remedial coursework often can reduce the time required to become ready for college-level work but determining who needs a series of structured courses and who could benefit from the alternatives alone depend on the accurate skill level assessment for these entering students and the effectiveness of the intervention.

The need to accurately assess skill levels to determine the appropriate intervention is an extremely important finding that Attewell et al. (2006) illuminate. What they found in their investigation that raises new questions, however, was that for students with the same academic skills and background, in the period of nearly universal open access before many of the state policies redirecting under-prepared students into the community colleges, students attending two-year colleges were considerably more likely to be placed in remedial courses based on assessments and less likely to graduate than similarly skilled students attending four-year colleges. Additionally, after controlling for high

school preparation and academic skills, students attending public four-year colleges had a significantly higher probability of being placed in remedial coursework and were less likely to graduate than the equivalent student in private four-year colleges. The researchers also looked at race and found that African American students are significantly more likely to enroll in college remedial courses than are White students with the same academic skills and preparation and social background. On the other hand, in the Center for Student Success 2005 study in California, African-American students successfully completed elementary algebra only 40% of the time--nearly ten percentage points below the state average of 49.6%. Given these findings, the policy implications for educators are clear. Educators should look at the impact of their initial assessment, developmental education pathways, and support services through a process benchmarking perspective and identify effective research based practices that would eliminate these types of differences at a minimum.

Although Attewell et al. (2006) found that taking remedial courses was not associated with a lower chance of academic success in two-year colleges even for students who took three or more remedial courses compared to similarly skilled students not taking remedial courses, they confirmed previous findings of much lower graduation rates for those who complete remedial coursework than for those who came prepared for college-level work. Implications of the research suggest a dramatic need to not only provide more effective developmental education but to continue to develop, reinforce, and build on these students' skills as they advance through their college level courses. The findings from the Attewell et al. (2006) study also raises questions about not only policies around access and assessment, as well as the effectiveness of remediation, but

also the accuracy of assessment instruments for certain populations and their ability to identify specific skill deficiencies. The following section on assessment and placement will address these questions.

Assessment and Placement

With this long history of developmental education and research on its effectiveness, one might conclude, inappropriately, that there is some consensus and understanding about what developmental education is, who it serves, and who should provide it. There is no such consensus. Numerous studies (Attewell et al., 2006; Grubb & Associates, 1999; Merisotis and Phipps, 2000; Perin, 2006) reveal that there is not only a lack of consensus among institutions but suggest that there is little consensus among educators even within institutions as to what constitutes college-level work. Efforts within the assessment initiative movement over the past decade to have faculty collaboratively and collectively agree on program goals, measurable objectives, and assessments may help with the alignment of developmental education courses to college-level work. In Perin's (2006) recent study of fifteen community colleges institutional practices for remediation, however, she notes that faculty were still unable to agree on the skills needed to enter college level English: such lack of consensus creates difficulty in setting accurate test cut scores used for placement in remedial or developmental education. Oudenhoven (2002) provides some insights citing Astin with: "most remedial students turn out to be simply those who have the lowest scores on some sort of normative measurement…but where we draw the line is completely arbitrary" (p. 37). The need to seriously examine the assessment process and pathways available to under-

prepared students and applying sound educational theory and practice becomes even more evident with each new study of policy and practice.

Assessing the skills of students as they enter college, however, is critical to student success in higher education (Perin, 2006; Roueche & Roueche, 1999). And, assessment of basic skills is well-established in community colleges: the majority of community colleges mandate skills assessment even when it is not required by the state. Perin (2006) suggests, nonetheless, that there is often a lack of consistency between state and local policy that is a product of both the lack of consensus in the definition of college-level work and the institution's struggle to balance access and standards. States and institutions often develop and implement policies that mandate assessment to protect educational quality and standards while maintaining open access with appropriate access to college-level coursework (Perin, 2006; Roueche & Roueche, 1999).

Jenkins and Boswell (2002) reported that less than half the states responding to a national 2001 survey had assessment policies at the state level and only seven had state mandated placement instruments. Nearly half the states, however, required placement in remedial education when students scored below college-level on an assessment test. None of the 47 states used high school exit exams to determine placement although Shults (2001) reports that high school exit exams are often used to exempt students from assessment testing. Perin (2006) found, however, that although students passing the high school exit exam were exempted at some institutions, they were not ready for the college curriculum. Shults (2001) reported that in the nearly 500 community colleges responding to another national survey on remedial policies and practices, only 58% required assessment of all students and only 43.5% also required placement based on the test

score. Although the need to validate exemption policy at institutions is evident, understanding what influences shape the policies will be beneficial.

Perin (2006), in the recent National Field Study of fifteen colleges, found that institutions shaped their policies and practices to meet political and local needs. Generally, the states formulated a framework of remedial policy but left the details to the institutions. Colleges often created institutional policies and requirements even when the state had not mandated them. Perin also found, however, that even when state policy existed, institutions would adapt those policies to meet local needs, sometimes even contradicting state mandates. Institutions would often also soften or strengthen the application of state mandates to increase or decrease enrollments through practices such as not assessing for all skill areas, not requiring assessment at college entry, setting cut off scores low to promote short term retention, allowing exemptions from assessment based on course taking patterns, requiring remedial enrollment only for declared majors, or simply allowing students to enroll in credit level courses because there were insufficient developmental education courses (Kozeracki, 2005; Perin, 2006). Perin (2006) groups common practices identified in the study into four areas: (a) decrease the number students in remediation, (b) increase the number of students in remediation, (c) increase the precision of assessment or placement, and (d) promote retention of students. She attributes the institutions efforts to balance access and standards to most of these practices but questions the ability of ineffective remediation to affect either.

One of the categories identified in Perin's (2006) study that is particularly relevant to the topic at hand was that colleges would increase the accuracy of placement to promote retention. Two practices focusing on retention through accurate placement

that the research highlighted were the use of separate tests for native-English and ESL students and use of institutional assessment instruments to confirm or change placements previously established by standardized tests. Grubb and Associates (1999) noted that in their extensive research on community colleges none of the colleges visited used follow-up tests to confirm placement as found by Perin seven years later. Grubb and Worthen (Grubb & Associates, 1999, chap. 6) reported that even when providers of standardized tests publish follow-up placement tests they were rarely used.

Additionally, it must be noted before discussing the need for increased placement accuracy, that although many colleges are providing separate testing for ESL and native English speakers, students are often placed in remedial courses who would be better served by either ESL courses or courses with a mix of remedial and ESL strategies. Blumenthal (2002) identifies a particular increasing population who because of recent immigration during their secondary education learned neither their first language nor English well. Although they manage to traverse their daily lives using informal English and use expressions common to native speakers, their grammar and pronunciation often contains second-language errors. They often completed ESL in high school and resent or avoid an ESL placement. And, although they are similar to traditional remedial students, may be assessed as native English speakers, and can benefit from some of the same programs and services, their second language issues are not usually addressed in standard remedial programs. Studies on using research based benchmarking strategies have shown that identifying this population and using effective ESL strategies to develop language skills along with effective developmental education can help these students be more successful (Blumenthal, 2002).

Getting In: The Need for Increasing Placement Accuracy

Assessing college-readiness requires accuracy in prediction. While no instrument can have 100% predictability, a good placement test minimizes the proportion of students placed in a course unprepared to do the work required. In other words, most of the students placed in a college-level course would be successful without developmental work and those placed in a developmental education course would not have been successful in a higher level course without it. Most community colleges assess student skill levels with standardized tests at entry (Grubb & Associates, 1999). And, even though a number of researchers have questioned their predictive value, most community colleges continue to use standardized placement tests (Behrman, 2000; Behrman & Street, 2005; Byrd & MacDonald, 2005; Grubb & Associates, 1999). Standardized tests often ignore students' strengths and cultural knowledge (Byrd & MacDonald, 2005). Even with accurate placement tests, proper placement within community college developmental education is difficult because of the many factors involved that go beyond skill assessment such as student goals, attitudes, financial resources, self-concept, and motivation (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996; Byrd & MacDonald, 2005; Grubb & Associates, 1999).

Perin (2006) illuminates the problems of inaccurate placement instruments with the example of a student who would pass a number of classes where mastery of English skills would be required such as history, sociology, or biology but then later fails the English placement exam. Numerous such examples of colleges excluding students from college-level courses based on test scores alone, and often in doing so excluded them from the institution, were also cited in the Mexican American Legal Defense and

Education Fund (MALDEF) lawsuit against the California community college system in the late nineteen eighties (Romero-Frias et al. v. Mertes et al., 1988). Susan Brown, the attorney for MALDEF, cited examples of students who were victims of test exclusionary practice. The students had previously attended prestigious universities such as the University of Texas at Austin and University of California at Berkeley, passed the "Subject A" exam, and successfully completed college-level English coursework. However, when trying to enroll in courses at a community college, they were tested and placed into remedial English courses and were restricted from college-level coursework without regard to their transcripts.

As Attewell et al. (2006) demonstrated, providing remediation for those who need it increases academic success and is particularly important for those needing remedial courses in reading. However, for students facing a sentence of unnecessary multiple remedial reading courses simply due to test deficiencies, dropping out of college becomes an enticing option (Boylan, 1999; Grubb & Associates, 1999). Behrman and Street (2005) provide some insights into how the use of content-general reading assessment instruments, used by most institutions, contributes to the inaccurate placement of many under-prepared students and highlights the need for research based benchmarking in the initial assessment of students. Commonly used standardized tests such as the Accuplacer, APS, Asset, and the Nelson Denny separate content from comprehension. These content-general placement tests are based on the idea that "a good reader is a good reader, no matter the content" (Behrman & Street, 2005, p. 6). However, as the authors point out "despite the common wisdom that general reading ability should be related to academic achievement, reading placement tests have shown a negligible to modest relationship to

grades in credit level courses" (p. 6) and have even less validity when predicting grades in developmental courses. The domain-generic model of reading comprehension results in a test that includes readings from a variety of subjects that produces a global comprehension score. For example, the asset test designed for two-year institutions includes passages from "fiction, business, and social studies"; the APS uses eight passages from "natural science, social science, and contemporary life"; and the Nelson-Denny uses seven passages from "humanities, natural science, and social science" (Behrman, 2000, p. 1). Behrman and Street (2005) argue, however, that the prime factor in learning is domain-specific. They propose that by using content-specific reading tests based on sound learning theory that include both domain specific knowledge and domain specific strategies, reading placement tests would be more valid and could be used to place students more appropriately. To test their proposition: they first developed a content-specific reading test based on "domain-knowledge research, schema theory, the construction-integration model, and expert novice studies" (p. 7); and then administered a content-general reading test, the researcher developed content-specific reading test, and a test of prior domain knowledge to 49 students enrolling in a community college anatomy course.

In their investigation of the predictive ability of the three tests, Behrman and Street (2005) found that only the content-specific reading comprehension test was a significant predictor of course grade. They argue that content-general reading tests should not be used for placement in college-level courses or in remedial education where they have little alignment to remedial content or learning strategies. They and others (Grubb & Associates, 1999) argue that tests used for placement should be consistent with

the kinds of tasks and content students will encounter in the target courses. Because of the proprietary nature of standardized tests and the confidential results, instructors are not able to align identified deficiencies with course content or tailor instruction where students had specific deficiencies. Grubb and Associates (1999) acknowledge that assessments designed with the competencies needed for success in specific developmental courses are more appropriate than standardized tests, however, they also recognize the resources required to create more content-specific tests. They note that these resource intensive endeavors are rare compared to "cheap, quick, and widely accepted" standardized tests (p. 175). Chuen Rong-Chan, a matriculation specialist in the California Community College Chancellor's Office, noted (personal communication, 10/2006) that simply increasing the number of questions used to set the range of scores on electronically administered standardized tests can dramatically increase the accuracy but those changes are often opposed based on concerns over the increased time to administer the test. Educators need to make concerted efforts to accurately place students and identify specific areas for development rather than simply sentence students to a series of developmental courses because it is more convenient and takes less time during initial testing.

As previously noted, effective developmental education begins with early and proper identification of skill areas that need to be strengthened. By aligning placement tests with course requirements and identifying specific skill development needs of students, appropriate developmental services can be provided that will minimize both costs and time for students. Determining whether a student has multiple skill deficiencies that could best be addressed by a structured remedial course or series of courses or

whether the student has deficiencies that can be addressed with more efficient alternatives such as tutoring or supplemental instruction is a foundational requirement for retaining students. More importantly, gaining a better understanding of the developmental needs of students through application of research-based benchmarking of the success of students is critical as revisions are made to develop sound placement practice.

Since it is evident that students who need and complete remedial coursework are more likely to graduate than students who need remediation coursework but never enroll and that most students who need remediation courses and enroll in them have some success in college, an effective placement practice would be to properly identify students who need specific services and require students to take advantage of those services. Theory based development of follow-up placement tests would provide the basis for research based benchmarks that could increase the accuracy of placement dramatically. Educators have a professional responsibility to insure that students are properly assessed and placed and then through a process of inquiry, problem identification and analysis of student learning and progress, provide a meaningful educational experience. Identifying students who need to develop skills and then sentencing them to a series of drill and kill courses based solely on standardized tests, often validated with quite low correlations, is problematic no matter how great the need.

Getting out of remedial education is just as problematic (Grubb & Associates, 1999; Perin, 2006). Practices across states differed as much as the practices of getting in. While some institutions require exit exams, successfully completing a required series of courses is sufficient and sometimes necessary in others. Yet, without course alignment between developmental and the elusive credit-level competencies, students will continue

to struggle with either long sentences of remediation or the credit-level coursework that follows. Educators who embrace student learning outcomes assessment cycles and go through the collaborative process of aligning courses and identifying and defining competencies provide benefits to both the students traversing their educational pathways and the faculty they meet along the way.

Effective Developmental Education Practices

This section contains a discussion of the research validating effective practices and highlights a few studies to help inform practitioners. The intent of this section is not to provide a detailed examination of each practice but to highlight that there is sufficient research to begin benchmarking our work with developmental education students and expanding what works and eliminating practices that don't. With the increasing body of literature on effective practice, the continued validation of existing and emerging learning theory and practice, an increased attention to assessing student learning, and a focus on improving student success, we now have the opportunity to make changes that will increase student success by observing how variations in structure, teaching, or student service methods effect student outcomes. Colleges and college departments often operate under vastly different conditions and serve increasingly diverse and sometimes different populations of students, so that what is an effective approach at one college may not be appropriate at another (Badway & Grubb, 1997). Only by assessing and analyzing student learning within the context of the institution and classroom can appropriate theories and effective innovations be applied. And even more importantly, it is in the "learning as we go" that effective practice emerges (Badway & Grubb, 1997, p. 59).

In their study of developmental education and community colleges, Grubb and Worthen (Grubb & Associates, 1999, chap. 5) stated that they found "both the best and the worst teaching" (p. 199) in developmental education. These authors state their amazement that innovative courses integrating basic skills with other kinds of content that treated "writing and mathematics (and other specialized literacies) as forms of communication rather than disembodied skills" (p. 199) were found in the same institutions as standard remedial courses consisting of the drill and kill practices on grammar and punctuation or decimals and fractions but otherwise devoid of academic content. They found the students in the integrated courses "infinitely more engaged" (p. 199) than students in the standard remedial courses. They note that most of the innovative practices were collective efforts rather than efforts of individual faculty. Where they found the most promising practices, they often found collective approaches such as "developmental studies departments with coherent philosophies and institutionalized practices and learning communities that resolve the problem of content" (p. 199). They note, however, that the centralized systems for delivery of developmental education still have the problems of collaboration when it comes to part-time faculty and faculty teaching remedial courses from other disciplines that were either unfamiliar with or unaccepting of departmental philosophies. Boylan and Saxon (1999) also note the importance of collaboration suggesting that whether developmental education is centralized or decentralized, the key to its effectiveness is the coordination and communication involved in the design and delivery. Additionally as Boylan and Saxon (2006) found, effective coordination and communication can also include students. One college in their study assumed since mathematics skills are less likely to be used in every

day life they would atrophy faster than other basic skills. Faculty and advisors systematically encouraged students completing the highest level of developmental mathematics to take the next college-level mathematics course in the subsequent semester. The data validated that chances of passing college-level mathematics increased with subsequent enrollment.

Although much of the research uses the term innovative, some of the interventions described in the literature have been around since the beginning of the efforts to develop under-prepared student skills and most called innovative have been used at least since 1970 (Boylan, 1999). More importantly, many resemble the original innovation even though research and sometimes isolated local practice has provided numerous ways to increase its effectiveness. Boylan groups developmental education practices into two categories: traditional approaches and alternative approaches. Traditional approaches include activities such as remedial courses, tutoring, learning laboratories, and individualized instruction. Alternative approaches include practices such as freshmen seminars, supplemental instruction, paired courses, learning communities, and critical thinking courses and programs. When designed with appropriate learning theories and teaching strategies, these practices have been shown to be effective (Boylan, 1999). Boylan and Saxon (1999), in their summary of a meta-analysis of literature on effective developmental education practices identified twenty practices and structures that contribute to successful remediation. Perin (Kozeracki, 2005, chap. 3) reported fourteen classroom practices that most developmental educators would agree are effective. Badway and Grubb (1997) documented numerous strategies and models for adding content, theory, and practice to the teaching of foundational and

basic skills. A number of others have documented and provided lists of effective practices such as McCabe (2000) and Roueche and Roueche (1999). Boylan et al. (1999) also list numerous key components to effective developmental education that include both policies--such as mandatory assessment and placement, institutional commitment, comprehensive approaches among many others--and practices--such as implementation of classroom assessment techniques, regular formative and summative evaluation of program activities, development of metacognitive skills and many others. They also found that developmental programs based on sound theory, research, and organizational strategies are linked to higher student completion rates, grades, and retention. And, they add that institutions that use more of these best practices have better outcomes than those who use fewer. As has been stated by more than one author putting forward examples of effective developmental education practice: "We know how to do it. We simply do not use what we know" (Boylan & Saxon, 1999, p. 9; McCabe, 2000, p. 46). What many researchers looking at developmental education also agree on, however, is that systematic, controlled evaluation of instructional innovations and methods is rare (Badway & Grubb, 1997; Behrman & Street, 2005; Boylan, 1999; Byrd & MacDonald, 2005; Grubb & Associates, 1999; Kozeracki, 2005).

Linking Knowledge and its Use

Community colleges typically attempt to impart the basic academic skills required for success in college-level coursework through remedial and developmental education that provides academic instruction to those needing it (Badway & Grubb, 1997). However, innovative programs, based on cognitive theory, that connect theory and practice to activities "that have meaning in everyday social and occupational practice,

and which are understood and credible to students…" (p. 13) have been demonstrated to increase student learning, retention, and persistence to graduation. As previously mentioned, however, colleges often have vastly different conditions and different populations of students, so that what is an effective approach at one college may not be effective or appropriate at another (Badway & Grubb, 1997). Through an ongoing process of assessing and analyzing student learning within the context of the institution and classroom, innovations can be applied and adapted to help instruction become more and more effective. This may be one of the biggest challenges to improving developmental education. Most instructors teach the way they learned (Boylan et al., 1999). By using sound learning theory as a basis for the design and delivery of developmental education instruction as well as formative and summative evaluation of the program, effective developmental education innovations can expand and increase success with under-prepared students.

Using Learning Communities to Link Content and Developmental Education

Learning communities are based on the idea that student involvement is important to student attainment (Tinto, 1998). Designed to involve students in the social and academic life of an institution, learning communities provide students with coherent learning experience. Similar to the educational experience espoused by Dewey in the 1920s, the contextual, experiential learning-by-doing, and constructivist approach relieves the student boredom of traditional schooling (Price, 2005; Talburt & Boyles, 2005). Others attributed with developing the theoretical and philosophical foundations of learning communities include Alexander Meiklejohn's work at the Experimental College at the University of Wisconsin in 1927, Paulo Freire's *dialogic model* that assumes both

teachers and students can construct and share the responsibility for learning (Price, 2005), There are many kinds learning communities ranging from linked or paired courses to coordinated studies developed around a central theme (Tinto, 1998). In each case the idea is to link the content of the courses "in pursuit of a singular piece of knowledge" (p. 2). By linking the curriculum, students experience a deeper type of learning than is possible in standalone courses. Tinto suggests that this aspect of learning communities, that he terms *shared knowledge,* seeks to connect an array of courses into a body of knowledge that is shared by the students in the community of learners. Another common trait of learning communities is co-registration. When enrolling together, students not only get to know each other but they share the experience of learning in the shared courses, termed *shared knowing*. Faculty promoting shared knowledge often employe collaborative or cooperative pedagogies within and between the linked courses.

Tinto argues that there is a growing recognition that developmental education can be enhanced through the use of learning communities and provides numerous examples of institutions creating learning communities which include remedial and developmental education. He cites a number of benefits of learning communities from his own and other studies which can be summarized under three areas: (a) building supportive peer groups; (b) shared learning-studying together; and (c) involvement, learning, and persistence.

Some particularly interesting learning community designs that improved outcomes in the area of retention were linking college-level and developmental courses. The first design cited was prompted by a study that found that delays in earning college-level credit often contributed to student drop out rates. Each of the designs that allowed students to earn credits and experience the college-level course while developing their

academic skills resulted in higher student persistence. Nearly all of the studies cited included reduced isolation of remedial students, higher grade point averages than control groups, higher completion rates, and higher long-term persistence. More importantly, "the students demonstrated significant affective and attitudinal changes suggesting positive self esteem and a joy for learning" (Tinto, 1998, p. 10). Faculty also reported benefits -- they spoke of "being reinvigorated, of coming to rediscover the joy of teaching" (p. 13).

Tinto (1998) also argues that learning communities are not costly when considering the cost benefit ratio compared to traditional developmental education programs. The real costs of reduced-load or release-time for faculty, he argues, are off-set by the significant increases in student retention and persistence.

There are additional costs and considerations in successful implementation of learning communities. The collaboration of key staff across the campus such as faculties, deans, advisers, and counselors along with registrars who can protect block schedules for the learning community may present significant burdens or barriers to developing new or maintaining existing learning communities. Talburt and Boyles (2005) note that budgetary and staffing demands often create enrollment problems and can add to the workload of creating collaborative assignments and integrated courses. They add that institutions with required core curriculum can add significant barriers to implementing a successful learning community.

Talburt and Boyles (2005) also identify considerations in implementing learning communities such as who does the learning community benefit and why as well as how do we protect students from isolation from the larger college community. The authors

site concerns about segregating freshmen learning community students from upper-class students and isolating them from the diversity of the whole institution. This isolation may reduce exploration, network development, and the development of autonomy in students. The authors also argue that faculty should be aware that having the same people in all of one's classes may breed contempt. They also caution that learning communities should focus on student need, interest, and learning. They urge that educators critically question the assumptions about curricula content, structure, and format of classes along with the administrative requirements as they consider implementing learning communities.

The following case study of a community college learning community demonstrates how the "learning as we go" allowed an innovation often applied only in residential campuses that facilitate the cohort model to emerge as an effective practice in a commuter population of a community college.

Raftery (Kozeracki, 2005, chap. 6) documents the evolution of developmental learning communities at a community college serving about 25,000 students in eastern Nebraska. The college has no mandatory assessment or placement requirements but encourages students to take advantage of the placement tests they offer. About half of the students who take the reading and English placement exams and close to 80% of students taking the math placement exam are identified as needing basic skills development. The colleges learning community initiative, Academic Improvement for Success program (AIM) was developed using Federal grant funds to more effectively address these high levels of developmental education needs. Although the college has a decentralized approach where faculty from math, English, and reading teach both developmental and

higher level courses, the college provides ongoing faculty and staff development to increase the awareness of the needs of developmental students. Additionally, the college integrates student services personnel into the learning community teams to address the non-academic areas impacting student success.

Raftery reported that the AIM program has evolved over its six year existence by learning from what worked and what didn't. Even the basic scheduling design evolved: originally designed as a rigid block schedule which consisted of fourteen credit hours evolved to add a more flexible option to enroll in paired courses of only seven credit hours with additional but optional developmental math or learning strategy courses that are more convenient for part-time students. This not only allowed part-time students to participate in a learning community but also helped the institution more effectively meet the increasing developmental education need on their campuses.

By assessing, analyzing, modifying, and identifying effective AIM components and using them as benchmarks to assess other core areas, the college determined that the active learning strategy component should be implemented across the developmental education curriculum. More importantly, the college has added learning communities to a variety of program areas by recognizing that students continued to struggle with basic skills after exiting the developmental education program. By using a research based approach the college also identified the need to retrain existing career counselors to provide academic assistance, life skills, and learning strategies to students in developmental education. The AIM program efforts to better understand students' needs through local research and benchmarking helped transform these academic counselors'

activities from facilitating registration to providing long-term caseload assistance with an additional benefit of creating greater faculty-counselor communication.

Although the AIM program reported improved outcomes such as increased class attendance and course completion, higher GPAs, increased retention and student satisfaction, a more important outcome is that for each of the results they reported there are continued efforts to assess and improve learning by investigating more effective ways to overcome barriers to student success and benchmarking successful practices to expand them across their three campuses.

Numerous case studies (Price, 2005; Tinto, 1998) show similar results in student outcomes of better grades, higher retention, and higher satisfaction for students in learning communities compared to stand-alone course comparison groups.

Improving Supplemental Instruction with Research Based Benchmarking

As previously noted, not all under-prepared students need a series of developmental education courses. Some might be better served through developmental activities while taking college-level coursework (Boylan, 1999). Additionally, as was reported by Raftery (Kozeracki, 2005, chap. 6), developmental education students often continue to struggle with basic skills after exiting their developmental program. Supplemental instruction (SI) has been used since the early nineteen seventies to help students succeed in difficult courses (Boylan, 1999). One of the key concepts undergirding SI is that when 30% or more of the students in a course receive a grade of D or F, the course is designated as high-risk in subsequent semesters rather than the students. The support students receive in SI courses typically comes from a student who has previously succeeded in the course. The recruited student attends classes, takes

notes, and then leads discussions with small groups of students. The student leader also provides information on note taking, test taking, as well as advice and encouragement.

Stansbury (2001) provides an exemplary implementation practice and an interesting discussion of the way supplemental instruction was implemented using what could be considered a process benchmarking cycle. He first notes that there is conflicting evidence regarding the relationship between SI attendance and student prior achievement. He also notes, however, that Arendale as early as 1994 reported that, implemented properly, SI can benefit weaker students. The first implementation of SI at the competitive urban university in the study was to support General Chemistry and although the author constantly reminds us of the small population being studied, the study is elegant in its simplicity and replicability. Forty SI sessions were offered during the fourteen weeks of the fall quarter providing the opportunity for the 25 enrolled students to attend at least one SI session during each week. And, students were encouraged to attend at least one session each week. When analyzing the attendance patterns for the sessions, the research revealed that many more students categorized as at-risk than students not categorized at-risk had stopped attending the sessions early in the semester. Forty-four sessions were offered in the following term and an analysis of the weekly attendance patterns showed that an even larger proportion of the at-risk students had stopped attending early. Interviews were conducted at the end of the spring semester. During the interviews, the at-risk students stated that they often did not understand the discussion in the sessions and added that they felt intimidated by their better-prepared peers. Efforts to redesign the intervention began with a review of the theories that would help the team develop an intervention that could strengthen both student preparation and

self-confidence. An intervention was designed using cognitive and social cognitive theories and implemented in the following fall semester. The new intervention, Accelerated Learning Groups (ALG), was designed to: (a) identify at-risk students, (b) provide students information about the prerequisite knowledge and strategies for learning chemistry, and (c) provide tutoring to small groups of two to three students at similar skill levels to strengthen prerequisite skills in preparation for the SI sessions.

Additionally, because the Director of the chemistry department supported a theory and research based pilot offering students the opportunity to strengthen necessary skills while mastering course content, she suspended regular enrollment policy allowing students who scored below the regular cut off score on the chemistry placement test to enroll. To reduce negative perceptions of the ALGs, all students were provided the opportunity to participate in an ALG and/or an SI session each week. Each student also completed a pre- and post-test measuring self-efficacy for chemistry. Again an analysis of weekly attendance patterns and course grades was completed. ALGs were shown to be highly beneficial to at-risk students. The just-in-time instruction in foundational academic skills set in the context of the content course places ALGs between linked courses and tutoring. The fact that ALG in SI sessions were institutionalized and still offered long past their original Federal grant funds had expired and that they were expanded to include a variety of math and science courses demonstrates the power of engaging students in content while building foundational skills in the context of that content. Moreover, using sound educational theory with research based and process benchmarking provided for development and expansion of an innovative alternative to remediation.

Focused Professional Development

California has begun to invest in solutions for the growing need for developmental education[4]. However, expanding existing models with such low success rates may not be the answer. Recent initiatives, such as the Basic Skills Initiative and the Assessment and Placement Initiative by the California Community College Board of Governors, have identified effective practices in both assessment and delivery of basic skills instruction. Although the efforts are substantial, without high quality ongoing professional development founded on sound educational theory and research-based benchmarks, the system will most likely simply grow the current ineffective system of remedial education. Numerous researchers (Badway & Grubb, 1997; Dowd, 2005; Grubb & Associates, 1999) have recognized the need for professional development in both effective teaching and learning practices and using a research based benchmarking approach or similar student learning outcomes assessment cycles to assess, analyze, revise, and evaluate improvements to curriculum and services using sound education theory. As Boylan et al. (1999) suggest "improving the quality of teaching available to developmental students cannot help but improve the quality of their learning" (p. 99). Additionally, Dowd (2005) argues that the analytical skills required to do either diagnostic or process benchmarking go beyond those currently available in faculty ranks or many institutional research offices. The development of those skills in the current ranks of faculty and staff will require concerted efforts of policymakers and institutional administrators to provide rigorous professional development that go beyond the one hour

[4] The California governor and legislature invested $31 million in 2006-2007, marked as ongoing funds, which was increased to $33 million in 2007-2008 to expand basic skills instruction in community colleges. Although this is a significant investment in improving basic skills capacity in the community colleges by the California legislature, it pales to the $5.2 billion annual total budget.

sessions available at conferences and staff development days. These types of one-shot learning experiences, although important in early innovation diffusion as a way to share and market strategies broadly, are ineffective in promoting adoption for a number of reasons.

Boylan and Saxon (1999) reported that about a fourth of the concurrent sessions at a National Developmental Education conference focused on effective teaching and learning strategies in developmental education. In the two recent Strengthening Student Success conferences, a collaboration of the California Partnership for Achieving Student Success (known as Cal-PASS) and the Research & Planning Group for California Community Colleges, offered timely sessions on effective practices and student engagement aligned with the state's assessment and basic skills initiatives. Although the conferences sold out weeks after opening up registration and these types of innovative practices were abundant in the conference sessions, they were limited to the hundreds that attended out of the nearly 75,000 faculty and administrators in the California community college system. Grubb and Webb (Grubb & Associates, 1999, chap. 8) point out that typically only a few instructors self-select to attend these kinds of one-shot workshops. Additionally, funds for professional development are in short supply at most institutions as budgets continue to be constrained. Professional development funds are often unavailable to developmental educators, and even less available to part-time instructors, when they are in competition for funds with vocational faculty in areas of rapidly changing technology. Yet part-time instructors frequently teach developmental education with little preparation for the developmental classroom (Boylan et al., 1999).

Who attends a session focused on an effective developmental education practice is even more problematic in decentralized systems where non-developmental faculty teach developmental courses and disciplinary conferences often hold priority over developmental education conferences. And, some of the more effective innovations require either (a) disciplinary faculty to integrate structured basic skills instruction, to strengthen or reinforce competencies, into the content of their curriculum; (b) developmental education faculty integrate content from other disciplines into basic skills curriculum; or (c) content area faculty to collaborate with basic skills faculty in the development, timing, and sometimes delivery of curriculum such as in the case of hybrid and paired courses, learning communities, and team teaching. These types of innovations suffer problems not only with exposure to effective practice but have dramatic fiscal implications as well. Faculty with full teaching loads are often hesitant to take on the additional work required to develop, assess learning, evaluate instructional methods, investigate effective practices to apply to situations, and make curriculum or pedagogical revisions and administrators are unlikely to provide release time or ongoing funds to support these kinds of innovations when budgets are already spread so thin.

Although funding to provide these kinds of resources is necessary, they are not sufficient (Grubb & Associates, 1999). Even providing ongoing training in effective teaching and learning practice and cycles of assessment, evaluation, and revision will not spread those effective practices across the institution without the culture to accept and support it. Building that culture, however, requires the use of effective innovation dissemination and diffusion theory into the planning and implementation of training just

as effective learning theory is needed to inform curriculum revision. And, ongoing support must be provided as institutions experiment with and adapt the innovations.

One-shot workshops offered during flex days and at conferences often do not attempt to build an institutional culture that supports the improvement of teaching and learning and faculty often find little or no support from either their peers or the institution when they try to implement ideas from them. Moreover, Grubb and Associates (1999) found that faculty want more professional development that is offered on their campuses and that is ongoing. Faculty wanted local and ongoing professional development that stimulates discussion about effective teaching and learning and uses the expertise within the local campus with only occasional help from outside experts.

Successful implementations require ongoing revision, negotiation, and collaboration. Where innovations have taken hold, effective curriculum innovations often become reform efforts as faculty who have experienced the benefits of the innovation become agents of change as they champion the innovation (Badway & Grubb, 1997). Grubb and Associates (1999) profiled a number of colleges that had developed faculty learning centers offering ongoing seminars every term. They found that these types of internal, continuous, and collaborative efforts not only improve teaching and learning, they help build a culture that values it. Faculty teaching and learning centers are a natural outgrowth of the assessment initiative, on campuses that have embraced the opportunities it provides, as faculty recognize and confront difficulties with student learning and look to institutional resources to provide technical assistance. The centers can provide not only technical assistance, resources, information about new innovations,

and support but can provide instructional research support resources often not available in the institutional research office.

Another perfect storm can be seen brewing but with an encouraging outlook. Recent Federal legislation[5] attaching Federal funds to program improvements demonstrated by student outcomes, the WASC accreditation focus on student learning outcomes integration into the institution's planning and budgeting cycles, and increasing state revenues creates a unique opportunity to build a culture of inquiry that could support an expansion of effective practice and research based benchmarking on community college campuses. That opportunity requires a commitment of funds and the political will to protect them. Such an initiative would need to be integrated into education systems' strategic plans.

Incentive grants could be developed at the state level using both learning and diffusion theories that would provide for development of both the skills needed to do research based benchmarking using effective practices as models and benchmarks and the culture to support it that would result in the outgrowth of faculty teaching and learning centers. Due to the vast differences of resources and skill levels available in colleges to do research based benchmarking, these types of grants would have to be ongoing as well as progressive. However, ongoing funds to provide support to faculty, staff, and administrators would have to be built in as another categorical funding stream that was unassailable. Assuring ongoing funds in any other way that will continue throughout the life of even the most successful projects in anything but a stable fiscal environment has

[5] The Carl D. Perkins Career and Technical Education Improvement Act, signed into law in August of 2006, included provisions that would require institutions to negotiate performance levels annually with the state agency distributing the funds. Institutions not meeting those negotiated targets for three consecutive years would be at risk of losing all or part of their Federal allocation.

proven to be nothing less than impossible. Given the political environment of term limits, partisan bickering, and new political appointees with each change in administration securing a long-term commitment of funds is critical. If policymakers value these types of changes, they must support them with the necessary funds to initiate and support them as well as provide the funds needed to monitor progress and continue to provide technical assistance by the state actors.

If these types of initiatives were funded sufficiently and in an ongoing manner, the problems of getting into, succeeding in, and getting out of developmental education would nearly solve themselves. As developmental Educators become better at assessing and improving student learning, they would also be able to identify placement problems. And, as they collectively and collaboratively establish assessments and integrate, contextualize, and align curriculum, problems currently seen in student retention and persistence could be more easily solved. Additionally, faculty in California in every discipline would experience the benefits of the assessment initiative, the basic skills initiative, and research based benchmarking through better understanding of the students in their classrooms and increased student learning. Educators have the responsibility to be accountable for student learning: Policymakers have a responsibility to be accountable for the funding they provide to do it.

CHAPTER III.

METHODOLOGY

The purpose of this study is to examine the extent and effectiveness of using contextualized formats for delivering basic skills instruction in California Community Colleges (CCC). This chapter will detail the methodology used including the nature and design of the study, the data collection procedures, and analytical frameworks and analysis procedures, as well as assumptions and limitations of the data.

Research Design

This research used both quantitative and qualitative research in a mixed method design. The research examines and compares student success in vocationally linked and contextualized basic skills credit courses with other methods of delivery of basic skills. This study also tested and documented the effectiveness of the instructional delivery formats.

The research used a two-phase design approach to overcome the problem of identifying cross-curricular courses in the system office database. While math and English courses are easily identifiable in the database by looking at the course content code, cross-curricular courses are often coded in content or occupational areas rather than the area of academics integrated into the course. Additionally, courses coded into occupational areas are not identifiable through the coding scheme as an integrated or linked course. The two phases were designed to overcome this problem by having faculty or administrators identify cross-curricular or academic-occupationally integrated

courses that are linked or contextual at the basic skills level. Once the courses were identified, course materials would be used to verify the contextual nature of the course and the course could be verified as existing in the database. A quick overview of the two phases is presented first and then detailed steps of the research within each phase are provided.

In the first phase, surveys were e-mailed to three administrator email addresses at each of the California community colleges. The surveys were designed to identify whether or not colleges offered contextual learning strategies for basic skills instruction during the 2006-2007 academic year. College officials responding affirmatively that they offered basic skills in contextual formats were contacted and course materials from the identified courses were requested. Course materials were then examined to verify survey responses and contextual content. The second phase of the research included accessing the CCC system office administrative data which contains information on the specific courses from the responding colleges to test the effectiveness of the contextual learning strategies.

Phase I

The first phase of this study used a mixed model of both quantitative and qualitative techniques to examine and triangulate evidence of implementation of contextual instruction formats for basic skills. A *sequential explanatory strategy* (Creswell, 2003) was used to identify and categorize linked and contextualized courses at responding colleges. The basic design of the sequential explanatory model in Figure 1 is adapted from Creswell (2003, p. 213). The "QUAN" (quantitative) methodology is the

primary design of this phase of the study, followed by the secondary "QUAL" (qualitative) method. Descriptions below the model identify specific steps of the study.

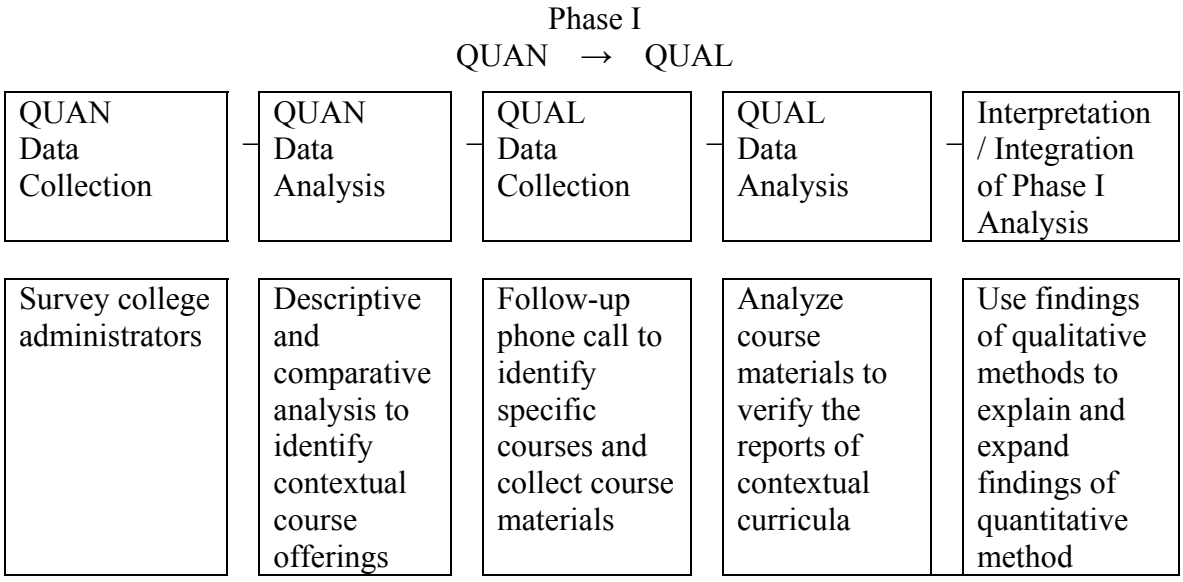

Figure 1. Sequential explanatory strategy with associated activities.

First, the study used a survey of three sets of administrators on the total population of 110 California community colleges accredited as of fall 2007. The survey identified colleges who either reported offering developmental education (i.e., basic skills) in either a course linked to another content course or courses that have a fully integrated contextualized hybrid format or not offering developmental education in the linked or integrated formats. Using the data collected from the surveys, follow-up phone calls with administrators and faculty at colleges identified as using contextual formats to deliver basic skills were conducted to identify specific courses and the unique codes that would identify the course in the database as well as request course documents for the contextualized courses. Course materials collected were used to corroborate

contextualization claims. Courses verified as structured to develop and strengthen foundational academic skills in a curriculum that is contextualized to a specific occupational or content area where applied learning occurs were coded as verified.

Quantitative Data Collection

The data collection for the study began with a survey sent to three college administrator e-mail addresses at each of the 110 California community colleges for a total of approximately 330 surveys. Chief Instructional Officers (CIO), usually vice presidents of instruction, and Administrators of Occupational Education (AOE), usually a dean over an occupational area, were targeted using alias lists maintained by the Chancellor's Office. The Project Directors of the Carl D. Perkins local assistance grants were each emailed the survey using e-mail addresses in their local applications.

Project directors may be CIOs or AOEs, and including them may add or duplicate district recipients. Additionally, AOE lists often include multiple deans or other administrators at each college. Because of the duplication and multiple recipient characteristics of these e-mail lists, the number of actual survey recipients is only approximate. Multiple administrators at each college were targeted in an effort to triangulate responses and assure identification of colleges offering contextualized courses. Each of the administrators selected was assumed to have specific knowledge that would help identify courses being offered in a linked or hybrid format. The CIO, generally, will have broad knowledge of assessment and placement policies and basic skills requirements. The CIO may also know of innovative instructional approaches being used at the college. The AOE and Perkins directors often have intimate knowledge of innovations occurring in the occupational programs and have access to discretionary

funds to promote innovations that may have included integrating basic skills into content area courses.

The survey, along with the letter introducing the study and requesting participation, was sent together electronically to e-mail addresses previously mentioned. The letter requested that if the recipient was not knowledgeable about these types of courses at the college, the recipient forward the letter and survey to the appropriate individual at the college who may know whether this type of instruction was offered. Both e-mail and fax were used to accept survey responses.

For all non-respondent colleges, a second and third e-mail follow-up occurred to a verified e-mail address. Second e-mail correspondence addresses were verified through investigation on the college web site and telephone contact to the instructional office identifying the study and requesting a valid e-mail address.

The survey, included as Appendix B, included the following requests for information about specific vocationally linked or contextualized basic skills instructional practices in place for the 2006-2007 academic year:

1. college name;
2. the types of contextualized courses offered at the college (i.e., infused, linked to content course, linked in a learning community);
3. contextualized basic skills instructional areas such as reading, writing, or math;
4. contact information for faculty teaching contextualized courses; and
5. contact information for the respondent.

Qualitative Data Collection

For the 35 colleges responding that indicated the use of vocationally linked or contextualized courses for delivery of basic skills, follow-up telephone calls with administrators and faculty were scheduled and conducted to identify specific courses and request course materials from faculty. Initial correspondence with faculty providing course materials included an overview of the study, the study purpose, and statements of confidentiality and data security.

Follow-up calls and emails with survey respondents and the faculty contacts provided on the survey were used to (a) verify the vocational nature of the course, (b) expand data collection through identification of specific course identification numbers of contextualized courses that uniquely identified the course in the Chancellor's Office management information systems (MIS) database and (c) request course materials from faculty teaching linked and contextualized courses. Course and section identifiers of the contextual basic skills courses were verified as existing and correct in the system office MIS database during those interactions. Follow-up with faculty teaching linked, infused or hybrid courses was intended to be limited to course identification and requests for specific artifacts such as course syllabi, assignments, quizzes, and midterm and final assessments.

Data Analysis Procedures

The qualitative data collection and analysis followed the guidelines of qualitative research as identified by both Creswell (2003) and Patton (2002) as described in the following sections. Additionally, criteria were developed and adjusted throughout the data collection process to evaluate contextualization of courses and level of basic skill

instruction (e.g., basic arithmetic, pre-algebra, elementary algebra, etc.) based on the data analysis. The following procedures were used to analyze the course materials:

1. Syllabus and course outline of record – These materials were examined to identify occupational themes that corroborate claims of contextualization in four areas: course descriptions, learning objectives or student learning outcomes, class assignments, and required reading and text selections.
2. Course outline of record – These materials were also examined for proper classification in the basic skills sequence of courses. Learning objectives and student learning outcomes were compared to standard basic skills course objectives and outcomes.
3. College catalog entries – These materials were also examined for proper classification in the basic skills sequence of courses. Whether the course had or met prerequisites was considered in the placement within the basic skills sequence of courses.
4. Classroom assignments – Classroom assignments were evaluated on whether they clearly make the connection between the academic and occupational content.
5. Assessments – Assessments were evaluated for (a) basic skills content assessed in an occupational context and (b) both academic and occupational skills are assessed.
6. Courses were coded on (a) any co-enrollment policies such as required co-enrollment, (b) allowed co-enrollment in courses normally requiring prerequisite basic skills, or (c) other policies emerging on co-enrollment.

7. Other available artifacts such as course flyers or marketing material were analyzed using a similar process.

Phase I – Preliminary Analysis Results

The first phase of this study resulted in a narrowing of the analysis to credit basic skills math courses. Although responses to the survey (N=39) from 35 colleges included 13 reading and writing contextualized basic skills courses, follow-up contacts with faculty eliminated nine of the thirteen identified as being offered in a noncredit mode. The study is limited to credit courses because of the difficulty of identifying student success in ungraded noncredit courses in a single semester or two adjacent semesters. Noncredit students who successfully remediate and eventually enroll in degree applicable credit bearing math or English courses often do so over many semesters. Additionally, the narrowing of focus to math courses was also influenced by the unavailability of course materials for contextual verification. Faculty in two of the three remaining reading and writing credit courses could not provide course materials for verification of contextualization. With only one remaining writing contextual course validated with course materials and minimal enrollments, the decision was made to focus the analysis on the basic skills math courses being offered. And, the particularly large group of students underprepared in mathematics in the California community colleges (Bahr, 2008) and the large number of students who do not successfully remediate added importance to the focus on mathematics and the efficacy of innovative ways to increase success rates for those underprepared students.

The types of academic-occupationally integrated credit courses and instructional methods reported at the 35 responding colleges were extremely limited. The descriptive

statistics listed in Table 1 indicate the prevalence of vocationally linked and contextualized credit basic skills courses reported by the 39 respondents in the California community colleges by the type of contextualization and the instructional area (i.e., Math, Reading, and Writing). The table illuminates the scarcity of basic skills integrated within vocational content courses reported by the respondents representing 35 colleges.

Table 1. Vocationally contextualized credit basic skills courses reported by type of contextualization in colleges responding to the survey.

	Colleges	Credit Courses	Courses after artifact review
Total Responses (N=39)	35		
No credit contextual courses reported	25		
No credit contextual Math courses	26		
Credit contextual courses	10	16	11
Hybrid or Infused content total	9	13	10
Math	9	13	10
Linked content total	2	3	1
Reading	1	1	0
Writing	2	2	1
Learning communities	0	0	0

Note. Noncredit and non-vocational courses are not reported in this table. No infused content Reading or Writing courses, or linked content Math courses were reported, therefore, no lines were included for them in the table.

No colleges reported academic-occupationally integrated learning communities that included basic skills courses among the 35 colleges responding to the survey. Twenty-five colleges reported offering no contextual basic skills courses and 10 colleges reported offering a total of 16 contextual basic skills courses. However, after the artifact review only 11 courses were of sufficient length and content for consideration in the study.

Twenty-six colleges reported no contextual math courses while nine colleges reported 13 credit basic skills math courses. All 13 courses were hybrid formats (equal emphasis on both occupational and academic content) or had infused basic skills content (academic content modules) within occupational content. However, three math courses were dropped from the study due to comparability problems. All three had short durations (i.e., workshop formats) and one of those had restrictive grading policies complicating comparisons even of short duration courses (i.e., a healthcare dosage class graded pass or no pass with 90% correct on the final exam required for passing) leaving 10 contextualized math semester length courses verified through course materials.

Two colleges reported offering contextual basic skills reading and writing courses. One of those colleges offered both contextually linked basic skills reading and writing courses that used an occupational course's materials or assignments to teach reading or writing. However, no course materials could be provided by the faculty other than fliers marketing the courses. While these courses were categorized as linked courses, they might be considered individualized instruction since, for example, each of the students in the reading class had their own remediation plan for the semester using course materials for the course from which they were referred. Under these conditions,

course materials would be student specific and the faculty were unwilling to share those materials other than through on campus observations. The other college responding with a linked writing course reported offering contextualized credit courses in both math and writing, and supplied course materials for both, resulting in a total of 10 colleges reporting contextual courses. With only a single English writing course available for analysis both reading and writing courses were dropped from the study.

Although the survey requested information on credit basic skills courses with academic and occupationally integrated content, three respondents reported other types of contextualized and linked content courses. Those responses cannot be considered representative of other types of linked and contextualized courses being offered, since the survey excluded them, however they do suggest that other types are being offered in the colleges. For example, three colleges reported linked basic skills reading and writing courses that were not vocationally contextualized. Because those courses were linked to General Education courses rather than courses with vocational content, they were not reported in Table 1 and were not included in the study.

The table also does not include six study skills courses (two credit and four noncredit), one noncredit math, four noncredit reading and four noncredit writing courses that were included in the responses. The noncredit reading, writing, and math contextualized courses were typically offered as short-term noncredit workshops and were not used in the study. Noncredit courses were specifically excluded from the study and because of the difficulty determining success in the short term window (i.e., two semesters) of this study.

The final group of contextualized math courses (N=10) used in the study consisted of math courses in a variety of areas. Two math courses were in the area of healthcare. One technical math course was in an apprenticeship program for electricians. One course was a general applied math course incorporating a number of occupational contexts. The remaining six courses were in a variety of trade and occupational areas with typical names that included the name of the occupational area and typically started or ended with the term math or mathematics of such as "Applied Construction Math" and "Math of Electronics."

Assumptions and Limitations

This portion of the study was founded on the assumption that participants in the study will respond to the best of their knowledge and beliefs. The assumption was also made that faculty and administrators are proud of the work they do and may tend to exaggerate the degree to which courses are contextualized and linked as well as how successful their students are. For this reason, contextual claims were verified with course materials. An additional assumption was that some level of administrator or department chair would know if contextual basic skills courses were being offered at their college. While this last assumption seems reasonable, a number of complications can limit the knowledge of local administrators about the courses in their areas as described below.

There are a number of limitations of both the data collection system and the classification process. The first limitation arises from the different structures in place at community colleges across the state of California and the distance those structures put between instruction and administration. Email content accompanying the survey responses often suggested that administrators were frequently unaware of whether or not

contextualized courses were being offered at the college. Additionally, division deans and department chairs were often only in place at the college for a few years (or months) and may not have been aware of contextual courses being offered in their area. Many administrators at colleges who reported that there was no contextual coursework occurring may simply have not known about the work being done in the classroom. However, in those colleges that did report contextual coursework, the number of course sections was small in every case. In all cases but one, contextual courses were coded in the area of the content course (e.g., electronics, nursing, HVAC, etc.) and therefore would not be included in the standard pre-algebra courses used for comparison.

A second limitation stems from the categorization process. A variety of topics may be included in a contextualized basic skills math course. For example, a technical math course for different occupational areas may contain a number of levels of math specific to the occupation. Although each of the contextual math courses examined included a majority of concepts of pre-algebra (e.g., fractions, decimals, ratios), they also included concepts from elementary algebra and sometimes geometry or intermediate algebra that applied to the specific vocational area of context. Since none of the courses included all of the concepts from elementary algebra and could not be used as a prerequisite for either elementary or intermediate algebra, they were classified at a pre-algebra level and were compared with standard pre-algebra courses. This classification limitation is exacerbated by the vastly different successful remediation rates of students needing pre-algebra, who have low successful remediation rates when compared to those needing to start at elementary algebra who have higher but still dismally low successful remediation rates (Bahr, 2007, 2008).

The Researcher's Role

Qualitative research requires that the researcher consider and document personal biases, values, assumptions and interests that may impact their analysis since the researcher is the primary data collection instrument (Creswell, 2003). This researcher's previous and present roles as a college researcher, a community college system office researcher, and a vocational education specialist in the community college system office must then be considered and procedures put in place to limit the bias of those experiences. This unique set of experiences undoubtedly influence my perceptions of faculty, administrators, and the importance of both developmental education and vocational education in the lives of many students enrolling in community colleges. This influence is recognizable in this author's selection of topics for prior research and publications (Sanchez, Laanan, & Wiseley, 1998; Mathur, Reichle, Strawn,& Wiseley, 2004). Those research projects investigated and demonstrated a dramatic impact on earnings for students who persist in occupational education in the community college system. Specific criteria were developed, as mentioned in the previous section, to reduce subjective bias in the collection and analysis of course materials. More specifically, course materials including assignments and assessments were required to verify contextual claims and detailed descriptions of the categorization process were maintained in an effort to avoid mis-categorization based on any influence of this bias.

Additionally, Creswell (2003) argues that when researchers study their own organization, power issues may result in biased, incomplete or compromised data. Significant efforts to separate the study from the researcher's responsibility as a system office staff were made through a clear identification of the researcher and the research

project with the University of the Pacific. Additionally, assurances to the survey recipients about the lack of consequences for non-response to the survey were included. Telephone follow-up conversations for requests of course materials were designed to cultivate and maintain trust relationships between faculty and the researcher beyond those specified in the survey introductory letter with special consideration to maintaining confidentiality and anonymity of college respondents.

Ethical Considerations

Creswell (2003) argues that the researcher should address ethical considerations and respect the rights, needs, values, and desires of informants. This is particularly important when sensitive information about classroom pedagogy and assessments are communicated by the informants. Confidentiality to protect the administrators and faculties' rights was maintained and assured using a number of safeguards. The following safeguards were implemented in the qualitative portion of the study: (a) the research objectives were clearly stated along with a description of how the data was used and kept confidential, (b) results from the analysis of individual course materials is only reported in summary fashion, (c) informants' rights and interests took primacy as data was developed for reporting, and (d) informants' anonymity was assured.

Internal Validity

Data triangulation was used to ensure internal validity of the data collected from administrators and faculty. First, surveys were administered to administrators at multiple levels (i.e., chief instructional officers, administrators of occupational education, and occupational deans managing Perkins projects). The email with the survey requested the recipient to forward the survey to an appropriate recipient if there was someone else who

would be more knowledgeable about the instructional offerings at the college including Deans, department chairs, and faculty. All levels of recipients responded to the surveys with eight responses from chief instructional officers, 18 responses from deans, and 13 responses from department chairs or faculty. Only four colleges had responses from two recipients while the rest of the colleges had single recipient responses. Of the eight responses from chief instructional officers, two were contradicted by occupational deans (and eventual artifact verification) and two included noncredit courses not relevant to the survey. With 13 responses coming from department chairs and faculty who were not targeted by the e-mail survey distribution process, it is evident that administrators often forwarded the information request to individual department chairs and faculty as requested in the survey.

Course contextualization assertions of administrators and faculty were verified with course artifacts to triangulate the assertions verifying that both basic skills and occupational content were apparent in the materials. There were no instances where of course materials invalidated claims of contextualization. There were, however, two instances where course materials were not made available to support the contextual claims made by administrators and then faculty.

Phase One Conclusion

With nearly a third of the community colleges in California responding to the survey (35 of 110) and less than a third of those (N=11) reporting contextual basic skills courses, it appears that among respondent colleges, contextual forms of instruction are not regularly used in the basic skills area. Moreover, with only a few vocationally linked courses in reading and writing reported, this form of instructional delivery of those basic

skills appears to be rare. Even in the nine colleges offering contextual basic skills math, there were only one or two courses, most often with a single section, except at one of the colleges which offered three math courses with one section each in three different occupational areas.

Once contacted, faculty were most often happy to provide course materials to assist in classifying their courses for the study. In only two cases were faculty unwilling or unable to provide course materials that could be used to verify contextualization such as course outlines, homework assignments and assessments.

Overall there is no clear indication whether this is a sample of more active colleges or just a convenient sample who responded to the survey. Generalizations of this part of the study should be made with care as there is no evidence that colleges who responded were more or less likely to offer contextualized courses than the 75 colleges who did not respond to the survey after multiple targeted emailings.

Phase II

The second phase of the study used results from the first phase (i.e., specific course identifiers and types of implementation) matched with MIS data maintained by the CCC system office including student, course, and enrollment data from the respondent colleges to analyze the effectiveness of contextualized courses.

Linking Phase I Results to Outcomes

The effectiveness of credit contextual and linked course modes of instruction was analyzed for those students in credit course sections identified in Phase I as using contextualized curricular design and students in comparable standard basic skills math courses at respondent colleges using data from the CCC Chancellor's Office MIS

database. To facilitate this analysis, data for both contextual and non-contextual basic skills students from the respondent colleges was extracted using data identified in the Phase I data. The following steps were taken to extract and merge the two data sources:

1. A data file consisting of college, term, course, and section identifiers from the first phase of the study was developed.
2. Courses were identified as being within one of the three groups (a) contextual math courses, (b) standard basic skills math courses at colleges offering contextual courses, and (c) standard basic skills math courses at colleges reporting that they did not offer contextual basic skills courses.
3. Identifiers for students at the 34 responding semester colleges, of the 35 quarter and semester colleges, were extracted for all students enrolled in courses identified in step one.
4. Course data, including vocational status or "SAM priority code," degree credit status, transferable status, and grades, along with student demographic (e.g., age, ethnicity, and gender) and financial aid data were extracted for all courses and students identified in step two.
5. Course and student outcome data were also extracted for all courses in the semester following the basic skills enrollment semester.

The students enrolled in contextual basic skills courses during the fall of 2006, or an adjacent semester when the course was not offered in the fall semester but is on an alternating basis, were coded into one of three groups from step two. Those groups were: students in (a) linked or contextual courses, (b) standard pre-algebra basic skills at colleges offering contextual courses, and (c) standard pre-algebra basic skills courses at

colleges not offering contextual courses. Standard pre-algebra courses were identified through the basic skills identifier for pre-algebra in the taxonomy of programs field and verification through course elements such as title, pre-collegiate basic skills, credit, and transferable status fields; and college catalog entries. Math workshops and labs at the pre-algebra level were excluded due to concerns over comparability of full semester contextual courses to short duration and focused content workshops and labs. Outcome data was extracted for two terms coded as occurring in the *initial* term or the term *following* the basic skills enrollment term.

Excluded Records

The data extracted was limited to only semester colleges in the CCC system. Most of the colleges in the community college system in California operate on a semester basis that spans approximately 18 weeks. Some colleges, however, operate on quarter system with about 10 weeks in each term. One of the 35 colleges responding to the survey was a quarter system college reporting no contextualized courses. Whether the success rates in the standard basic skills courses in quarter schools is similar to success rates in semester schools is uncertain so the quarter school was dropped from this study. Dropping the quarter system college from the 35 responding colleges left 34 colleges of which 25 colleges reported no contextualized basic skills courses. Enrollments in courses resulting in a grade of unknown (XX), ungraded (UG), or report delayed (RD) were not included since grades were used to determine successful course completion. Additionally, students with unknown values for age (999), gender (X), or ethnicity unknown (X) or decline to state (XD) were not included in the extract since these variables were used as independent variables.

Final Sample

In Table 2, the age, gender, and ethnic distributions of the three sample groups are provided for comparison. A total of 17,152 students were included in the final sample. The demographic characteristics of the three groups differ only slightly between the two

Table 2. Comparison of the three sample groups by gender, ethnicity, and age.

		Contextual		Standard 9[a]		Standard 25[b]	
		Number	Percent	Number	Percent	Number	Percent
Total (N=17,152)		392	100.0%	3,657	100.0%	13,103	100.0%
Gender	Female	112	28.6%	2,245	61.4%	8,226	62.8%
	Male	280	71.4%	1,412	38.6%	4,877	37.2%
Ethnicity	Asian/PI	59	15.1%	458	12.5%	1,119	8.5%
	Black	44	11.2%	513	14.0%	1,840	14.0%
	Hispanic	124	31.6%	1,683	46.0%	5,313	40.5%
	Other	14	3.6%	126	3.5%	421	3.2%
	White	151	38.5%	877	24.0%	4,410	33.7%
Age	Under 20	79	20.2%	1,717	46.9%	6,475	49.4%
	20-29	189	48.2%	1,317	36.0%	4,482	34.2%
	30-39	69	17.6%	336	9.2%	1,145	8.7%
	40-49	34	8.7%	208	5.7%	718	5.5%
	50+	21	5.4%	79	2.2%	283	2.2%
Median Age		23		20		20	
Age Range (Low – High)		14 – 63		13 – 76		13 – 78	

Note. Asian includes Asians, Filipinos, and students from Pacific Island nations. Other includes Native American and Other Non-white.

[a] "Standard 9" represents the group of students in the standard basic skills courses at the nine colleges reporting contextualized basic skills courses.

[b] "Standard 25" represents the group of students in standard basic skills courses at the 25 colleges reporting no contextualized basic skills courses at their colleges.

groups of students enrolled in standard pre-algebra courses (Standard 9 and Standard 25) but are very dissimilar to the contextual group. First, the gender distributions are within two percentage points between the two groups of students in standard pre-algebra courses. Females comprised 61.4% of the students in standard pre-algebra courses at the nine colleges reporting contextual courses (Standard 9) and 62.8% of students in pre-algebra at the 25 colleges reporting no contextual basic skills courses (Standard 25).

However, the gender distribution of the students in the contextual courses with 71.4% males is very different than the two standard math course groups with both at under 39% male. This higher concentration of males in the contextual group might be expected since most of the vocational programs with contextual basic skills courses reported were in male dominated occupations. Only two math courses reported in the healthcare area were exceptions.

Ethnic distributions of the three groups are also quite different. Hispanics and Whites together represented about 70% of each of the three groups. However, the White category was the largest in contextual group (38.5%) but Hispanics were the largest category in the two standard pre-algebra groups with 46% of students in the *Standard 9* group and 40.5% of the *Standard 25* group of students. Asians appear slightly over represented in both the *Contextual* (15.1%) and *Standard 9* (12.5%) groups relative to the *Standard 25* group at 8.5%.

Although median ages were only three years apart between the contextual and standard groups (23 years old and 20 years old, respectively), the contextual group appears older when reviewing each of the age categories. The age distributions between the two groups (Standard 9 and Standard 25) in standard pre-algebra courses are very

similar with a maximum of 2.5 percentage points difference in the Under 20 age group. However, the contextual group has 26.7 percentage points fewer students than the Standard 9 group in the Under 20 age category and 12.2 percentage points more than the Standard 9 group in the 20-29 age category. Each of the contextual groups categories represented for 20 years old or older show much higher percentages relative to the two standard groups.

Given all these differences, the contextual group is older, more White and male dominated. These demographic differences may be the result of the predominately vocational status of the students in the contextual group as shown in Table 3 and the primarily male dominated occupations the contextual courses prepare students for. While the overwhelming majority of students in the contextual group (79.3%) enrolled in a vocational course above the introductory level (i.e., Vocational status is vocational), only a small percentage of the two standard groups (13.5% and 18.2%) took vocational courses above the introductory level while enrolling in the math course.

Students in the Contextual group also received fewer Board of Governors course fee waivers, only 33.4%, relative to the students in the two standard groups with 56.2% of the Standard 9 group and 49.3% of the Standard 25 group receiving fee waivers. Students in the two standard groups also received cash grants at higher rates than the contextual group. While nearly 19% of the contextual group received a cash grant, about 30% of the standard groups received grants. However, the median grant amount and the mean grant amount were very similar across the three groups. While the median grant amount in the Standard 25 group was just over 10% less than the Standard 9 group grant amount, both the median and the mean grant amounts were nearly identical between the

Table 3. Comparison of the three sample groups by vocational status, course fee waiver, grant receipt and grant amounts.

	Contextual		Standard 9[a]		Standard 25[b]	
	Number	Percent	Number	Percent	Number	Percent
Total (N=17,152)	392	100.0%	3,657	100.0%	13,103	100.0%
Vocational Status[c]						
Not Vocational	81	20.7%	3,162	86.5%	10,719	81.8%
Vocational	311	79.3%	495	13.5%	2,384	18.2%
Board of Governors Course Fee Waiver						
No Fee Waiver	261	66.6%	1,601	43.8%	6,640	50.7%
Received Fee Waiver	131	33.4%	2,056	56.2%	6,463	49.3%
Received Cash Grants						
No Grant	318	81.1%	2,493	68.2%	9,345	71.3%
One or more Grants	74	18.9%	1,164	31.8%	3,758	28.7%
Received $1000-$2999	51	68.9%	820	70.5%	2,623	69.8%
Grant Range	$200 - $5,038		$100 - $8,238		$7 - $7,221	
Median Grant Amount	$2,025.00		$2,025.00		$1,819.00	
Mean Grant Amount	$2,059.61		$2,002.18		$1,708.42	

[a] "Standard 9" represents the group of students in the standard basic skills courses at the nine colleges reporting contextualized basic skills courses.

[b] "Standard 25" represents the group of students in standard basic skills courses at the 25 colleges reporting no contextualized basic skills courses at their colleges.

[c] "Vocational Status" indicates that the student enrolled in a vocational course above the introductory level during the same term as the math course.

Standard 9 and Contextual groups. The range for the grant amounts for both standard groups were wider at both the low and high range. While grant amounts were both lower and thousands of dollars higher in the standard groups than in the Contextual group, the

percentage of students receiving at least $1000 but less than $3000 does not vary across the three groups more than 1.6 percentage points. While those who apply for grants and fee waivers differs between the contextual and standard groups, eligibility for grants based on family size and income that meet the income standards for receipt of cash grants appear to be similar for those who apply for cash grants. While course registration fee waivers and grant receipt have been used as a proxy of socioeconomic status (Bahr, 2008; Dowd & Coury, 2006), it is uncertain how accessible financial aid offices are to vocational students on many of these campuses. This reduced accessibility may influence the differential rates seen in Table 3.

Quantitative Phase II Analysis

The effectiveness of contextual and linked modes of instruction will be analyzed using a panel study with a causal-comparative research design (Gall, Gall, & Borg, 2002) on a number of student outcomes (dependent variables) using logit analysis. Gall, Gall and Borg (2002) suggest that this type of non-experimental investigation is appropriate when the independent variable (i.e., enrollment in the contextual course or not) is measured in the form of categories.

Logit analysis, or logistic regression, is particularly useful in research where the dependent variable is dichotomous (Grimm & Yarnold, 2003; Huck, 2004; Zelterman, 1999) such as in this research where the dependent or response variables are a type of success or not. Additionally, when the assumption of homogeneity of variance (i.e., variance within each of the groups is equal), also known as homoscedasticity, cannot be met, logistic regression remains efficient. Moreover, logistic regression, log-linear and logit methods have relaxed data assumptions compared to ordinarily least squares (OLS)

regression. Wright (Grimm & Yarnold, 2003, chap. 10) in his chapter on logistic regression adds that there is not only no assumption of homoscedasticity, there is no assumption that the dependent and independent variables have a linear relationship nor does the dependent variable need to be normally distributed or the independent variable be bounded. However, there is an assumption that there is a linear Logit relationship. And, as in linear regression analysis the outcomes must be statistically independent. In other words, both conditions of the outcome cannot occur for an individual in the study.

Dependent Variables

All of the outcome measures (i.e., dependent variables) in this study are dichotomous. Specifically, whether student either passed a basic skills course or not, persisted to the next term or not, enrolled in college-level coursework or not. For each of the dependent variables the number of students in the sample may vary. For example, the number of students who pass a degree applicable course will depend on the number of students who attempt a degree applicable course. The number students in the sample will be made clear at each step of the analysis.

The first outcome will indicate whether the student passed the basic skills course, termed "Passed" using the criteria from Bahr (2007), where the student earns a passing grade of A-D, P (pass), or CR (credit) in the initial term. The second set of outcomes measure how quickly students move into and successfully pass degree applicable credit bearing (i.e., college-level) coursework and transferrable coursework. While all coursework that is "transferable" to the California State University system or the University of California system is degree applicable, not all degree applicable coursework is transferable. For example, while intermediate algebra can be applied to

the associate degree in the community college, a degree applicable course, intermediate algebra does not transfer to either of the public four-year systems in California and is therefore not "transferable." Although this study differentiates between the two types of courses in regards to their transferability, it does so as an indicator of higher level coursework. Caution should be taken when interpreting the rates of students attempting transferrable courses since many vocational certificate programs do not require or include courses that are transferrable.

Previous research (Bahr, 2008; Bailey & Morest, 2006; Grubb & Associates, 1999; Perin, 2001b, 2007) has identified student persistence and progression into college-level coursework as an important factor in student persistence to degree. Bahr (2008), however, argues that persistence, as an outcome, is not really a goal of remediation. Student persistence as simply "sticking around" may not help students progress into or through college-level course work. In this study, persistence is considered necessary but not sufficient as an outcome leading to progression into college-level course work.

The study examines enrollment in and successful completion of college-level courses during the initial enrollment term and the following term. Because the contextual basic skills courses are often certificate and degree applicable due to their occupational (i.e., contextual) content, the study examines successful college-level work with and without the contextual math courses counted as college-level work during the initial enrollment term. However, it should be noted that the contextual nature of the course is intended to increase students' ability to learn occupational content that is degree applicable. Persistence to the following term, enrollment in any credit course at the

college, was also measured as an initial indication of progress toward longer-term certificate and degree completion.

Independent Variables

To evaluate the effectiveness of contextualized basic skills courses on those outcomes identified as dependent variables, three basic groups of students were defined. Students enrolled in courses identified as contextualized basic skills courses were coded into the first group. Students identified in the comparable basic skills courses at responding colleges were coded into two groups depending on whether contextual basic skills courses were offered at the responding college or not. This predictor variable, enrolled in a contextualized course or not, was included in the logistic regression model as an indicator of group membership identifying participation in the contextualized basic skills course.

Control Variables

A number of covariates were included as control variables. Student age, gender, ethnicity, vocational status, and two proxies of socioeconomic status (SES) were included as control variables in the final model. The demographics are included as controls because there is considerable difference in our three sample population demographics and these demographics have been identified as predictors of successful remediation in prior research (Bahr, 2007, in press).

Students in the contextual courses were generally older than the students in the standard basic skills courses with considerably fewer students under 25 years old in the contextual group. Controlling for age should diminish effects of the age differences in our sample groups on the outcomes of interest in this study. Age-at-term of enrollment is

treated as a continuous variable and is calculated using birth date and semester start date. Age squared was also used to test the linearity of the effects of age. Adding the quadratic term of age and age squared can provide additional information on the effects of age throughout the range of ages of students in the sample and may provide a better model fit when age actually has a curved relationship rather than a linear relationship.

With the contextual group being predominantly male (71%) while females constituted over 61% of the students in the two standard basic skills groups, controlling for the effects of gender on the outcome measure is critical. Gender was coded as a dichotomous variable (female= 1; male= 0).

While the ethnic distribution across the three groups was quite similar, there was a considerably higher percentage of Hispanic students in the standard basic skills groups than in the contextual group and more White students in the contextual group than in the standard basic skills groups. With the concerns raised by Bahr (2007, in press) over the barriers of prior educational experience and considerably lower odds of successful remediation of Black and Hispanic students, ethnicity will play a considerable role in this analysis and an important role as a control variable. Ethnicity was collapsed into five nominal categories of Asian, Black non-Hispanic, Hispanic, Other, and White treated as dummy variables with White as the excluded category. To maintain significant group numbers, Asian included Asians, Filipinos, and all students reporting to come from Pacific Island nations. The "Other" category includes Native American and Other Non-White categories.

Student Vocational Status is used as a control variable because prior research has shown that vocational students had higher motivation to complete courses once they had

decided on an occupational path (Grubb & Associates, 1999). With the extreme differences in the percentages of students classified with a vocational status between the contextual and standard basic skills groups, it is imperative that we examine the effects of vocational status on the outcomes of interest in this study.

The three available variables that could serve as proxies of SES are Board of Governors Fee Waivers, Receipt of any Grants, and total Grant amount as indicated by prior research (Bahr, 2008; Dowd & Coury, 2006; Singell, 2007). The barriers that students from lower socioeconomic status groups are confronted with often contribute to their low persistence rates in the California community colleges (Mathur, Reichle, Strawn, & Wiseley, 2004). With the large differences in rates of students receiving fee waivers and grants between the three sample groups, it is imperative that we reduce the effects of these barriers when examining the effects of contextual methods of instruction.

The first SES proxy is a dichotomous variable indicating receipt of a Board of Governors fee waiver during the initial term when the math course was taken (received fee waiver = 1; did not receive fee waiver = 0). Fee waivers are based on household income and family size standards set at 150% of poverty. The second proxy is a dichotomous variable indicating receipt of any grants during the initial term when the math course was taken (received one or more grants = 1; did not receive any grants = 0). The third proxy is a continuous variable indicating the total monetary value of any grants received during the initial term. Students who did not receive any grants during the initial term are assigned a value of zero on the grant amount variable.

Recent prior research (Dowd & Coury, 2006; Singell, 2007) indicates that eligibility for financial aid, as an indices for family size and income, along with dollar

amounts of grant awards can be used as predictors of retention and graduation. With the grant amount available as a continuous variable representing unmet student financial need based on eligibility criteria, the dichotomous variable for receipt of any grant was considered redundant and was not included in the model. Because the logistic regression produces estimates of likelihood for each unit of increase, the amount of the grant was divided by 500 to so that the effect estimate would indicate an increase in $500 increments of the grant. Additionally, because the continuous nature of the grant amount and the concern that it is unlikely that the effects of the grant amount received would be linear, for example the effects of a $7000 grant would be seven times the effect of a $1000 grant, a grant-squared term was added to the model to test for a curved relationship rather than a linear relationship with grant amount.

Assumptions and Limitations

Certain assumptions about and limitations of the data and analysis used in the second phase of the study are described in the next two sections. Although these assumptions and limitations focused most directly on the data and methodology in phase two of the study, the effects of limitations of phase one data influence the limitations addressed here.

Assumptions

The basic assumptions in this phase of the study included assumptions about the accuracy and completeness of the data. The first assumption involves the accuracy of the management information system (MIS) data maintained by the CCC Chancellor's Office and the coding of courses as basic skills at the colleges. Since both policymakers' attention and funding for basic skills courses have continued over the past few years, the

public nature of the data and the required audit trails provide some assurances of the data accuracy and completeness for at least the variables used in this study.

Limitations

The data assembled for the study has a number of strengths and weaknesses. Although the MIS includes the population of the 110 California community colleges, this study includes only those students from the 34 responding semester colleges who enrolled in either contextualized or comparison basic skills math courses. Additionally, a number of data specific weaknesses must be stated.

First, assessment of student math abilities for math placement may not have occurred for vocational students or students asserting vocational goals. Assessment policies, practices, and assessment instruments at colleges vary (Perin, 2006) and many colleges requiring assessments exclude vocational or career oriented students. The placement of students in the comparison group basic skills courses can also be considered a weakness of the data. Accurate assessment of math skill levels to determine the appropriate math placement across the colleges as well as the predictive ability of many assessment tests has been questioned in numerous research studies (Attewell et al., 2006; Behrman & Street, 2005; Perin, 2006).

Second, the study does not examine prior basic skills enrollments or successes at either the responding colleges or other colleges or adult education schools. Students with previous efforts to remediate math skill deficiencies, although expected to be only a small fraction of the sample, should be considered in evaluating the findings of this study.

Next, the study does not include a number of factors impacting students' success such as student motivation, hours of employment, course loads, financial need, parental

status, and a number of other life circumstances. The study also did not include institutional characteristics that may impact student success such as size, location (i.e., Urban, rural, suburban), or any measures of faculty or student diversity.

Finally, there are concerns of generalizability that must be considered. The population groups addressed in the study are all from the same system of California public community colleges. Additionally, although the sample contains nearly a third of the colleges in the system, colleges included were only those who responded to the survey. Policies and practices vary from college to college within the system. Whether the policies and practices of the responding colleges bias the outcomes sufficiently to deter generalization to the remaining colleges in the system or to other states is uncertain.

CHAPTER IV.

FINDINGS

This study examines the extent and effectiveness of using vocationally contextualized formats for delivering basic skills instruction in California Community Colleges (CCC). This chapter will detail the findings of the data collection and analysis of the data related to both the extent of use of contextualized formats and the effectiveness of the vocationally contextualized courses compared to standard basic skills courses at the same level.

Extent of Contextual Basic Skills in the CCC System

Contextual basic skills math courses were scarce at the responding colleges. Among the 35 colleges who responded to the survey, 10 colleges offered vocationally contextualized credit basic skills courses. However, in all cases but two the course had only a single section. Furthermore, the average section included only 24.5 enrollments.

Math was the dominant contextualized basic skills subject area reported in the responding colleges. Infused basic skills math in vocational content was reported for 13 credit courses at the responding colleges. There was only one credit vocationally linked basic skills reading course, two vocationally linked credit basic skills writing courses, and no vocational learning communities reported by any of the responding colleges. Even at large colleges, individual programs were often quite small and enrolling a sufficient number of students in a section of a basic skills math course contextualized for a specific program could be a challenge. More importantly, contextual courses were usually found

in isolated programs. Only two of the responding colleges offered a contextual math course for more than one program area.

Enrollments in a technical math course specific to the program area may or may not be required for all students within the program. Additionally, since none of the technical math courses included in the study could be used to meet a math prerequisite for elementary algebra, which would then lead to a college-level intermediate algebra course, students planning to transfer to a four-year institution may have opted for the standard math sequence of courses.

Although not intended as part of the study, a few faculty contacted for course materials volunteered that students in their programs were being counseled away from their technical math course because the course could no longer be used to meet the math requirement for the associate degree[6]. Additionally, they stated that the California State University system would not accept transferable math courses that had an applied math prerequisite. Because of this prerequisite requirement, they suggested, counselors were hesitant to direct students to applied math courses in case the student ever determined that they wanted an associate degree or wanted to transfer. A few also volunteered that because of these recent changes they were abandoning the technical math course and embedding the mathematics material deeper within other required courses within the program such as in a blueprint reading course that would be taken early in the program. In this way they could reinforce the mathematics without losing the student to a remedial math course that might further disengage the student. Again, although the effects of this

[6] In the fall of 2006, the California community college Board of Governors adopted Title 5 changes that would require intermediate algebra or an equivalent course offered outside the math department with elementary algebra skills as a prerequisite. As of fall 2009, any math course that did not meet these requirements could not be used to meet the associate degree math requirement.

policy change were not intended as part of this study, a query against the courses identified for this study that previously met the associate degree requirement, but would not meet the new requirements, showed not only declining numbers beginning in fall 2005 until those courses no longer appeared in the database. While only speculation, the disappearance of the course in the database might possibly be due to a lack of sufficient number of enrollments.

A survey of the course catalogs for these colleges, when available online, reinforced the movement from meeting the math requirement for the degree to no longer meeting the math requirement. And, in the majority of cases this change occurred in the 2007-2008 catalog. While a few faculty reports and a quick query on the courses they taught were not an exhaustive investigation of the effect of these policies, the phenomenon raises concerns and should be investigated further given the outcomes presented in the next section.

Outcomes in the Initial Term

Prior research (Badway & Grubb, 1997; Grubb & Associates, 1999; Kozeracki, 2005, chap. 6; Perin, 2001b, 2007; Price, 2005; Talburt & Boyles, 2005; Tinto, 1998) has suggested that student engagement through the use of contextualized basic skills instruction would provide multiple benefits of increased successful remediation. Some of those benefits include quicker entry into college-level coursework (i.e., credit degree applicable and transferable), and increased pass rates in college-level coursework during the same term as the basic skills instruction. If the increased student engagement of contextualized basic skills coursework applies to basic skills math in the California community colleges, then we would expect to see both increased pass rates for the

students enrolled in the basic skills math courses offered in the contextual mode (Contextual group) compared to the standard mode groups and higher pass rates in college-level work for those in the contextual group.

Table 4 presents the rates of students in the three sample groups passing basic skills math courses and attempting and passing degree applicable courses and transferable courses. The three sample groups presented in the table are:

1. The "Contextual" group is the group of students enrolled in contextual math courses at the nine colleges reporting contextual basic skills math offerings.
2. The "Standard 9" group is the group of students enrolled in standard pre-algebra courses at the nine colleges reporting contextual basic skills math course offerings.
3. The "Standard 25" group is the group of students enrolled in the standard pre-algebra course at the 25 colleges reporting that they did not offer contextual basic skills math courses.

Students in each group must have attempted the basic skills math course to be included in the group. Those same students may have attempted a degree applicable course and may also have attempted a course coded as transferable to a California public four-year university or attempted either of the course types alone. Additionally, because many of the contextual courses are also degree applicable, one of the attractive characteristics of the courses to students, an additional degree applicable category was included for only degree applicable courses other than a degree applicable contextual basic skills course.

The differences between the rates of passing basic skills math and attempting and passing degree applicable and transferable coursework were quite large between the

Table 4. Rates of passing basic skills math courses and attempting and passing degree applicable and transferable courses in the initial term for three sample groups.

	Contextual		Standard 9		Standard 25	
Course type	Number	Percent	Number	Percent	Number	Percent
Total (N=17,152)	392	100.0%	3,657	100.0%	13,103	100.0%
Basic Skills Math						
Passed [a]	337	85.97%	2,181	59.64%	7,749	59.14%
Degree applicable (includes contextual course)						
Attempted [b]	390	99.49%	3,108	84.99%*	11,029	84.17%*
Passed [a]	361	92.56%	2,422	77.93%	8,214	74.48%
Degree applicable (without contextual course)						
Attempted [b]	264	67.35%	3,108	84.99%*	11,029	84.17%*
Passed [a]	245	92.80%	2,422	77.93%	8,214	74.48%
Transfer coursework						
Attempted [b]	228	58.16%	2,913	79.66%	10,361	79.07%
Passed [a]	210	92.11%	2,171	74.53%	7,498	72.37%

Notes. Chi-squared tests of independence indicate significant relationships ($p < 0.0001$) for the likelihood of success between the contextual group and each of the standard basic skills groups. There was no statistically significant relationship between the two standard basic skills groups except as noted.

[a] The percent "Passed" is calculated based on the number attempted for the category.

[b] Students who attempt a transfer course may also have attempted a degree applicable course.

* Indicates significantly different group scores ($\chi^2 = 15.5$, df = 1, $p < 0.0001$).

Contextual and the two standard sample groups. While only one half a percentage point separated the two standard sample groups for the "Passed" basic skills math outcome (59.64% vs. 59.14%), the pass rate for students in the contextual group (85.97%) was

over 26 percentage points higher than the highest standard group (59.64%). Nearly all of the students in the contextual group attempted a degree applicable course (99.49%), when allowing the degree applicable contextual course to apply, while less than 85% of students in the two standard groups did so with the two standard groups again separated by less than one percentage point. More importantly, however, while only 67.4% of the contextual group attempted an additional degree applicable course, 92.56% of them passed that degree applicable course while less than 78% of students in the two standard courses passed the course. Even when the degree applicable contextual course was not used for the attempted degree applicable category and the degree applicable course was in addition to the contextual course, much higher percentages of students passed the additional degree applicable course. Again, the two standard basic skills math groups were separated by only a few percentage points.

While students in the Contextual group attempted transferable coursework at much lower rates (58.16%) than students in either the Standard 9 (79.66%) or the Standard 25 group (79.07%), the two standard groups were only 0.59 percentage points apart. However, students in the contextual group passed that transferable coursework at much higher rates (92.11%) than the two standard groups with both falling below 75% pass rate on the transferable course. The lower rates of students attempting transferrable courses in the contextual group might be expected given that many of the vocational programs are made up of courses that are not transferable to the four-year public colleges in California. Students in those programs pursuing an associate degree would eventually be required to take general education courses that are transferrable but the certificate programs usually require little or no general education coursework.

A bivariate analysis using Chi-square tests independence for each of those outcomes for the three combinations of student groups (i.e., Standard 9 vs. Standard 25, Contextual vs. Standard 9, and Contextual vs. Standard 25) revealed that all of the comparisons with the contextual group mentioned above were statistically significant. Although all of the outcomes in the contextual courses were significantly different ($\chi^2 >$ 35.6, $df = 1$, $p < 0.0001$) from each of the standard groups, the rates for students in the two standard pre-algebra groups from the "9" and "25" colleges were not significantly different from each other except for one case. The single exception where significance was found ($\chi^2 = 15.5$, df = 1, $p < 0.0001$) occurred when comparing the "Attempted" rates for degree applicable coursework between the "Standard 9" (84.99%) and the "Standard 25" (84.17%) groups. Although the percentages are very similar and there is no practical difference, the large Ns (especially in the group for the 25 colleges) contributed to this significance between the two standard groups, and therefore we could not reject the null hypothesis that this difference would not be found in the full population.

These findings suggest that there is little or no difference in the outcomes during the initial term of enrollment in the basic skills math course between the two standard groups (i.e., Standard 9 vs. Standard 25) and the two standard groups both have very different outcomes when compared to the contextual group. With these large and highly significant differences between the contextual and two standard groups and the highly similar rates of the two standard groups in mind, the two standard groups were collapsed into a single standard basic skills math group for further analysis of each of the outcomes.

A simultaneous logistic regression was used to test whether there was a difference in successful course completion of the basic skills math courses while controlling for student demographics (i.e., age, gender, and ethnicity), proxies of SES (i.e., fee waivers and grant amounts) and Vocational Status. The logistic regression was invoked against a model with and without the controls to determine whether the controls had a significant omnibus effect (Wuensch, 2007). The Wald Chi-square statistic used tests the null hypothesis that a parameter is zero, or has no effect, given that the other variables are in the model. The results show that there was little difference between the significance of the Contextual vs. Standard comparison in the reduced model and the full model with controls. With highly significant effects for the "Contextual vs. Standard" in the reduced model (Wald $\chi 2 = 96.6889$, $df = 1$, $p < 0.0001$) and similar effects in the full model (Wald $\chi 2 = 92.3390$, $df = 1$, $p < 0.0001$), there was no evidence of an omnibus effect. To check for effects that may have been introduced by multicollinearity of covariates in the full model, the partial effects were also examined together with the reduced model that included only the group variable as suggested by Huck (2004). The full model odds ratio (*OR* = 4.270, *Wald CI* = 3.179 - 5.736) for the group comparison shown in Table 5 was compared to a reduced model with only the group variable that had a similar odds ratio (*OR* = 4.213, *Wald CI* 3.163 - 5.611) demonstrating that there was no evidence of a multicollinearity effect in the model that included the controls.

As shown by the size of the regression coefficients in Table 5, being in the contextual or standard group provides the largest contribution to passing the basic skills math course. The large positive and significant coefficient for the group variable suggests an increased probability for students in the contextual group. Moreover, the

odds ratio estimates that the odds of passing the pre-algebra course, while controlling for student demographics (i.e., age, gender, and ethnicity), SES (i.e., fee waivers and grant amounts) and Vocational Status are nearly 4.27 times, or 327%, greater for students in contextual math courses than in standard math courses. With 95% confidence, we can infer that in the population, the odds of passing basic skills math course are between 3.18

Table 5. Likelihood and odds ratio estimates of effects of contextualization on passing a basic skills pre-algebra course with covariate predictor partial effects.

Parameter		Coefficient	*SE*	Wald χ^2
Maximum Likelihood Estimates				
Intercept		0.4894 **	0.1721	8.0804**
Group	Contextual	0.7258***	0.0753	93.0114***
Age		0.0244*	0.0105	5.3773*
Age-squared		-0.00025	0.000159	2.4888
Gender	Female	0.1032***	0.0166	38.4527***
Ethnicity				
Asian	vs. White	0.4376***	0.0480	83.0929***
Black	vs. White	-0.4945***	0.0401	152.0024***
Hispanic	vs. White	-0.0688*	0.0300	5.2643*
Other	vs. White	-0.1809*	0.0705	6.5831*
Vocational	No vs. Yes	0.0294	0.0212	1.9108
SES				
Fee Waiver	No vs. Yes	0.1581***	0.0192	67.5138***
Grant Amount[a]		0.1951***	0.0211	85.5770***
Amount-squared[a]		-0.0152***	0.00298	26.0510***

Table 5. Likelihood and odds ratio estimates of effects of contextualization on passing a basic skills pre-algebra course with covariate predictor partial effects. (continued)

Effect			Point Estimate	95% Wald Confidence Limits	
Odds Ratio Estimates					
Group[b]	Context vs. Standard		4.270***	3.179	5.736
Age			1.025*	1.004	1.046
Age-squared			1.000	0.999	1.000
Gender	Female vs. Male		1.229***	1.152	1.312
Ethnicity					
Asian	vs. White		1.140***	1.010	1.287
Black	vs. White		0.449***	0.406	0.497
Hispanic	vs. White		0.687*	0.637	0.741
Other	vs. White		0.614*	0.514	0.741
Vocational Status	No vs. Yes		1.060	0.976	1.152
SES					
Fee Waiver	No vs. Yes		1.372***	1.272	1.479
Grant Amount[a]			1.215***	1.166	1.267
Amount-squared[a]			0.985***	0.979	0.991

Note. Wald χ^2 is based on one degree of freedom for all comparisons.

[a] Grant amount represents $500 for each increment of one.

[b] N = 17,152; The Standard group includes students in both Standard 9 and Standard 25.

Pseudo-R^2_{max} = 0.0525; The *Pseudo-*R^2_{max} is the *Pseudo-*R^2 adjusted to have a maximum of one.

*p< 0.05.; **p< 0.01.; ***p< 0.001.

and 5.74 times as likely for students in contextual courses than for students in comparable standard math courses. The small standard error and the narrow confidence limits suggest that the estimate of a 327% advantage is quite reliable.

It is also important to note that all of the covariates are at least significant at the $p = 0.05$ level with the exception of age-squared and vocational status. More importantly, gender, ethnicity and the SES proxies (i.e., fee waivers and grant amount) have noteworthy effects even when controlling all other covariates in the model. The negative regression coefficients for Black, Hispanic and the Other categories indicates a decreased probability of passing the basic skills math course for those groups compared to the probability for White student reference group. The relatively large contributions for Asians and Blacks suggest the importance of ethnicity in the model. The odds ratios, however, provide an easier interpretation of the partial effects of ethnicity on passing a basic skills pre-algebra course while controlling for all of the other covariates in the model.

Specifically, controlling for all covariates in the model, Black students are only 44.9% as likely to pass the math course as White students. Or, from another perspective, taking the inverse of the coefficient, White students are 223% as likely as Black students to pass the math course. Similarly, the odds of passing for Hispanics are only about 69% compared to White students. Or inversely, the odds of passing the pre-algebra course are nearly 46% greater ($OR = 1.46$) for White students than for Hispanic students (controlling for all other covariates in the model).

The partial effects for gender, while controlling for group participation, other demographics, SES, and vocational status, estimates that females have a 23% greater

likelihood of successfully completing the course than do males. There is also an advantage for older students. The quadratic terms of age and age-squared were entered into the model to test whether there was a linear relationship of age in the Logits. When age-squared is significant, the association of age with the dependent variable may be significantly different than linear and suggests a curved rather than linear relationship in the population. However, in this case the age-squared term is not significant which suggests that the relationship between the logged odds of passing the math course and age do not deviate significantly from linear. However, other transformations of age may be found to be significant and provide more information on the linear relationship.

Even with age-squared being not significant there is evidence that in the samples that there is a slight curve rather than a linear relationship estimating the same change in the odds of the outcome for every one unit change in age. Looking at the effect of age on younger students, the combined coefficients suggest that there is a modest increase in odds for each year of age ranging from 1.5% at 18 years old decreasing to 1% at age 29. This suggests that older students do better than younger students in the early adult years but the annual advantage decreases as the years pass. The advantage for age decreases continually to zero at age 49 where there is no effect of age on the odds of passing a basic skills course. The slope of the combined effect becomes increasingly negative with additional years of age suggesting that younger students do better than older students in passing the basic skills math course after age 50.

The partial effects for vocational status were also not found to be significant. The lack of significance of vocational status suggests that there is no additional advantage for students enrolled in vocational courses in passing the pre-algebra course with the other

covariates in the model. The proxies for SES, however, were highly significant. The highly significant effects of receiving a fee waiver suggests that when the student is eligible for the fee waiver they are less likely to pass the basic skills math course. Not receiving a fee waiver, in other words not having a household income at or below 150% of poverty, increases the odds so that students not receiving a fee waiver are 137% as likely to pass the math course as those who receive a fee waiver. This 37% advantage for students who do not need to apply for and receive a fee waiver may be an indicator of the differences in prior education due to socioeconomic status and the quality and depth of math instruction in local schools available for that population.

The second proxy for SES tells a slightly different story. Because the grant amount and grant amount squared are both significant, there is evidence that the odds ratios are not linear for each increment of the grant amount. For each increase in grant award there is an increased advantage in the odds of passing a basic skills math course over students who do not receive a grant. However, the advantage evens out when the amount reaches about $3,203. The suggest that small amounts of unmet financial need can be moderated through grants up to a certain point. As grant amounts continued to increase, indicating higher amounts of unmet student financial need, the odds of passing the math course decreased indicating that financial need above that point shows similar disadvantages of low SES as seen in the fee waiver effects.

While many of the covariates remained significant even when controlling for contextualized instruction and the other covariates in the model, the impact of ethnicity on the change in odds while controlling for contextual instruction, other demographics, and SES remains quite high. Concerns over the possible differential effects of

contextualized instruction on students in the different ethnic groups led to a post hoc analysis that would determine whether contextual math instruction was more or less effective for the five ethnic groups in the study. Nine dummy variables were created that combined an ethnic category and an indicator of group participation (i.e., Contextual or non-contextual). Those variables were then compared to a reference category of White students in non contextual math. For example, success in passing the math course for black students in contextual courses was compared to the success in passing math course for White students in the non-contextual group. The nine ethnic-group variables were included in the model with the other covariates and the coefficients for the nine variables were then used to calculate differences for the ethnic categories using contextual minus the non-contextual categories. The results of combining the coefficients from the logistic regression provide an indication of whether the contextualization is more or less effective for each of the groups.

The estimated net effects of contextualization on each of the five ethnic groups' probability is presented in Table 6. While controlling for other demographics, vocational status, and SES, contextual instruction is clearly more effective for students in the Black, Hispanic and Other categories. Black students in contextual courses were 263% as likely to pass the basic skills math course as Black students in the standard math course. Likewise, Hispanic students and students in the "Other" category were 27% and 33%, respectively, more likely to pass a contextual math course than the standard math course. While there is no significant difference for Whites in passing the contextual or standard basic skills math course, the coefficient difference for Asians suggests, for Asians, the advantage is for passing the standard math course over the contextual math course.

Table 6. Net effects of contextualization on passing basic skills math for each of the five ethnic groups controlling for age, gender, vocational status, and SES (controls not shown).

Ethnicity	Coefficient Difference	*SE*	*df*	*t*	*OR*
Asian	-0.1237***	0.0102	6,921	-12.1017***	0.8837
Black	0.9684***	0.0511	7,682	18.9346***	2.6336
Hispanic	0.2383***	0.0131	12,405	18.1390***	1.2691
Other	0.2860***	0.0436	5,846	6.5622***	1.3311
White	-0.0676	0.0579	5,437	-1.1680	0.9346

Note: Coefficient differences are the "coefficient for contextual minus the coefficient for non-contextual" within each ethnic group. Original coefficients are calculated using the White non-contextual reference group.

Asian includes Asians, Filipinos, and students from Pacific Island nations. Other includes Native American and Other Non-white.

Pseudo-R^2_{max} = 0.0428; The *Pseudo-*R^2_{max} is the *Pseudo-*R^2 adjusted to have a maximum of one.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Asians in the contextual math courses were only 88% as likely to pass the course as Asians in the standard math course and there was no significant difference in passing either math course for White students.

The partial effects for the control variables, not shown in the table, maintained a similar relationship in the ethnic-contextual combination model as existed in the model with separate contextual group and ethnicity variables. However, the age-squared term was significant ($p = 0.0376$) in the model using the ethnic-contextual combination variable while it was not ($p = 0.1147$) in the model with separate group and ethnicity

variables. The age where the advantage for passing the math course changed from older students to younger students decreased from age 48 to age 46 in the ethnic-group model.

Table 7 shows that the differences contextualization made for these groups in passing courses stayed high for students in the Black, Hispanic and Other categories

Table 7. Net effects of enrolling in a contextual math course on passing a degree applicable course in the initial semester for each of the five ethnic groups controlling for age, gender, vocational status, and SES (controls not shown).

Ethnicity	Coefficient Difference	*SE*	*df*	*t*	*OR*
Asian	-0.0362**	0.0113	5,934	-3.2092**	0.9644
Black	0.8605***	0.0650	6,620	13.2416***	2.3643
Hispanic	0.4712***	0.0196	10,464	24.1012***	1.6019
Other	0.2045***	0.0150	5,052	13.6416***	1.2270
White	0.2052**	0.0741	4,716	2.7698**	1.2278

Note: Coefficient differences are the "coefficient for contextual minus the coefficient for non-contextual" within each ethnic group. Original coefficients are calculated using the White non-contextual reference group.

Asian includes Asians, Filipinos, and students from Pacific Island nations. Other includes Native American and Other Non-white.

Pseudo-R^2_{max} = 0.0496; The *Pseudo-*R^2_{max} is the *Pseudo-*R^2 adjusted to have a maximum of one.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

when comparing the effects of taking a contextual math course on passing a degree applicable course during the same term as the math course. Students in every category except the Asian category were more likely to pass a degree applicable course in the

same term if they took a contextual math course rather than a standard pre-algebra math course. The effects were particularly high for Black and Hispanic students who were 236% and 160% as likely to pass degree applicable course, respectively, if they were enrolled in the contextual math course. While the odds of passing a degree applicable course were nearly 23% greater for students in the Other and White categories if they were enrolled in the contextual math course rather than the standard math course, there was little difference in the odds of passing the degree applicable course for students in the Asian category. Asian students in the contextual category were only 96% as likely to pass the course as Asian students in the standard category. With an odds ratio so close to one it is unlikely that there is much difference between the groups in the population.

In Table 8, the estimated net effects of contextualization on student outcomes during the initial semester under examination are presented for a number of additional outcomes. Estimated effects for the basic skills math course from Table 5 are repeated for comparison. Controlling for student demographics, vocational status, and SES, the odds of attempting a Degree Applicable course while enrolled in the pre-algebra course are much higher for students in the contextual group. Students in contextual math courses were nearly 1524% as likely to enroll in a college-level course as students in the standard basic skills math courses. With 95% confidence, we can infer that in the population, the odds of attempting a degree applicable (i.e., college-level) course are between 371% and 6255% as likely for students in contextual courses than for students in comparable standard math courses. These extremely high odds ratios (OR = 15.24) suggest that contextual math courses facilitated simultaneous enrollment in degree applicable courses (99.4% of the students in contextual math group attempted a degree

Table 8. Net likelihood of attempting and passing courses comparing the contextual and the standard basic skills groups in the initial term estimated through logistic regression controlling for demographics, vocational status, and SES (controls not shown).

Outcome/DV	Coefficient	SE	Wald χ^2	*OR*	*Wald 95% CI*	
Basic Skills Math	0.7258***	0.0753	93.0114***	4.270	3.179	5.736
Degree Applicable						
Attempted[a]	1.3620***	0.3602	14.2942***	15.240	3.713	62.551
Passed[b]	0.6722***	0.0991	46.0204***	3.836	2.601	5.656
Transfer Coursework						
Attempted[a]	-0.8003***	0.0639	157.0261***	0.202	0.157	0.259
Passed[b]	0.6933***	0.1216	32.5056***	4.001	2.484	6.444

Notes. All comparisons on the dependent variable (DV) are based on Contextual vs. Standard where the Standard group is the comparison category.

[a] The "Attempted" estimates are based on the total cohort N = 17,152.

[b] The "Passed" estimates are calculated based on the number attempted for the category: Attempted degree applicable N = 14,527; Attempted transfer N = 13,502.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

applicable course). Because of the small percentage that did not enroll in a college-level course in the contextual group (only two of the 392 students in the contextual group), the coefficient, standard error and the range of the confidence interval were quite large and suggests that the small numbers in the "did not attempt" cell for the contextual group may have created unreliably high values. However, these high odds of accelerating entrance into college-level courses illustrates the importance of the contextual nature of the course. More importantly, with an odds ratio of nearly 3.84 for passing the degree applicable

course, the odds of passing that degree applicable course are nearly 284% greater for students enrolled in contextual math courses than those also enrolled in standard math courses. And, the increased odds of passing the degree applicable course signals the effectiveness of contextual math courses in accelerating entry into, and readiness for, college-level coursework.

The partial effects for the control variables maintained their relationships in the attempted degree applicable course model with a few exceptions. Student gender was no longer significant, controlling for all other variables in the model, for attempting a degree applicable course, as it was in the model for passing the basic skills math course. White students were more likely to enroll in a degree applicable course than Asian, Black and Hispanic students (57%, 34%, and 72%, respectively). However, Black and Hispanic students were only 56% and 76%, respectively, as likely to pass the degree applicable course as White students while controlling for all other variables in the model. These partial effects for ethnicity are aligned with the ethnic-group findings presented in Table 7 where the effects of the contextual math course increased the likelihood of passing the degree applicable course for Blacks and Hispanics. However, because of the increasingly small number in the lower incidence combination groups (i.e., contextual-ethnic group), no combination group analysis was possible beyond those presented either in the initial or subsequent semesters..

While vocational status was not significant in the model for passing the math course, it was significant in the attempting degree applicable model (Wald $\chi^2 = 213.78$, $p < 0.0001$) and had a coefficient larger than the group coefficient. However, with only two students in the contextual group not enrolling in a degree applicable course and 13

independent variables, it may be that small cell sizes have increased the standard error (*SE* = 0.1303) sufficiently high to create overly high significance and greater odds ratios than would be expected with a larger sample in the lower incidence group. With that as a consideration, controlling for all other variables in the model, students enrolled in a vocational course above the introductory level were 45.45 times, or 4,545%, as likely to be enrolled in a degree applicable course. And, vocational status remained significant when examining the relationships for students passing the degree applicable course with the advantage decreasing to having vocational students only 115% as likely to pass the degree applicable course as non-vocational students.

The odds ratio comparisons displayed in Table 8 also provide the estimate that students in the contextual group are only 20.2% as likely to attempt a transfer-level course while taking their contextual math course compared to students in the standard basic skills group. In other words, using the contextual group as the comparison, students in the standard basic skills math courses are nearly five times as likely to attempt a transfer-level course. This might be expected as many of the vocational programs targeted by these courses (e.g., Airframe mechanics, electricians, and construction) may not include courses that transfer to the public four-year university systems in California nor do they require general education for the certificate.

Although students who pursue an associate degree in a vocational area would often take general education that is transferable, students usually defer those course enrollments until the end of their program. Additionally, the partial effects for the control variables not shown in the table suggest that vocational students are 423% as likely as non-vocational student to attempt a transfer-level course in the same semester as their

math course but are no more likely to pass the transfer level course (while controlling for all other variables in the model). However, of those students who attempt a transfer-level course during the same semester as the math course, students in the contextual group are just over four times, or 400%, as likely to pass the transfer-level course even though vocational students were not more likely to pass the course than non-vocational students. In other words, enrolling in the contextual math course increased the likelihood of passing the transferable course far beyond what being a vocational student did.

The partial effects in the transferable course related models also have an interesting SES relationship. While controlling for all other variables in the model, students in the higher SES group were only 76.4% as likely to attempt transfer-level coursework but were 125% as likely to pass it compared to the lower SES group as indicated by receipt of a fee waiver. This might suggest that students in lower SES groups have prior educational experiences that not only did not prepare them for higher level college-level coursework but did not provide indications of their readiness for it. Without the foundational coursework that would prepare students for higher level college work, low SES students not experiencing quality foundational coursework in high school are unaware of the disadvantages they face in these transfer level courses.

Subsequent Term Findings

Whether students re-enroll and pass courses in the subsequent term is considered progress toward the longer term goals of completing programs during the short two semester window of this study. While simply persisting to the next term is not progress in and of itself, the increase in motivation to pass courses exhibited in the initial semester of the math course would need to be maintained for progress to occur. To determine

whether students were sufficiently engaged during the semester of their basic skills math course to return the following semester and whether they were sufficiently prepared to pass college-level work, outcomes for both students who passed and students who did not pass the math course were examined.

Students who Passed the Math Course

Table 9 provides the rates of students attempting and passing courses in the subsequent term for those who passed the math course in the initial term of the study.

Table 9. Rates of attempting and passing courses in the subsequent term for those persisting who passed the basic skills math course in the initial term controlling for demographics, vocational status, and SES (controls not shown).

	Contextual		Standard	
Course type	Number	Percent	Number	Percent
Total	337	100.0%	9,930	100.0%
Attempted Credit	276	81.9%	8,448	85.1%
Degree Applicable				
Attempted [a]	276	100.0%	8,212	97.2%
Passed [b]	246	89.1%*	6,749	82.2%*
Transfer Coursework				
Attempted [a]	165	59.8%***	7,344	86.9%***
Passed [b]	150	90.9%**	5,866	79.9%**

Note: Students in the "Attempted Credit" category are those who returned the following semester and enrolled in a credit course. Students may enroll in either a degree applicable or transferable course or both course types.

[a] The percent "Attempted" is calculated based on the number for the "Attempted Credit" category.

[b] The percent "Passed" is calculated based on the number of attempted for the category.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Students from both the contextual and standard group persisted and attempted credit bearing courses in the subsequent semester at approximately the same rates (81.9% and 85.1%, respectively). And, students from the two groups also attempted degree applicable courses at approximately the same rate (100% and 97.2%, respectively). Because everyone who persisted in the contextual group also attempted a degree applicable course in the subsequent semester, there were zero who did not attempt the degree-applicable course. As shown in Table 10, an odds ratio could not be calculated

Table 10. Net likelihood of attempting and passing courses in the subsequent term for students who passed the basic skills math course in the initial term controlling for demographics, vocational status, and SES (controls not shown).

Outcome	Coefficient	*SE*	Wald χ^2	*OR*	*Wald 95% CI*	
Attempted Credit	-0.0753	0.0788	0.9142	0.860	0.632	1.171
Degree Applicable						
Attempted[a]	6.8330	183.6	0.0014	undefined[c]		
Passed[b]	0.2570*	0.1023	6.3173*	1.672	1.120	2.496
Transfer Coursework						
Attempted[a]	-0.7794***	0.0762	104.7107***	0.210	0.156	0.284
Passed[b]	0.4113**	0.1387	8.7903**	2.276	1.322	3.921

Note: Students in the "Attempted Credit" category enrolled in credit courses.

[a] The percent "Attempted" is based on the number for the "Attempted Credit" category.

[b] The percent "Passed" is calculated based on the number attempted for the category.

[c] Because all of the students in the contextual group attempted a degree applicable course, the cell for "did not attempt" contained zero and created an undefined slope.

* $p < .05$; ** $p < .01$; *** $p < .001$.

due to a cell size of zero in the contextual "did not attempt a degree applicable course." With such a small difference in rates of attempting a degree applicable course, however, we can be assured that there was no practical difference between the two rates.

While there was no significant difference between persistence to the next term for the contextual and standard groups, the partial effects suggest that, controlling for other variables in the model, other independent variables in the model did have an influence on the persistence. For example, older students who passed the math course were less likely to return and less likely to enroll in a degree applicable course until about age 40 at which time the likelihood of persistence went to the older student. Additionally, Black and Hispanic students who passed the math course were only 82% and 86%, respectively, as likely as White students to persist to the subsequent term. Students in the non-vocational and higher SES groups who passed the math course, controlling for all other variables in the model, were only 83% and 88%, respectively, as likely to return and enroll in a credit course. And, students in the higher SES group who passed the math course were only 54% as likely to enroll in a degree applicable course in the following term.

While similar percentages of students in the contextual and standard group enrolled in degree applicable courses, a significantly (Wald $\chi^2 = 6.3173$, $p < 0.001$) higher percent (89.1%) of the students in the contextual group passed that degree applicable course than the percent who passed (82.2%) in the standard group. Moreover, students who passed the math course in the contextual group were 167% as likely to pass a degree applicable course in their subsequent term as were students in the standard math course group. Again, White students were more likely to pass the degree applicable course in the subsequent term than were Black students with Black students being only

74% as likely to pass the course as their White counterparts. Additionally, higher SES students who passed their basic skills math course were 125% as likely to pass the degree applicable course in the subsequent term than were students in the lower SES group.

A significantly ($Wald\ \chi^2 = 104.71$, $p < 0.001$) higher percentage of students in the standard group (86.9%) attempted transfer coursework in the subsequent semester than the percentage in the contextual group (59.8%). The odds ratio for attempting a transfer-level course in the subsequent term estimates that students in the contextual group are only 21% as likely as the students in the standard math course group to attempt a transfer-level course. This might be expected given the contextual group included programs in trades and apprenticeships. While many of these types of vocational degrees and certificates require degree applicable coursework that may include some transfer level work, including general education, vocational students exhibit a tendency to delay transferable general education coursework required for the associate degree or transfer until after completing their vocational subjects.

The partial effects for the covariates in the model suggest additional influences in attempting a transfer course. Younger students were more likely to attempt transferable courses until about age 50 when the odds began to increase with each year of age. Other significant partial effects, controlling for all other covariates, suggest that the Hispanics were only 64% as likely to attempt a transfer course as White students and vocational students were more likely than their non-vocational counterparts to attempt a transfer-level course in the subsequent semester. Vocational students who passed the math course were 147% as likely, or 47% more likely, to attempt a transfer-level course in the subsequent semester than non-vocational students. And, similar to attempting degree

applicable courses, the higher SES group was only 80% as likely to attempt a transfer-level course as the lower SES group as indicated by receipt of a fee waiver.

More importantly, although students in the standard math group were more likely than students in the contextual group to attempt a transfer course, the percentage of students who successfully passed the transfer course they attempted is significantly ($Wald\ \chi^2 = 8.7903$, $p = 0.003$) higher for the contextual group (90.9%) than for the standard pre-algebra math course group (79.9%). The odds ratio of passing a transfer-level course in the subsequent term estimates that the contextual group is 228% as likely as the standard math group to pass the course. Black students who passed the math course, persisted to the subsequent term, and enrolled in a transferable course were significantly ($Wald\ \chi^2 = 13.1231$, $p = 0.0003$) less likely to pass the transferable course than their White counterparts. Black students were only 73% as likely to pass the transferable course as White students. Similarly, students in the lower SES group were only 79% as likely to pass the transferable course as students in the higher SES group.

Students who did Not Pass the Math Course

Table 11 shows the rates of successful outcomes for students who did not pass the contextual or standard math course in the initial course of the study. There is little difference between the behaviors of the two groups who were unsuccessful in passing the math course in the initial term and in their efforts to attempt and pass courses in the subsequent semester. The groups persisted and attempted credit course work at approximately the same rates. Persistence to the subsequent term is a necessary step in completing a sufficient number of courses to obtain the skills necessary for the labor market and meeting long-term educational goals (Gray & Herr, 2006; Grubb, 1996a,

Table 11. Rates of attempting and passing courses in the subsequent term for who did not pass the basic skills math course in the initial term controlling for demographics, vocational status, and SES (controls not shown).

	Contextual		Standard	
Course type	Number	Percent	Number	Percent
Total	55	100.0%	6,830	100.0%
Attempted Credit	28	50.9%	3,734	54.7%
Same Math				
Attempted [a]	7	25.0%	1,501	40.2%
Passed [b]	3	42.9%	632	42.1%
Another Math				
Attempted [a]	3	10.7%	204	5.5%
Passed [b]	1	33.3%	66	32.4%
Degree Applicable				
Attempted [a]	28	100.0%	3,420	91.6%
Passed [b]	25	89.3%*	2,174	63.6%*
Transfer Coursework				
Attempted [a]	24	85.7%	3,221	86.3%
Passed [b]	20	83.3%	1,969	61.1%

Notes. No statistical significance could be determined for "Same Math" and "Another Math" outcomes between the likelihood of success in the contextual group and the standard basic skills group due to small cell sizes (Thompson, 2006).

[a] The percent "Attempted" is calculated based on the number for the "Attempted Credit" category.

[b] The percent "Passed" is calculated based on the number attempted for the category.

* $p < 0.05$.

1996b; Grubb & Associates, 1999; Perin, 2006). However, Bahr (2008) suggested that persistence by itself it is not a goal of remediation. He argues that the students who do not successfully remediate, although they "stick around", are not likely to be successful in subsequent coursework.

Because cell sizes got so small in the contextual group for the outcomes displayed in the table, there was little information for the regression about those students with which to estimate the coefficients. Interestingly, although there are insufficient numbers of students in the contextual group to test for significance between the groups in whether they attempted and passed the same math course that they previously failed or whether they attempted another math course in the following semester, the percentages look almost identical. Since such small numbers of students who did not pass their basic skills math course in the contextual group repeated the math course or attempted another course in the math department, the differences in the attempted and passed rates for those categories should not be used for comparison purposes beyond the individuals actually in the study.

There was an observable difference between the contextual and standard groups in the percentage of students passing the degree applicable and transferable courses they attempted. The differences were quite large in the pass rates with the contextual group passing with rates over 25 percentage points higher than the standard group (89.3% to 63.6%, respectively) and over 22 percentage points higher for passing transfer courses (83.3% to 61.1%, respectively). However, with the numbers in the lower incidence contextual group at 24 attempting transfer coursework, the standard errors were so high due to the small numbers that finding significance was not possible at the 0.05 level.

As shown in Table 12, although there was no significant difference between the contextual and standard groups for these outcomes at the $p = 0.01$ level, there was significance (Wald $\chi^2 = 5.1789$, $p < 0.05$) between the two groups for passing the degree applicable coursework attempted. Interestingly, the odds ratio ($OR = 4.081$, Wald 95% $CI = 1.215 – 13.702$) estimates that students in the contextual group were 4.08 times as likely to pass the degree applicable courses they attempted as students in the standard

Table 12. Net likelihood of attempting and passing courses in the subsequent term for those who did not pass the basic skills math course in the initial term controlling for demographics, vocational status, and SES (controls not shown).

Parameter	Coefficient	SE	Wald χ^2	*OR*	*Wald 95% CI*	
Attempted Credit[a]	-0.0592	0.1419	0.1740	0.888	0.509	1.549
Degree Applicable						
Attempted[b]	6.4575	201.1	0.0010	undefined slope		
Passed[c]	0.7032*	0.3090	5.1789*	4.081	1.215	13.702
Transfer Coursework						
Attempted[b]	0.0013	0.2798	0.0000	1.003	0.335	3.003
Passed[c]	0.5245	0.2788	3.5386	2.855	0.957	8.517

Notes. No significance could be determined for "Same Math" and "Another Math" outcomes between the likelihood of success in the contextual group and the standard basic skills group due to insufficient cell sizes (Thompson, 2006).

[a] Total $N = 6,885$.

[b] The percent "Attempted" is calculated based on the number for the "Attempted Credit" category; Attempted Credit $N = 3,762$.

[c] The percent "Passed" is calculated based on the number attempted for the category; Attempted Degree Applicable $N = 3,448$; Attempted Transfer Coursework $N = 3,245$.

* $p < 0.05$.

group. This very wide confidence interval might suggest that the reliability of the odds ratio is in question and due to the very little amounts of information available (i.e., small numbers) for determining the regression coefficients. While taking and failing a contextual course might provide some advantage in the subsequent semester, the degree of that advantage could be estimated better with a larger sample size.

The wide confidence interval also suggests that we might considered the large standard errors of the estimated coefficients for the transfer coursework as well. The considerable difference in rates of passing transferrable coursework is consistent with the difference in rates for degree applicable coursework with at least a 20 percentage point advantage for the contextual group in each of the measures as previously mentioned in the discussion of Table 11. Whether there is a significant difference or not, it does show a consistent pattern of higher rates of passing degree applicable and transferable coursework for this group of students.

There are also interesting partial effects for covariates in the model other than the contextual group variable while controlling for all other covariates. Looking at general persistence of those who did not pass the math course in the initial semester, younger students were more likely to re-enroll in the subsequent semester with decreasing likelihood until about age 37 where age no longer made a difference and increased age began to add to the likelihood of re-enrollment with each year. This pattern for age persisted in the measures for attempting degree applicable and transferable courses. Vocational students and students who received a fee waiver who failed the basic skills math course in the prior term were also more likely to enroll in a credit course in the subsequent semester. The non-vocational students were only 85% as likely as vocational

students to enroll in a credit course in the subsequent semester. Students in the higher SES group were also only 85% as likely as students in the lower SES group to re-enroll in the subsequent term.

Students in the higher SES group were also significantly more likely than students in the lower SES group to pass degree applicable (Wald $\chi^2 = 7.3097$, $p < 0.01$) and transferable courses (Wald $\chi^2 = 4.4261$, $p < 0.05$). Students who receive fee waivers were nearly 27% more likely to pass degree applicable courses and nearly 21% more likely to pass transferable courses than students who did not receive a fee waiver.

Summary of Findings

Contextualized developmental education courses, where foundational academic skills are studied in context, have been identified as instructional practices that students find engaging (Grubb & Associates, 1999). Limited research also cites these engaging practices as more effective for retaining and remediating certain populations (Bailey & Morest, 2006; Tinto, 1998). While 70% of students entering the community colleges in California were placed in remedial mathematics in 2004 (CSS), Bahr (2008) estimates that only 10% of students successfully remediate into college level courses. This study examined the extent and effectiveness of using these engaging contextualized formats for delivering basic skills instruction in the California community colleges.

This study found that contextual basic skills courses were scarce at the responding colleges. Respondents reported contextualized basic skills at less than a third (10 of 35) of the colleges they represented. More importantly, contextual courses were only found in isolated areas of the colleges. In the 10 colleges reporting credit contextual courses, only 16 courses were offered. Most of these colleges offered a single contextual course

in only one vocational area and only two of the course offerings reported had multiple sections. Only two colleges offered contextual courses in more than one vocational area. While a number of people have been promoting engaging contextualized and integrated instruction for at least 20 years, very little contextualization was found at the responding colleges, the contextual courses that were found were in isolated areas of the colleges, and a number of those courses found disappeared in the subsequent semesters.

Mathematics was the primary academic area found in the contextual course offerings. The overwhelming majority (13) of the 16 contextual content basic skills courses were in basic skills math. With only a few vocationally linked credit basic skills reading and writing courses and no vocational learning communities reported by any of the responding colleges, contextual math courses at the nine colleges reporting them were selected as the focus of the study.

The study used logistic regressions to test whether there were differences in rates of passing basic skills math courses between students in contextual and non-contextual courses while controlling for demographics (i.e., age, gender, and ethnicity), vocational status, and proxies of SES (i.e., fee waivers and grants). The study also tested whether those students had different levels of success in degree applicable and transferable courses in both the initial semester, when the basic skills course was taken, and the subsequent semester. This research also investigated whether the effects of contextual courses were different for students in different ethnic populations.

Occupational content rich math courses provided an environment where students stayed and passed the courses in much higher percentages than in standard math courses (86% vs. 59%, respectively). Controlling for demographics, vocational status, and SES,

students in contextual basic skills math courses were 327% more likely to pass the course than students in standard math courses. During the same semester as their basic skills math course work, students in the contextual group were also 1,524% as likely to attempt and 384% as likely pass degree applicable coursework than their counterparts. Basic skills math taught in an occupational context accelerated student progression into college-level degree applicable coursework where students were able to successfully complete the courses.

Students in the contextual group were, however, less likely to attempt a transfer-level course but they were more likely to pass it than students in the standard math group. While they were enrolled in their basic skills math course, just over 92% of the contextual group students attempting a transferable course passed it when less than 73% of the students in the standard math course attempting one passed an additional transferrable course. Students in the standard math group were 202% as likely as their contextual group counterparts to attempt a transfer-level course in the same semester as their basic skills math course, however, controlling for demographics, vocational status and SES, the contextual group is 400% as likely to pass a transfer-level course in the same semester as their counterparts.

Vocational status alone was not sufficient to increase the likelihood of passing a transfer-level course. While vocational status did increase the likelihood of attempting a transfer-level course 323% over non-vocational status students, while controlling for other variables in the model, there was no significant difference between vocational and non-vocational students in passing the course. The increased motivation of preparing for a vocation was not sufficient to increase the likelihood of passing the transferable course.

Similarly, students in the lower SES group were 130% as likely to attempt a transferable course as students in the higher SES group but were only 80% as likely to pass it.

Subsequent term outcomes follow similar success patterns. There was little or no difference between the contextual and standard groups when looking at whether they persisted to or attempted degree applicable coursework in the semester following the basic skills course. However, students in the contextual group who passed their basic skills math course were 167% as likely as their standard group counterparts to also pass a degree applicable course in the subsequent term. Even students in the contextual group who did not pass their basic skills math course in the prior term were 408% as likely to pass a degree applicable course than were their counterparts who did not pass the standard math course. Not only did students who passed their contextual basic skills math course attempt and pass degree applicable coursework in the subsequent term at much higher rates than students in the standard group (89% and 82%, respectively) but students who failed their contextual basic skills math course were more successful than their standard basic skills counterpart. Although similar percentages of the contextual and non-contextual groups who failed their math course attempted credit courses in the subsequent term, students in the contextual group continued to be engaged in their occupational coursework and, even though the numbers were small (N=28), were able to pass college-level work at rates significantly higher than students in the standard basic skills courses (89% and 64%, respectively).

While there were significant differences between the contextual and standard group in passing degree applicable coursework in the subsequent term, only two other covariates were also significant for those who passed the math course. Just as in the

initial term, Black students were only 74% as likely to pass the degree applicable course as their White counterparts in the subsequent term while controlling for the other covariates. And, the lower SES group was only 80% as likely as the higher SES group to pass the course.

Attempting and passing transfer-level coursework in the subsequent term follows the same patterns as transfer-level coursework in the initial term. Students in the Standard math group were 3.76 times more likely to attempt a transfer-level course in the subsequent semester than their contextual group counterparts. However, the contextual group students were 2.28 times more likely to pass a transfer-level course in the subsequent semester than students in the standard math group. We might expect the lower likelihood of attempting a transfer course is as students in vocational certificate programs often are not required to take transferrable coursework. This relationship, however, did not hold for vocational students vs. non-vocational students when controlling for the other covariates. Vocational students were 147% as likely as non-vocational students to attempt transfer-level courses and 120% as likely to pass the course. While this likelihood of passing a transfer course differs from the initial term when there was no significant difference, for this group of students each passing semester will undoubtedly increase the likelihood of more advanced vocational and general education coursework.

Two additional findings, not originally specified as a focus in this study, are worth mentioning. First, even when controlling for all of the covariates in the model (i.e., contextual vs. standard, age, gender, and three other ethnic group comparisons), White students were 223% as likely as Black students and 146% as likely as Hispanic students

to pass the basic skills math course. A post hoc subgroup analysis examined the differential effects of contextualization for each of the ethnic groups while controlling for the other covariates. The analysis identified significant effects ($p < 0.001$) of contextualization on passing basic skills math for all ethnic groups except the White student group. While there was no significant difference in passing either contextual or standard math for students in the White group, there was a highly significant difference for students in the Asian group. Students in the Asian Group were only 88% as likely to pass the contextual course as they were to pass the standard math course.

Contextualization of the math course provided a positive effect on passing the course for the remaining groups. Black students were 263% as likely to pass the contextual math course as they were the standard math course. Similarly, Hispanic students were 27% more likely to pass the contextual course than the standard course. Additionally, students in the Other ethnic group, which includes native-Americans and other non-whites, were 33% more likely to pass the contextual math course than the standard math course. The contextualization of math appears to benefit students from ethnic groups who have historically been underserved in education and are most often considered at-risk.

The second finding of import not included in the original study focus is that although just over 50% of students who did not successfully complete their math course return in the following semester to attempt credit courses, high percentages of them attempt degree applicable and transfer coursework. And, those not passing the standard math course have little success in passing those courses they attempt. More in-depth study of this phenomenon might uncover a particular need for guidance and educational

planning for these students. Additionally, because the numbers were small for the contextual group who did not pass the math course in the initial term but returned and attempted college-level coursework in the subsequent term, the differences in likelihood found of passing those courses compared to students who failed the standard math course and returned are questionable. The higher rates for passing those college-level courses for students who failed the contextual course (89%) than students who failed the standard course (64%), however, are real for this group of students. What those differences may point to, however, is that some measure involved in participation in a contextualized course, whether it be career needs, motivation, occupational focus, or some other self selection bias present in contextual course participants may be missing in the model.

Participation in contextual basic skills math courses rather than comparable standard basic skills math courses provided students with an instructional environment that increased pass rates in the basic skills math course and accelerated entry into college-level work. Additionally, students who participated in contextual courses were not only more likely to pass their basic skills math course but were more likely to pass a degree applicable and transferable course in the same semester. The increased likelihood of passing college-level coursework for students in the contextual group over the standard group persisted into the subsequent term where students were more likely to pass both the degree applicable and transferable courses that they attempted.

CHAPTER V.

CONCLUSIONS AND RECOMMENDATIONS

This study examined the extent and effectiveness of using contextualized formats for delivering credit basic skills instruction in California Community Colleges (CCC). More particularly, the research questions were:

1. What is the extent of implementation of the various forms of contextualized developmental education courses in California Community Colleges?
2. How does the effectiveness of these forms of contextualized instruction compare to stand alone developmental education programs in terms of student retention, progress, and persistence?
3. Are these forms of contextualized instruction more or less effective for specific populations within the community colleges?

This chapter provides a discussion of the implications of the research findings from those questions for educators and policymakers. In short, contextualization had a highly positive impact on student course completion and some measures of progress. This analysis found contextualization provided particular benefits for Black and Hispanic students in passing both basic skills math and degree applicable coursework. However, contextual courses were mostly found in isolated areas at a small number of colleges. This chapter will first address questions of the effectiveness of contextualizing basic skills math and the benefits for retention, progress and persistence and the ethnic

populations that benefitted most to set the groundwork for the discussion and policy implications of the continuing scarcity of these effective innovations in delivering Basic Skills instruction in the community colleges.

Effectiveness of Contextual Basic Skills in the CCC System

This analysis expands on prior research on the effectiveness of basic skills mathematics in remediating mathematics deficiencies in the California community colleges. By examining the effectiveness of contextual basic skills math courses relative to standard basic skills courses, and effectiveness of contextualization in the diverse populations of California community colleges, a more nuanced view of student success in basic skills math and entry into and success in college-level coursework emerged. The study also tested whether basic skills math was more effective in contextual or standard math formats for the different ethnic groups in the community colleges.

This research revealed that contextual basic skills math courses were dramatically more effective than standard math basic skills courses, at the responding colleges, in remediating students at the pre-algebra level and moving students into college level coursework. Not only was contextualization effective in helping students pass their basic skills math course and accelerate their entry into college-level coursework, but students in the contextual math course were also more likely to pass degree applicable and transferable coursework in the same and subsequent semester. Students in this study passed the standard remedial math course at pass rates similar to the remedial math course pass rate found across all of the California community colleges (CSS, 2005). However, students in the contextual group not addressed in that previous research passed their contextual remedial course at much higher rates (86%) than students in the standard

math group (59%). Bahr (2007, 2008, in press) has published extensive research on the effects of successful remediation and the barriers to that success in the California community colleges. He avoids, however, an analysis of basic skills in the context of occupational programs due to the difficulty of identifying those courses. This research begins to address the gap in our understanding of the effectiveness of contextual basic skills math and how it affects student progress.

Although students in the contextual group were far more likely to pass the basic skills math course than students in the standard math group, simply passing a remedial course is not the goal of remediation (Bahr, 2008). The goal of remediation is to move students into and prepare them for college-level coursework as Bahr and others (Bailey & Morest, 2006; Grubb & Associates, 1999; Perin, 2000) point out. The greater likelihood of students in the contextual group passing degree applicable and transferable coursework than the standard group counterparts (384% and 400% as likely, respectively) during the same term as the remedial course, suggests that contextualizing math courses provides students with paths to success in progressing towards longer term goals.

Bahr (2008) points out that only 13.4% of students entering at the pre-algebra level ever successfully remediate into college level math. However, students in the contextual math courses were able to learn the foundational pre-algebra math skills along with higher levels of math relating to the occupational content that was often included within that same cross-curricular course. More importantly, they were able to transfer those learning skills to another context helping them succeed in other college-level courses that would require not only further application but an adaptation of those learning skills. Students in the contextual courses had learned how to learn.

By engaging students in their area of interest while introducing math concepts, offered only in the abstract in standard math courses, as described by Grubb and Associates (1999) and others (Bailey & Morest, 2006; Perin, 2001a, 2002), student motivation to complete other college-level courses, and possibly learning the competencies and problem solving strategies necessary to complete them, appears to increase. While "occupational instructors may be better able to motivate their students to learn academic material than academic faculty can" (Grubb & Associates, 1999, p. 271), the vocational status of students added no predictive ability for success in the math course beyond contextualization in the model used in this study. The increased motivation of vocational students to pass the standard math course was not sufficient without the contextual application in the math course. In other words, the increased likelihood to complete the contextual remedial course is not likely to be an artifact of increased student motivation simply because the student has already chosen an occupational path or experienced increased motivation to learn math to support their occupational choice.

Connecting academic content and its application in areas that interest students appears to not only increase the likelihood of their success in the math course but increases their motivation to complete other college-level coursework as noted by Perin and Charron (Bailey & Morest, 2006, chap. 7). Although they saw integration of remedial and college credit course work "as solutions to learning difficulties or to accelerate exit from remediation" (p. 179) in their case study, Perin and Charron suggested that a study to ascertain effectiveness of this type of integration was needed. These results provide evidence of that effectiveness for both remediating math deficiencies and accelerating exit from remediation. Given the dismal prospects for

students entering community colleges needing to remediate math deficiencies who enter the standard basic skills math sequence and the high rates of success students experienced in the contextual basic skills math courses in this study, institutional efforts to increase opportunities for students to enter contextual basic skills courses should be supported both politically and financially. While collaborative efforts of faculty and researchers, with funding from the CCC Chancellor's Office Basic Skills Initiative (BSI), recently produced a review of the literature and faculty practices on contextual teaching and learning (Baker, Hope, & Karandjeff, 2009) and faculty professional development workshops on contextualizing academic content in vocational courses have begun appearing in the 2009 Perkins local applications, California's economic crisis that began in 2008 may eliminate the BSI funding available for these workshops.

Students who successfully completed the contextual math course persisted to the next term and attempted credit courses at rates similar to the non-contextual group (82% and 85%, respectively). However, the contextual group completed college-level and transferable courses at much higher rates than the standard math group (7 and 11 percentage points higher, respectively). Bahr (2008) documents how successful remediation moves students into college-level coursework but excludes vocational basic skills courses from his study because of the difficulty in identifying vocational basic skills courses in the data. The results of this study provide evidence that contextual basic skills courses improve the likelihood of successful remediation, accelerate entry into college-level coursework, and increase the likelihood of success in college-level and transfer-level coursework in the same and subsequent semesters.

While contextualizing basic skills courses improve the likelihood of success for students in basic skills math courses even when controlling for age, gender, and ethnicity, great disparities were evident for Blacks and Hispanics in comparison to Whites in rates of passing basic skills math and college-level courses in the initial and subsequent terms. Bahr (in press) reported significant racial gaps in the likelihood of successful remediation and those gaps are evident in this data as well. However, this study provides evidence that contextualization of basic skills math significantly increased the likelihood of passing basic skills math for Black and Hispanic students. Black and Hispanic students were also more likely to pass a college-level course in the same semester if they were enrolled in the contextual basic skills math course. With Black and Hispanic student enrollments constituting over 55% of the basic skills enrollments in fall of 2008, increasing opportunities for students to enroll in contextual basic skills courses may provide an effective means to close the successful remediation gaps between these ethnic groups and their white counterparts.

Bahr (in press) found that Black and Hispanic students began their remedial math sequences with much higher math deficits than Whites or Asians. He and others (Carnevale & Fry, 2000; Spann, 2000) argue that the deficit is a result of educational experiences starting as early as kindergarten. Martin (2009) further suggests that these are not just inadequate math experiences but are rather "consequences of the racialized nature of students' mathematical experiences" (p. 330) where differences in expectations based on race disadvantages students of color. Barajas and Ronnkvist (2007) in their study of Hispanic students' college experience reported that relationships and practices were often delineated along racial lines. Even when controlling for age, gender, and

participation in contextual courses, prior experiences in math embodied in the different ethnic groups remained a significant predictor of success. Improving student experiences in math across all ethnic groups, income levels, and geographic areas in primary and secondary schools is critical to improving the college readiness of students moving into occupational programs in community colleges (Carnevale & Fry, 2000; Spann, 2000). More importantly, increasing opportunities that minimize those educational disadvantages and increase student success, like contextual basic skills courses, can help level the playing field for those with disadvantaged prior math experiences.

Extent of Contextual Basic Skills in the CCC system

Given the increased likelihood of success for students in contextual courses, it may seem surprising that contextual basic skills courses were scarce at the responding colleges. This basic finding of scarcity of contextualized basic skills courses is, however, similar to findings in other national studies (Bailey & Morest, 2006; Grubb & Associates, 1999; Perin, 2000, 2002). The prevalence of contextual courses appears to have decreased rather than increased over the past 10 years despite the increased attention given to basic skills and contextualization. Among the 35 colleges who responded to the survey in this study, 10 colleges offered vocationally contextualized basic skills courses. Additionally, only isolated occurrences of contextual courses were found at those 10 colleges and the small numbers of students enrolled in those contextual courses severely limit the positive impacts of contextualization on students. Students, for the most part, found little opportunity to enroll in courses that made the link between the occupational content they were at the college for and the academic skills they needed to learn that content. There are two specific reasons why these numbers might be so small: the

difficulties of accurate identification of contextualized courses and the policies that inhibit colleges from offering academic-occupational contextual courses.

First, one of the limitations of this data was the self-reported nature of contextual course identification. Previous research (Grubb & Associates, 1999; Perin, 2002) reported unreliable reporting of contextual content in courses in numerous instances even when reports came from faculty. However, sending the survey from this study to individual faculty or even department chairs at all the colleges was not an option. Without contacting faculty, finding the appropriate person who would know whether contextual courses were being offered and then validating the contextual claims is a challenge.

Additionally, this study had its own set of particular difficulties in the course identification process. For the most part, only faculty teaching the course know the current content of the course. There are, of course, required course outlines of record in the community colleges and catalog entries that describe the course as it was originally designed and approved. However, course outlines of record were only publicly available on the Internet in one of the responding colleges and the course syllabus was not available publicly at any of the colleges responding. Even if course outlines were available publicly, however, they may become outdated as courses evolve beyond their original content design as faculty integrate new materials into the course and adapt the course for more effective student learning.

Vice Presidents of Instruction, one of the groups receiving the survey, have general knowledge of their college's course offerings but only occasionally reported that there were contextual courses being offered at the college. The letter requested that they

forward the letter and survey to an appropriate respondent when necessary. The occupational dean recipient of the letter and survey is the next administrator level of recipients. Many of the positive responses came from dean level positions. However, the dean position often has incumbents that are new to the California community colleges or new to their specific college position and may or may not know about the content of the courses offered in the departments they serve. Deans made up the majority of the respondents and a number of times forwarded the letter and survey to the department chair where the dean believed contextual courses were being offered.

Department chairs, at most community colleges, are temporary positions filled by faculty members in the department. Departmental meetings are often about schedules, rules, and requirements rather than the types of courses or content of courses. While efforts to collaborate on student learning outcomes for courses and programs may have facilitated more conversation between faculty on the content of their courses, ongoing conversations between faculty in the department may be limited and may include part-time faculty on an even more limited basis.

These difficulties finding faculty or administrators aware of the contextual nature of courses offered by the college confirmed that the ubiquitous isolation of faculty found by Grubb and Associates (1999), and later by others (Perin, 2006; Perin & Charron, 2003), still had not been eliminated or even diminished by the time of the study. There is, however, still a continuing opportunity to increase communication among faculty and administrators about content of courses as the student learning outcomes for college programs are developed and assessed. The collaborative nature of faculty developing and agreeing on program level student learning outcomes and assessments and the cycles of

assessing learning outcomes and improving curriculum to increase student learning can facilitate communication about innovative content and delivery within the department and institution.

Alternate methods to identify the courses from data submitted to the Chancellor's Office are not readily available since many of the courses do not have course characteristics in the system office database that would identify them as a vocational course with basic skills integrated into the course. Cross-curricular courses such as technical math courses offered in a program area, except in one case, had the program area as the content identifier (i.e., the taxonomy of program code) in the database. Second, even course titles cannot be used to identify whether the course was contextual in nature or not. The titles of courses identified for this study may or may not have reflected the math or English component within the course. Moreover, recent Federal and California state education policy changes and California State University (CSU) transfer policy and practices provide incentives to not identify courses as "applied" general education or basic skills since the new Perkins Act excludes funding basic skills and an applied general education status limits transferability of subsequent transfer level courses at CSU.

Those policies and changes to policy are the second reason that this data may report low numbers of contextual course offerings. Changes in California education policy, Federal vocational education policy and CSU transfer policies associated with applied math and English courses influence how courses are coded, their credit level status, and their status as a prerequisite. More importantly, these policies have resulted in

the elimination of some cross-curricular courses and in students being counseled away from existing courses.

Changes to education policy in Title 5 of the California Administrative Code (Section 55063), in an effort to increase standards for the associate degree across community colleges in California, eliminated the possibility of many contextualized courses meeting degree requirements. Those changes, entered into Title 5 in 2006 and effective in the fall of 2009, require that math courses be at the intermediate algebra level or higher, or have elementary algebra as a prerequisite, in order to meet associate degree math requirements. Those changes created an incentive to integrate math instruction below college level into a content course that was degree applicable due to its occupational content alone so that it could be required for the vocational associate degree. This practice is not unique to California, however, as Perin and Charron (Bailey & Morest, 2006, chap. 7) identified the same practice at colleges in the National Field Study sites. While integrating math topics that apply directly to a content course is desirable and increases math acquisition along with technical skill acquisition (Stone, Alfeld, Pearson, Lewis, & Jensen, 2006), forcing vocational students into basic skills math course sequences to meet the new math degree requirements only exacerbates problems of student attrition as demonstrated by this study and others (Bahr, 2008; Bailey & Morest, 2006).

These changes might be considered a cup half full or half empty. While Congress required the integration of academic and occupational content in the 1990 Carl D. Perkins Vocational and Applied Technology Education Act (and subsequent reauthorizations), most colleges across the nation met this integration requirement by requiring general

education courses in their vocational associate degrees (National Assessment of Vocational Education [NAVE], 1994). The NAVE report (1994) also recognized that cross-curricular courses were a "longstanding feature of postsecondary institutions" (p. 99). Throughout the early 1990s, a number of colleges integrated academics into their occupational content courses (Badway & Grubb, 1997). With the reauthorization of the Perkins Act in 2006, however, remedial education courses were specifically excluded in the definition of career technical education courses and programs including prerequisite courses (section 3(5)(A)(iii)). This change in the Perkins Act, along with the change in California education policy that defined elementary algebra and below as remedial, provides an additional incentive to "reinforce academics" in college-level occupational content courses rather than offer a technical math course that cannot be applied to the vocational degree and cannot be funded with Perkins dollars.

Additionally, California State University policies on transferable coursework limited development of academic-occupational integrated math and English courses. Current transfer practice does not allow a community college course that is transferable to the state university system to have an applied course as a prerequisite. This limitation seems to be interpreted at the community college level to extend throughout the math curriculum. Of the lower level contextual math courses included in this study, none could be used as a prerequisite for even elementary algebra. Since prerequisites in the California community colleges must be validated as predictive of success in the subsequent course, policies that exclude applied courses as prerequisites should be abandoned. Courses that meet prerequisite validation criteria should be allowed as prerequisites whether the subsequent course is transferable to the California State

University system or not. Given the evidence of increased abilities of students in contextual courses to transfer skills from one content area to another, policies should be implemented that not only allow contextual and applied courses as prerequisites but provide incentives to offer contextual courses.

Further Implications for Policy

There is an underlying concern that continues to be voiced by researchers and educators across the nation (Bahr, 2008, in press; Bailey & Morest, 2006; Grubb & Associates, 1999; Grubb & Lazerson, 2004; Malveaux, 2003). That concern is the reduced recognition of the public benefit of education and the resulting long-term decline in the public investment in higher education and education in general as demand increased in the last half of the 20th century. The loss of that public investment has resulted in reduced access to quality education, financial aid availability, and funds available for instructional improvements.

Reduced public investment has particularly severe impacts for low income students with limited access to quality elementary and secondary education. The effects can be seen in the increasing numbers of students under-prepared for college-level work. With increasing demands for higher education and lower public investment, community colleges tend to focus on low cost solutions to meeting those increasing needs. Funding innovations such as academic-occupational integration in a community college is difficult when the focus is on meeting enrollment demand and maintaining revenues through enrollment practice rather than developing and supporting effective pedagogies (Bailey & Morest, 2006; Grubb & Lazerson, 2004).

In California, budget pressures over the past few decades have resulted in not only the elimination of funds earmarked as "funds for instructional improvement" but a general decline in state funds available for instructional improvement in community colleges. Along with the reduction and elimination of those funds was a reduction of professional staff in the community college system's Chancellor's Office who would direct state funds to innovative and effective projects when state funds became available. Increasingly, as state revenues increase and funds are made available to address problems brought to the attention of policymakers, no funds are made available to the Chancellor's Office to engage professionals knowledgeable in innovative solutions that address those problems. The importance of knowledgeable professional staff who can advocate for effective innovations, professional development to expand effective practices, and avert unintended consequences of new policy at the state and federal levels cannot be overstated. Without that advocacy, chants from the education gospel choir, as described by Grubb and Lazerson (2004), sing the chorus of "college degrees for all" and effective vocational programs and the cross-curricular courses supporting them that engage students and help meet the nation's labor market needs go unattended or get eliminated. Policymakers should recognize that funds made available to address problems will simply be used to build more of the same unless provisions are made to engage appropriate expertise, encourage innovation, and expand those innovations that are effective.

In response to the unquestioned chorus of "college for all," high schools and community colleges turn their focus to preparing students for four-year institutions (Gray & Herr, 2006). While high schools eliminated their vocational programs to meet the

demands of reduced budgets and "No Child Left Behind" academic testing requirements, community colleges responded with increased attention to academic standards and requirements. Although California's efforts to increase math skills of students earning the Associate Degree are laudable, eliminating the availability of contextual math courses as a response to state university prerequisite requirements along with the elimination of those courses as vocational degree requirements, when contextual courses increase the acquisition of math skills and the likelihood of success for students so dramatically, is untenable and should be revisited.

Bailey and Morest (2006) identify one of the major barriers to providing access with an opportunity of success as the enrollment-driven funding model used in California. Community college funding in California is based on the number of students sitting in seats at first census of the course (i.e., one fifth of the way through the course). With a goal of maintaining sufficient enrollments for the class "to go", usually 18-24 students, for only the first fifth of the semester, it is not difficult to imagine a scenario where on the day after first census the course difficulty level increases dramatically and student enrollments gradually decline to a manageable class size. This is not to say that faculty consciously manage enrollments in this way, however, practices may evolve unintentionally when class size criteria meet curricular difficulty. Without an incentive to retain students and increase student learning, faculty would need to consciously resist those tendencies for classroom management.

Funding policies could be developed that reward student retention and student learning rather than classroom management. Those same policies would also provide incentives for effective innovations to expand. However, safeguards would need to be

put in place to avoid the pitfalls identified by Bailey and Morest (2006) such as "creaming" that would reduce or eliminate access to under-prepared students rather than increase their success. Designing policies that would balance access and success would require an environment that encourages research-based instructional improvements, innovations, and experimentation. Developing or rebuilding effective and engaging cross-curricular courses that integrate academic and occupational competencies that have been demonstrated in this study to be effective in moving students into college-level work would require such an environment. Community colleges and their educational partners, as well as the state and federal systems that govern them, and the students they serve would benefit from an environment that encouraged innovation and funded expansion of those innovations that were successful in helping students progress to their educational goals.

This dissertation stated early in the text that "Educators and policymakers have difficult choices ahead: the impact of those choices will determine our nation's future" (p. 14). Some educators and public policy leaders now question the relevancy the ideals in the California master plan's promises of minimal fees and universal access nearly 50 years after its adoption (Keller, 2009). They base this question of relevancy on the declining percentage of the population in California completing degrees and certificates and the current state of the California economy. Increasing availability of highly effective contextual math and English courses that would meet degree requirements would make the most efficient use of our dwindling resources. Rather than the eliminate funds for instructional improvement and the basic skills initiative, the governor and

legislature should target resources in the basic skills initiative to strengthen basic skills through expansion of contextualized instruction.

With the impacts of the recession that began in 2008 disproportionately affecting low-income populations and increasing the size of populations in poverty (Flaming, Matsunaga, & Burns, 2009), innovations that would increase the success of Black and Hispanic students in their postsecondary efforts are critical. Flaming, et al. describe how poverty increased during the 1990 recession and then peaked nearly two years after the peak in unemployment. They also document how success in college mediated the effects of the recession on poverty rates for college going populations. As the recession of 2008 plays out, it is imperative that we focus on effective education for low-income students as their numbers increase and fewer resources are available to support them. It is possible and probable that by expanding the contextual basic skills offerings in the community colleges, college success rates for those hit hardest by the recession could be increased with very few additional fiscal resources. Policy-makers should recognize that targeting resources where they are most effective in increasing student skill attainment, and the resulting increased worker productivity, is the goal of policy rather than simply reducing and growing budgets as state revenues decline or become available.

REFERENCES

ACT. (2004). *Crisis at the core*. Iowa City, IA: ACT, Inc.

Adelman, C. (1999). *Answers in the toolbox: academic intensity, attendance patterns, and bachelor's degree attainment*. Washington, DC: Office of Educational Research and Improvement, U.S. Department of Education.

Arendale, D. R. (2004). Mainstreamed academic assistance and enrichment for all students: The historical origins of learning assistance centers. *Research for Educational Reform, 9*(4), 3-21.

Attewell, P., Lavin, D., Domina, T., & Levey, T. (2006). New evidence on college remediation. *Journal of Higher Education, 77*(5), 886-924.

Badway, N., & Grubb, W. N. (1997). *A sourcebook for reshaping the community college: Curriculum integration and the multiple domains of career preparation. Volumes I and II: Framework and examples*. California: NCRVE Materials Distribution Service.

Bahr, P. R. (2007). Double jeopardy: Testing the effects of multiple basic skill deficiencies on successful remediation. *Research in Higher Education, 48(6)*, 695-725.

Bahr, P. R. (2008). Does mathematics remediation work?: A comparative analysis of academic attainment among community college students. *Research in Higher Education, 49(5)*, 420-450.

Bahr, P. R. (in press). Preparing the underprepared: an analysis of racial disparities in postsecondary mathematics remediation. *Journal of Higher Education*.

Bailey, T., & Morest, V. S. (Eds.) (2006). *Defending the Community College Equity Agenda*. Baltimore, MD: Johns Hopkins.

Baker, E., Hope, L., & Karandjeff, K. (2009). *Contextualized teaching & learning: A faculty primer*. Sacramento, CA: Chancellor's Office of the California Community Colleges.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman

Bandura, A., Barbaranelli, C., Caprara, G. V., & Pastorelli, C. (1996). Multifaceted impact of self-efficacy beliefs on academic functioning. *Child Development, 67*, 1206-1222

Barajas H., & Ronnkvist, A. (2007). Racialized space: Framing Latino and Latina experience in public schools. *Teachers College Record*, *109*(6), 1517-1538

Bastedo, M. N., & Gumport, p. J. (2003). Access to what? Mission differentiation and academic stratification in U.S. public higher education. *Higher Education, 46*(3), 341-359.

Bauer, L., & Casazza, M. E. (2005). Oral history of postsecondary access: K. Patricia Cross, a pioneer. *Journal of Developmental Education, 29*(2), 20-25.

Behrman, E. H. (2000). Developmental placement decisions: Content-specific reading assessment. *Journal of Developmental Education, 23*(3), 12-17.

Behrman, E. H., & Street, C. (2005). The validity of using a content-specific reading comprehension test for college placement. *Journal of College Reading and Learning, 32*(2), 5-21

Blumenthal, A. J. (2002). English as a second language at the community college: An exploration of context and concerns. *New Directions for Community Colleges, 2002*(117), 45-53.

Boswell, K., & Wilson, C. D. (2004). *Keeping America's promise: A report on the future of the community college*. Denver, CO: ECS and League for Innovation in the Community College.

Boylan, H. R. (1999). Exploring alternatives to remediation. *Journal of Developmental Education, 22*(3), 2-8.

Boylan, H. R., & Bonham, B. S. (2007). 30 years of developmental education: A retrospective. *Journal of Developmental Education 30*(3), 2-4.

Boylan, H. R., Bonham, B. S., & White, S. R. (1999). Developmental and remedial education in postsecondary education. *New Directions for Higher Education.* (108), 87-101.

Boylan, H. R., & Saxon, D. P. (1999). *What works in remediation: Lessons from 30 years of research*. Unpublished report. Retrieved October 14, 2006 from http://www.ncde.appstate.edu/reserve_reading/what_works.htm

Boylan, H. R., & Saxon, D. P. (2006). *Affirmation and discovery: Learning from successful community college developmental programs in Texas*. Research contracted by the Texas Association of Community Colleges. Retrieved March 12, 2007 from http://www.ncde.appstate.edu/reservereading.htm

Breneman, D. W. (1998). Remediation in higher education: Its extent and cost. In Ravitch, D. (Ed.), *Brookings Papers on Education Policy: 1998.* (pp. 359-371). DC: Brookings Institution Press.

Breneman, D. W., & Haarlow, W. N. (1998). *Remediation in higher education.* DC: Thomas B. Fordham Foundation.

Brint, S. (2003). Few remaining dreams: Community colleges since 1985. *The ANNALS of the American Academy of Political and Social Science, 586*(1), 16-37.

Byrd, K. L., & MacDonald, G. (2005). Defining college readiness from the inside out: First-generation college student perspectives. *Community College Review, 33*(1), 22-37.

California Community Colleges (1984). *Student accountability model operations manual*. Sacramento, CA: Chancellor's Office of the California Community Colleges.

California Community Colleges (2000a). *Data element dictionary.* Sacramento, CA: Management Information System, Chancellor's Office of the California Community Colleges.

California Community Colleges (2000b). *Vocational & Technical Education Act report and indicator descriptions and methodology for the California Community Colleges*. Sacramento, CA: Chancellor's Office of the California Community Colleges.

California State University (2006). [Proficiency reports in table format for Fall 2006 regularly admitted first-time freshmen for math and English by gender and ethnicity]. Proficiency reports of students entering the CSU System. Retrieved July 21, 2007 from California State University Office of the Chancellor, Analytic Studies website at http://www.asd.calstate.edu/performance/proficiency.shtml

Carnevale, A. P., & Fry, R. A. (2000). *Crossing the great divide: Can we achieve equity when generation Y goes to college?* Leadership 2000 series. NJ: Educational Testing Service.

Carroll, T., Fulton, K., Abercrombie, K., & Yoon, I. (2004). *Fifty years after Brown v. Board of Education: A two-tiered education system*. Washington, DC: National Commission on Teaching and America's Future.

Center for Student Success (2005). *Environmental scan: a summary of key issues facing California community colleges pertinent to the strategic planning process - July 2005*. Sacramento, CA. Retrieved July 21, 2007 from http://rpgroup.org/Projects/CCC-StrategicPlan/EvScanCCC-StrategicPln-RPCSS-07-05.pdf

Center for Student Success (2007). *Basic Skills as a Foundation for Student Success in California Community Colleges*. Sacramento, CA. Retrieved March 12, 2007 from http://css.rpgroup.org/uploads/RPBasicSkills2007.pdf

Clark, B. R. (1960). The "Cooling-Out" function in Higher Education. *The American Journal of Sociology, 65*(6), 569-576.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage Publications, Inc.

Dougherty, K. J., & Kienzl, G. S. (2006). It's not enough to get through the open door: Inequalities by social background in transfer from community colleges to four-year colleges. *Teachers College Record, 108*(3), 452–487.

Dowd, A. C. (2003). From access to outcome equity: Revitalizing the democratic mission of the community college. *Annals of the American Academy of Political and Social Science, 586*, Community Colleges: New Environments, New Directions, 92-119.

Dowd, A. C. (2005). *Data don't drive: Building a practitioner-driven culture of inquiry to assess community college performance*. Boston: University of Massachusetts. (Lumina Foundation report December 2005). Retrieved October 15, 2006 from http://www.luminafoundation.org

Flaming, D., Matsunaga, M., & Burns, P. (2009). *Ebbing tides in the golden state: Impacts of the 2008 recession on California and Los Angeles county*. The California Endowment and Economic Roundtable, Los Angeles, California. Retrieved June 18, 2009, from www.economicrt.org

Gall, M. D., Gall, J. P., & Borg W. R. (2003). *Educational research: An introduction.* New York: Pearson Education Inc.

Gray, K., & Herr, E. (2006). *Other ways to win: Creating alternatives for high school graduates. 3rd edition.* Thousand Oaks, CA; Corwin Press.

Grimm, G., & Yarnold P. (Eds.) (2003). *Reading and understanding multivariate statistics*. Washington, DC: American Psychological Association.

Grubb, W. N. (1996a). *Learning to work: The case for reintegrating job training and education.* New York: Russell Sage Foundation.

Grubb, W. N. (1996b). *Working in the middle: Strengthening education and training for the mid-skilled labor force.* San Francisco: Jossey-Bass.

Grubb, W. N. (2001). *From black box to Pandora's box: Evaluating remedial/developmental education.* New York: Community College Research Center, Teachers College, Columbia University.

Grubb, W. N., & Associates (1999). *Honored, but invisible: An inside look at teaching in community colleges*. New York: Routledge.

Grubb, W. N., & Badway, N. N. (2005*). From compliance to improvement: Accountability and assessment in California Community Colleges* (Contract #03-0393, pp. 1-46). Berkeley, CA: Higher Education Evaluation Research Group.

Grubb, W. N., Badway, N., & Bell, D. (2003). Community colleges and the equity agenda: The potential of noncredit education. *The Annals of the American Academy of Political and Social Science, 586*(1), 218-240.

Grubb, W. N., & Kraskouskas, E. (1992). *A time to every purpose: Integrating occupational and academic education in community colleges and technical institutes*. MDS-251. Berkeley, CA: University of California at Berkeley, National Center for Research in Vocational Education.

Grubb, W. N., & Lazerson, M. (2004). *The education gospel: The economic power of schooling*. Cambridge, Massachusetts: Harvard University Press.

Huck, S. W. (2003). *Reading statistics and research (4th ed.)*. New York: Addison Wesley Longman, Inc.

Keller, J. (2009, June 15). California's "gold standard" for higher education falls upon hard times. *The Chronicle of Higher Education*, pp. A37-38. Retrieved June 15, 2009, from http://chronicle.com/weekly/v55/i39/39masterplan.htm

Kozeracki, C. A. (Ed.) (2005). Responsive developmental education [Entire issue]. *New Directions for Community Colleges, 2005*(129), 103.

Lenning, O. T., & Ebbers, L. H. (1999). The powerful potential of learning communities: Improving education for the future. *ASHE-ERIC Higher Education Report, 26*(6). (ED428606).

Malveaux, J. (2003). *What's at stake: The social and economic benefits of higher education* (College Board research report No. RR2). New York: College Entrance Examination Board.

Martin, D. B. (2009). Researching race in mathematics education. *Teachers College Record*, *111*(2), 295–338.

Mathur, A. K., Reichle, J., Strawn, J., & Wiseley, W. C. (2004). *From jobs to careers: How California community college credentials pay off for welfare participants.* Washington, D.C.: Center for Law and Social Policy.

McCabe, R. H. (2000). *No one to waste: A report to public decision-makers and community college leaders*. Washington, DC: American Association of Community Colleges: Community College Press.

McCabe, R. H., & Day, P. R. (1998). *Developmental education: A twenty-first century social and economic imperative.* CA: League for Innovation in the Community College.

Mumper, M. (2003). The future of college access: The declining role of public higher education in promoting equal opportunity. *The Annals of the American Academy of Political and Social Science, 585*(1) 97-117.

Merisotis, J. P., & Phipps, R. A. (2000). Remedial education in colleges and universities: What's really going on? *The Review of Higher Education, 24*(1), 67-85.

National Assessment of Vocational Education (1994). *Final report to Congress, volume III*. Office of Research, Office of Educational Research and Improvement. Washington, DC: United States Department of Education.

Oudenhoven, B. (2002). Remediation at the community college: Pressing issues, uncertain solutions. *New Directions for Community Colleges, 2002*(117), 35-44.

Patton, M. Q. (2002). *Qualitative research & evaluation methods.* Thousand Oaks, CA: Sage Publications, Inc.

Perin, D. (2001a). Academic-occupational integration as a reform strategy for the community college: classroom perspectives. *Teachers College Record, 103*(2), 303-335.

Perin, D. (2001b). Making remediation more learner-centered: promising approaches from case studies. *Community College Journal, 72*(1), 53-56.

Perin, D. (2002). Curriculum and pedagogy for academic-occupational integration in community colleges: Illustrations from an instrumental case study – Part IX: Conclusions and recommendations. *Teachers College Record*, ID Number: 11002, Retrieved August 6, 2006 from http://www.tcrecord.org

Perin, D. (2006). Can community colleges protect both access and standards? The problem of remediation. *Teachers College Record, 108*(3), 339-373.

Perin, D., & Charron, K. (2003). *Trends in community college assessment and placement approaches: Implications for educational policy* Presentation at American Educational Research Association annual conference, April 2003. New York: Columbia University, Teachers College, Community College Research Center, 18.

Phelan, D. J. (2000). *Enrollment policies and student access at community colleges* (policy paper No. CC002). CO: ECS Distribution Center.

Phipps, R. (1998). *College remediation: What it is, what it costs, what's at stake?* DC: Institute for Higher Education Policy.

Price, D. V. (2005). *Learning communities and student success in postsecondary education: A background paper.* NY: MDRC.

Romero-Frias et al. v. Mertes et al., No. 502341, (S. C. Sacramento County 1988)

Roueche, J. E., & Hurlburt, A. S. (1968). The Open-Door College: The Problem of the Low Achiever. *The Journal of Higher Education*, *39*(8), 453-456.

Roueche, J. E., & Roueche, S. D. (1999). *High Stakes, High Performance: Making Remedial Education Work.* District of Columbia: American Association of Community Colleges: Community College Press.

Sanchez, J. R., Laanan, F. S., & Wiseley, W. C, (1999). Postcollege earnings of former students at California colleges: Methods, analysis, and implications. *Research and higher education, 40*(1), 87-113.

SAS Institute Inc. (2008). *SAS/STAT® 9.2 User's Guide*. Cary, NC: SAS Institute Inc.

Schults, C. (2001). *Remedial education: Practices and policies in community colleges* (Research Brief No AACC-RB-00-2). American Association of Community Colleges. Retrieved Aug 1, 2006 from http://www.aacc.nche.edu/content/contentgroups/research_briefs2/Remedial.pdf.

Spann, M. G., Jr. (2000). *Remediation: A must for the 21st-century learning society* (policy paper No. CC004). Colorado: ECS Distribution Center.

Stansbury, S. (2001). Accelerated learning groups enhance supplemental instruction for at-risk students. *Journal of Developmental Education, 24*(3), 20-26.

Stone, J.R., Alfeld, C., Pearson, D., Lewis, M.V., & Jensen, S. (2006). *Building academic skills in context: Testing the value of enhanced math learning in CTE*. National Research Center for Career and Technical Education, University of Minnesota.

Talburt, S., & Boyles, D. (2005). Reconsidering learning communities: Expanding the discourse by challenging the discourse. *The Journal of General Education, 54* (3), 209-236.

Tinto, V. (1998). *Learning communities and the reconstruction of remedial education in higher education*. Monograph prepared for presentation at the "Conference on

Replacing Remediation in Higher Education" at Stanford University, January 26-27, 1998, Syracuse University: New York, 27.

Tinto, V. (2000). Learning better together: the impact of learning communities on student success in higher education. *Journal of Institutional Research, 9*, 48-53.

Thompson, B. (2006). *Foundations of behavioral statistics: an insight-based approach*. New York: The Guilford Press.

Wuensch, K. L. (2007). *Logistic regression with SAS.* Retrieved March 2, 2007 from http://core.ecu.edu/psyc/wuenschk/MV/multReg/Logistic-SAS.doc

Zelterman, D. (1999). *Models for discrete data*. NY: Oxford University Press.

APPENDIX A. SURVEY LETTER

Month Day, Year

Dear Colleague,

You are invited to participate in a study on the effectiveness of pre-collegiate credit basic skills courses offered in reading, writing, and math in California community colleges. The study will examine the effectiveness of innovative practices that integrate developmental education and career technical education topics. You were selected as a possible participant in this study because of your direct knowledge of the types of curricular offerings at your institution. If there is a more appropriate person on your campus to answer the short survey, please forward this invitation to them. There are no risks for either responding or not responding to the survey, however, your response to this short questionnaire is important to the study regardless of whether you were undertaking integration efforts during the study period.

The study will link courses identified through the survey and subsequent follow-up with data from the California Community Co if lleges Chancellor's Office Management Information System database. An executive summary of the completed research will be provided to participating colleges to help them understand possible benefits of integrating of vocational and basic skills topics.

Survey responses will be kept confidential and data from this research will only be reported in the aggregate and no colleges will be identified.

Although the survey has been approved and is being facilitated through the California Community Colleges Chancellor's Office, the study is being conducted as dissertation research through School of Education at Pacific University. By responding to the survey you are providing consent to use the data collected in the survey for this research.

Please return the survey by e-mail to cwiseley@cccco.edu before _____ if possible. Surveys may also be returned to my attention by fax at (916) 445-6268. If you have questions or concerns regarding the survey or research, please feel free to contact me.

W. Chuck Wiseley
CCC Chancellor's Office
Career Technical Education
(916) 327-5895 cwiseley@cccco.edu

Attachment: Questionnaire

APPENDIX B. SURVEY

Dear Colleague,

Thank you for participating in this study on the effectiveness of instructional practices that integrate pre-collegiate credit basic skills courses in reading, writing, or math and career technical education topics. Your response to this short questionnaire is important to the study regardless of whether you were undertaking integration efforts during the study period.

Survey responses will be kept confidential and data from this research will only be reported in the aggregate. No colleges will be identified in any reports.

College name:	

The following questions pertain only to **Credit Basic Skills** courses or sections of courses that were **at least two levels below transfer level** courses offered during the 2006-2007 academic year in any of the three areas of Reading, Writing, or Math. ESL courses are not included in this study.

Please indicate Yes or No for each of the practices stated below by putting an X in the appropriate column. Either answer is equally useful to the study.

Yes	No	During the 2006-2007 academic year:
		Some credit Basic Skills courses or sections of courses were adapted to the interests of Career Technical Education (CTE) students (e.g., reading technical manuals, writing for technology industries, business math, math for health careers, etc.).
		Some credit Basic Skills courses or sections of courses were linked to CTE courses as a unit. Concurrent enrollment may or may not be required.
		3. Some credit Basic Skills courses or sections of courses were linked to CTE courses and students formed a learning community. Concurrent enrollment is required.

If you answered yes to any of the questions above, please indicate the question number (Q #) relating to the contact, basic skill area (Reading, Writing, or Math,) of the offering, and provide contact information for further follow-up on course content. Use additional space if necessary.

Complete contact information is crucial to the accuracy of the study.

Q #	Skill Area	Name	Title	Phone	Email

Please provide your contact information in the boxes below:

Name:	Title:
Phone:	E-mail:

Please return the survey to cwiseley@cccco.edu

Thank you for your time and effort

APPENDIX C. COURSE DATA ELEMENTS

Course data elements for extraction for the system office Management Information System database will include the following:

DED#	DATA ELEMENT NAME	PICTURE
GI90	RECORD-CODE	"CB"
GI01	DISTRICT-COLLEGE-IDENTIFIER	X(03)
GI03	TERM-IDENTIFIER	X(03)
CB01	COURSE-DEPARTMENT-NUMBER	X(12)
CB02	COURSE-TITLE	X(68)
CB03	COURSE-TOP-CODE	X(06)
CB04	COURSE-CREDIT-STATUS	X(01)
CB05	COURSE-TRANSFER-STATUS	X(01)
CB06	COURSE-UNITS-OF-CREDIT-MAXIMUM	99v99
CB07	COURSE-UNITS-OF-CREDIT-MINIMUM	99v99
CB08	COURSE-BASIC-SKILLS-STATUS	X(01)
CB09	COURSE-SAM-PRIORITY-CODE	X(01)
CB10	COURSE-COOP-WORK-EXP-ED-STATUS	X(01)
CB11	COURSE-CLASSIFICATION-CODE	X(01)
CB21	COURSE-PRIOR-TO-COLLEGE-LEVEL	X(01)
CB22	COURSE-NONCREDIT-CATEGORY	X(01)
CB24	COURSE-PROGRAM-STATUS	X(01)