

EFFECTIVENESS OF CONTEXTUAL APPROACHES TO DEVELOPMENTAL  
MATH IN CALIFORNIA COMMUNITY COLLEGES

by

Walter Charles Wiseley

University of the Pacific  
Stockton, California

Dissertation Committee:

Dissertation Advisor: Norena Norton Badway, Ph.D.

Committee Member: W. Norton Grubb, Ph.D.

Committee Member: Delores McNair, Ed.D.

Committee Member: Lynn G. Beck, Ph.D., Dean, Benerd School of Education

Defended May 7, 2009

## TABLE OF CONTEXTS

INTRODUCTION AND RATIONALE FOR THE STUDY .....	1
THE PROBLEM.....	3
PURPOSE AND SIGNIFICANCE OF THE STUDY .....	3
RESEARCH QUESTIONS .....	4
CONCEPTUAL FRAMEWORK.....	5
METHODOLOGY .....	7
<i>Research Design</i> .....	7
<i>Data Analysis</i> .....	9
Dependent Variables .....	9
Independent Variables .....	10
Control Variables .....	10
FINDINGS.....	10
CONCLUSIONS AND RECOMMENDATIONS .....	14
REFERENCES .....	19

Note: Only references included in this abstract are included.

## INTRODUCTION AND RATIONALE FOR THE STUDY

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 those 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 are entering 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 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.

Educators have begun to identify and implement effective developmental education practices in areas such as (a) assessment and placement, (b) curriculum design and delivery, (c)

support services, and (d) evaluation of those practices. Some of the evolving practices to address these four areas at community colleges involve multiple strategies. Some 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 (a) knowledge and skill deficiencies and (b) 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 advising. Evaluation strategies include assessment of student learning outcomes and classroom assessment techniques and research to identify effective basic skills placement and practices.

The evolution of developmental education has reached a point where efficient yet effective practices are emerging and the literature is highlighting better ways to serve students in need of developmental instruction and services (Bailey & Morest, 2006; Boylan, 1999; Center for Student Success [CSS], 2007). However, the 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 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 for replication 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. The study also examines 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 also identifies criteria to measure the effectiveness of basic skills and developmental education courses taught where vocational and academic content has been integrated through a linked or a fully integrated model.

## PURPOSE AND SIGNIFICANCE OF THE STUDY

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 occupational content areas, in California Community Colleges (CCC).

In 2006, California provided \$33 million in ongoing funds to increase the effectiveness of basic skills instruction in CCC. The funds have continued to be in state budgets through 2009. The CCC system office was encouraged to request an increase of the funds to \$60 million for 2008. In preparation for the release of those funds, the state 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 (CSS) to develop workshops and accompanying materials to help colleges plan to increase the capacity and effectiveness of basic skills instruction.

The materials on effective organization and instructional practices in basic skills developed by the CSS (CSS, 2007), included both contextual learning and learning communities. 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 seeks 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? .

## CONCEPTUAL FRAMEWORK

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 success 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 academic 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 developmental activities and continued support in college-level courses.

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 found in the mid-1990s only in isolated pockets of institutions (Badway & Grubb, 1997; Grubb & Associates, 1999). This study examines whether the colleges implemented those innovative and effective practices using contextual instruction, and whether those implementations were effective for the students of the community college system.

Contextualized curriculum delivers reading, writing, English language, math, or critical thinking skills in the context of a content course (Grubb & Krouskouskas, 1992; Perin, 2001a). 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 on 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 using various models of integration.

A number of types of contextualized basic skills instruction were included in the study such as hybrid and infused courses, linked courses, and learning communities. Hybrid courses have 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, 2001a). Another form of contextualized curriculum included in the study 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, tandem, or paired courses, also considered in the study, 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. The last type of contextualized instruction considered in the study was learning communities. Although there are many types of learning communities with various levels of curricular integration (Lenning & Ebbers, 1999), this study looked at those defined as “curricular cohort learning communities” (p. 23) that included a basic skills component.

The framework for this study juxtaposes these types of contextualized instructional methods against standard academic model forms of basic skills instruction. Furthermore, the study examines whether contextualized instructional models are more or less effective for students of color. While case studies of various forms of contextual instruction provide evidence of increased student engagement that increases persistence and retention, this study examines the effectiveness of contextual models across the California community college system.

## 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 section briefly details the methodology used including the nature and design of the study, the data collection procedures, and analytical frameworks and analysis procedures, as well as some 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 instruction. The research used a two-phase design approach to overcome a problem of identifying integrated and cross-curricular courses in the CCC system office database. While math and English courses are easily identifiable in the database by looking at the course content variable, 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 were used to verify the contextual nature of the course and the course was identified in the database. A short overview of the two phases is presented with some details the research within each phase.

In the first phase, surveys were emailed to three administrator addresses at each of the 110 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 that they offered basic skills in contextual formats provided faculty contacts. Course materials from the identified courses were then requested from the faculty and examined to verify survey responses and contextual content.

Because of the predominance of math courses in the contextualized offerings reported, the first phase of this study resulted in a narrowing of the analysis to credit basic skills math courses starting at the pre-algebra level. The particularly large group of students underprepared in mathematics in the CCC (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 final group of contextualized math courses identified at 10 of the 35 responding colleges used in the study consisted of math courses in a variety of areas such as airframe mechanics, apprenticeship for electricians, construction, electronics, healthcare or multiple occupational contexts.

The second phase of the study used results from the first phase (i.e., specific course identifiers) matched with data maintained by the CCC system office including student, course, and enrollment data from the respondent colleges to analyze the effectiveness of contextualized courses. The effectiveness of contextual modes of credit 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. A total of 17,152 students were included in the final sample with 392 students in contextual basic skills math. The students were coded into one of three groups: 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.

## Data Analysis

The analysis of contextual instruction effectiveness used a panel study with a causal-comparative research design (Gall, Gall, & Borg, 2002) on a number of student outcomes (dependent variables) using logit analysis. This type of non-experimental investigation is appropriate when the independent variable (i.e., enrollment in the contextual course or not) is 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) as in this research where the dependent or response variables are a type of success or not.

### *Dependent Variables*

All of the outcome measures (i.e., dependent variables) in this study are dichotomous. Specifically, whether a student either passed a course or not, persisted to the next term or not, enrolled in college-level coursework or not. Outcomes that look at whether the student passed a course or not, termed “Passed”, use 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 first outcome is whether the student passed the basic skills math course. The second set of outcomes measure how quickly students move into and successfully pass college-level coursework.

Previous research (Bahr, 2008; Bailey & Morest, 2006; Grubb & Associates, 1999; Perin, 2001b, 2006) 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. 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 math 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. Age-at-term of enrollment and grant amount (one of the SES proxies) were treated as continuous variables. Age squared and grant amount squared were used to test the linearity of the effects of age and grant amount. Adding the quadratic terms 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. Similarly, 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.

## FINDINGS

This section provides a summary of 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 basic skills courses compared to standard basic skills courses at the same level in California Community Colleges (CCC).

Contextualized developmental education courses 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, 2005), 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.

Contextual basic skills courses were found to be 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 contextual credit 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 odds 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 college-level 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 to 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.

While students in the contextual group were less likely to attempt a transfer-level course, they were more likely to pass it than students in the standard math group. 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 a 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, 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.

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. 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)

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.

Two additional findings, not originally specified as a focus in this study, are discussed in the dissertation. Only the most significant is mentioned here. Even when controlling for all covariates in the model, 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 showed the differential effects of contextualization for each ethnic group 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.

Contextualization of the math course provided a positive effect on passing the course for the three of the five 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.

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.

## CONCLUSIONS AND RECOMMENDATIONS

This section provides a brief discussion of the implications of the research findings for educators and policymakers. In short, contextualization had a highly positive impact on student course completion (passing both basic skills math and degree applicable coursework) and some measures of progress. This analysis found contextualization provided particular benefits for student groups historically underserved in education including Black and Hispanic students. However, contextual courses were mostly found in isolated areas at a small number of colleges. The study discusses the implications of both (a) the effectiveness of contextualizing basic skills math and the benefits for retention, progress and persistence and the ethnic populations that benefitted most and (b) the continuing scarcity of these effective innovations in delivering Basic Skills instruction in the community colleges.

This analysis expands on prior research on the effectiveness of basic skills mathematics in remediating mathematics deficiencies in the California community colleges (CCC). 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 CCC, a more nuanced view of student success in basic skills math and entry into and success in college-level coursework emerged.

Bahr (2007, 2008, in press) has published extensive research on the effects of successful remediation and the barriers to that success in the CCC. 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.

The goal of remediation is to move students into and prepare them for college-level coursework (Bahr, 2008; Bailey & Morest, 2006; Grubb & Associates, 1999; Perin, 2001a). 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 immediate 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 not only able to learn the foundational pre-algebra math skills along with higher levels of math relating to the occupational content, often included in the same cross-curricular course but were able to transfer those learning skills to other contexts providing success in other college-level courses. 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.

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), 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 with 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 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.

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, 2001a, 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 in the literature. With only isolated occurrences of contextual courses found at the colleges and the small numbers of students in those contextual courses, the colleges 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. State, federal, and institutional policies often create barriers to expanding these effective instructional methods.

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. The new Carl D. Perkins Act excludes funding basic skills courses and an applied general education status limits transferability of subsequent transfer level courses at CSU. Those policies and changes to policy result in lower 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.

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 and educators 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

- 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.
- Bauer, L., & Casazza, M. E. (2005). Oral history of postsecondary access: K. Patricia Cross, a pioneer. *Journal of Developmental Education, 29*(2), 20-25.
- 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., & 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](http://www.ncde.appstate.edu/reserve_reading/what_works.htm)
- 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.
- 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](http://www.economicrt.org)
- Gall, M. D., Gall, J. P., & Borg W. R. (2003). *Educational research: An introduction*. New York: Pearson Education Inc.
- Grimm, G., & Yarnold P. (Eds.) (2003). *Reading and understanding multivariate statistics*. Washington, DC: American Psychological Association.
- 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., & 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.
- Huck, S. W. (2003). *Reading statistics and research (4th ed.)*. New York: Addison Wesley Longman, Inc.
- 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).
- 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.
- 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.

- Oudenhoven, B. (2002). Remediation at the community college: Pressing issues, uncertain solutions. *New Directions for Community Colleges*, 2002(117), 35-44.
- 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.
- Phipps, R. (1998). *College remediation: What it is, what it costs, what's at stake?* DC: Institute for Higher Education Policy.
- 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.
- Spann, M. G., Jr. (2000). *Remediation: A must for the 21st-century learning society* (policy paper No. CC004). Colorado: ECS Distribution Center.
- 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.
- Zeltermann, D. (1999). *Models for discrete data*. NY: Oxford University Press.

