Course-taking patterns, policies, and practices in developmental education in the California Community Colleges

A report to the California Community Colleges Chancellor's Office

June 2010

EdSource

Mary Perry, deputy director, study project director
Matthew Rosin, Ph.D., senior research associate
Kathryn Morgan Woodward, research associate

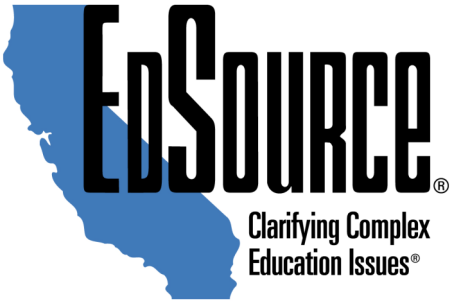
Trish Williams, executive director

University of Michigan
School of Education

Peter Riley Bahr, Ph.D., assistant professor

Suggested citation:

Perry, M.; Bahr, P.R.; Rosin, M.; & Woodward, K.M. (2010). *Course-taking patterns, policies, and practices in developmental education in the California Community Colleges*. Mountain View, CA: EdSource.



EdSource is an independent, impartial, not-for-profit organization whose sole mission is to clarify complex education issues and to promote thoughtful decisions about improving public education. Founded in California in 1977, EdSource is a respected source of information for K–14 education policy, data, and research.

520 San Antonio Rd, Suite 200, Mountain View, CA 94040-1217 | 650/917-9481

Fax: 650/917-9482 | edsource@edsource.org

www.edsource.org | www.ed-data.org

Table of contents

List of figures

About this study

In 2009, the California Community Colleges Chancellor's Office (CCCCO) contracted with EdSource to perform a study of developmental (or basic skills) course-taking patterns, practices, and policies within the community college system. The CCCCO provided the study team with ample independence to pursue and report on the research as we believed was best.

The research questions included:

- What key policies and decisions have shaped developmental education in California?
- How can we describe the remedial course-taking patterns of students within the California Community Colleges?
- Which remedial course-taking patterns correlate most highly with various student outcomes, and to what extent does this vary based on student characteristics?
- What are the current policies and practices related to remedial course-taking and developmental education more generally within the system?
- What are the current critiques, issues, and innovations related to those policies and practices?
- What are the implications of these findings for CCC practices and policies, and for state policy related to developmental education?

To develop the analysis of course-taking patterns and their correspondence with particular outcomes, EdSource contracted with Dr. Peter Riley Bahr, Assistant Professor of Education at the Center for the Study of Higher and Postsecondary Education, University of Michigan, Ann Arbor. Using unitary Management Information System (MIS) data supplied by the CCCCO, Bahr compiled and analyzed the course-taking history of students who enrolled for the first time in Fall 2002 and—at some point prior to Summer 2009—enrolled in a remedial mathematics, writing, or reading course.

The balance of the study describes relevant policies and practices in the community colleges. Researched and written by EdSource staff, it reflects literature review, policy analysis, and information gathered through interviews and other consultation with more than 40 community college stakeholders, including educators, policymakers, and researchers within and outside California.

Crucial questions in California today

Policy discussions in California and nationally focus increasingly on student success in community colleges, and those discussions inevitably come around to questions of academic rigor within the system. But in the open-access community colleges in this state, ratcheting up expectations for ultimate outcomes cannot be separated from thinking about developmental education.

This reality was clear when the California Community Colleges officially standardized the minimum course expectations for the associate degree to require that students successfully complete Intermediate Algebra and Freshman Composition. Although the first class to be directly affected by this statewide requirement just entered the system in September 2009, it has already focused new attention on developmental education. It has also raised many important questions, including those explored in this study.

The quantitative portion of this study, presented in Part Two, looks at remedial course-taking

patterns and their relationships with student attainment and completion. This information was requested to inform policymaking related to developmental education.

As Part Three of this report highlights, the relevant policy issues are numerous, including questions of prerequisites and their enforcement on one hand and the need to support effective practice and innovative approaches to developmental education on the other. California also is considering changes in how incoming students are assessed for placement. And the state remains challenged to provide consistent and clarifying information about student outcomes in developmental education, given the myriad approaches undertaken by local colleges.

This study provides benchmark measures of student behavior and outcomes in developmental education as it has been practiced in the state to date, and an assessment of prospects for continued growth and improvement looking forward. Based on the findings and conclusions from both the quantitative and qualitative sections, it also presents implications for state policy as California works to strengthen developmental education at its 112 community colleges.

June 2010

Executive summary

The visibility of developmental education—or basic skills education as it is called most often in California—has increased in recent years. One major catalyst was a comprehensive community college strategic planning process completed in 2004 that listed basic skills as a critical area of focus. Another was an increase in the system's minimum course-taking requirements for the associate degree. These helped pave the way for the state's Basic Skills Initiative (BSI) and greater public reporting of basic skills outcomes through the new *Basic Skills Accountability Report* (CCCCO, 2009). These policy actions underscore the place of developmental education as a cornerstone of the work and purpose of the California Community Colleges.

EdSource undertook this study, under contract with the Chancellor's Office, to further understanding of several issues related to this part of the system's mission.

This study has two parts. The quantitative section describes remedial course-taking patterns in the community colleges and examines the correspondence between those patterns and various student outcomes. The qualitative sections examine research and opinion on related policies and practices both historically and looking forward.

Terminology Used in This Study

- **Developmental** is the broadest and most inclusive term used in this report, and is the predominant term used in the qualitative portions of this study.
- **Remedial** is used to refer to *courses* and *course sequences*.
- **Basic skills** is a common term in California that appears in state regulations and the names of major initiatives, and is used consistent with that reality.

The course-taking data follow students from Fall 2002

The present study focuses on the cohort of students who entered community college for the first time in Fall 2002, and who enrolled in credit remedial courses in mathematics, writing, or reading during a seven-year period. The quantitative section includes statistics describing the remedial sequences offered within the system and the students who enrolled in those courses. It also, for writing and mathematics, explores differences between those students based on the academic level at which they started. Finally, a further quantitative analysis looks at possible correspondence between student course-taking patterns and academic outcomes in these two subjects.

The system's complexity and a lack of data set limits on this study

Because there was *tremendous variation* in how students moved through—or did not move through—the remedial writing and mathematics sequences, this study cannot provide a meaningful summary of students' most common remedial course-taking *trajectories*. Instead, it focuses on key course-taking *variables*—e.g., the skill-level of a student's first remedial course; delay in taking that course; passing that course; delay between a first remedial course and a second, more advanced course—all of which are used to characterize underlying patterns.

In addition, because student-level data on placement recommendations are not collected for the state of California as a whole, this study cannot describe students who "need" developmental education and compare them with students who "do not." Rather, it focuses on students in the cohort who *actually enrolled in* a remedial course in writing, reading, and/or mathematics during the seven-year period analyzed.

California community colleges vary widely in how they organize remedial sequences in writing and reading

The number of course "levels" offered below college composition varied among the colleges. In addition, slightly more than half of colleges offered some form of *integrated* (or *combined*) writing and reading instruction within their respective remedial sequences, with a few colleges offering them at every remedial level. This variation made an analysis of student course-taking in remedial reading impossible to do with any precision. (For the purposes of analysis, integrated courses were considered part of a college's writing sequence.)

The structure of remedial mathematics sequences is more consistent

In general, colleges offered three or four levels of remedial coursework below college mathematics, which were coded with respect to their progression of *content* as follows: Basic Arithmetic (four levels below college math), Pre-Algebra (three levels below), Beginning Algebra (two levels below), and Intermediate Algebra/Geometry (one level below).

The study looks at students who took at least one remedial course

About half of the 122,427 first-time students in the Fall 2002 cohort[1] enrolled in a remedial course during the seven-year period studied. In all, 41% enrolled in a course in a remedial mathematics sequence, 32% took a course in a remedial writing sequence, and 11% took a course in a remedial reading sequence. There was a great deal of overlap among these three groups: overall, slightly more than half of students who took a remedial course did so in more than one sequence. (See the figure on the next page.)

The Course-taking Information in This Study

This study involved the creation of a database that made it possible to identify students based on various characteristics, accurately follow their progress through remedial sequences to college-level courses, and identify their attainment within the system. The study:

- Covers the timeframe from Fall 2002 to Spring 2009.
- Looks at statewide patterns of remedial course-taking within 107 semester-based colleges.
- Is limited to credit courses in mathematics, writing, and reading, and more specifically those that are part of subject-area sequences that lead to college-level coursework.
- Focuses on the subset of all first-time students who entered the system in Fall 2002 and enrolled in those courses.

The study began with careful examination of the remedial sequences offered by the colleges using course catalogs for the years 2002–03 through 2008–09. Using course-taking data for the cohort provided by the California Community Colleges Chancellor's Office, each relevant course taken by a student was coded to specify its "level" with respect to college-level coursework.

Compared with the full first-time cohort, a larger share of students who took a remedial course:

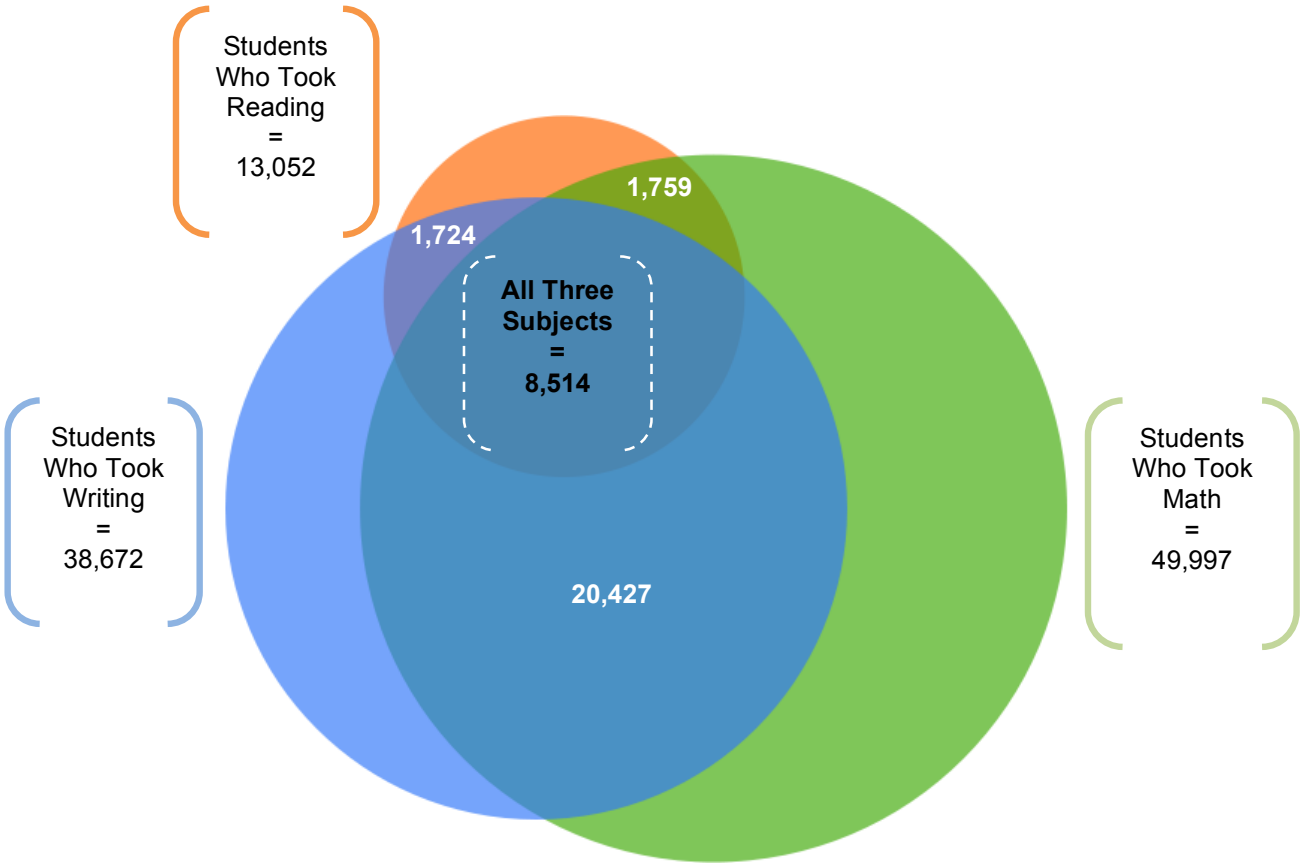
- Were of traditional college age (19 or younger).
- Aspired to transfer.
- Enrolled full time during their first year (12+ units per term), on average.
- Attended community college for a greater number of semesters.

About a third of developmental students in writing and mathematics completed a credential/degree and/or transferred. But large proportions of developmental students did not reach those milestones, including:

[1] See page 15 for a detailed definition of this student cohort.

- Roughly two-thirds of students who enrolled in each of the remedial *mathematics* and *writing* sequences; and
- Nearly three-quarters of students who enrolled in a remedial *reading* sequence.

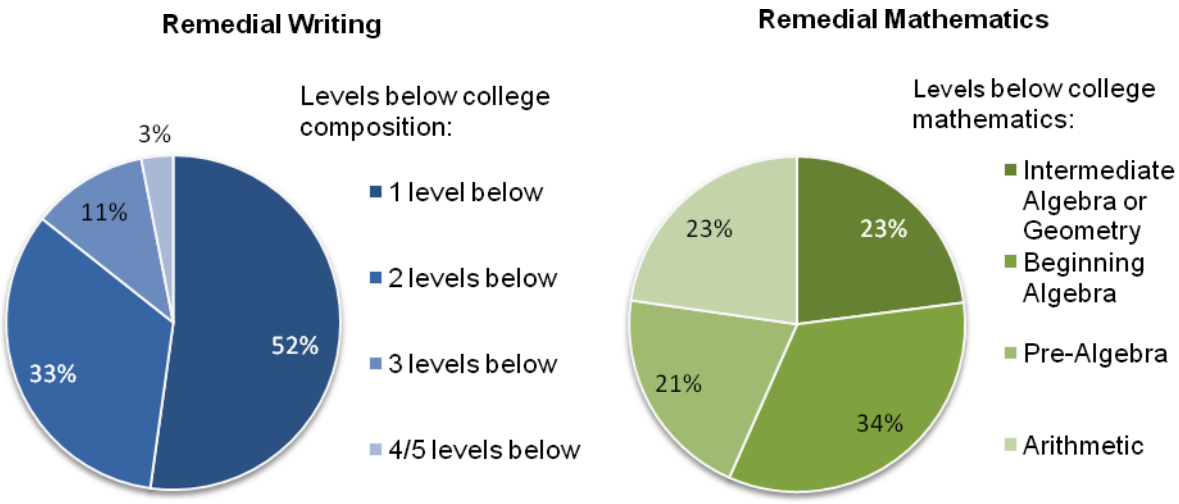
Fall 2002 first-time students who enrolled in one or more remedial courses in writing, reading, and/or mathematics



Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges.

EdSource 6/10

The starting levels of students in the sample who took a remedial writing and/or mathematics course



Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges.
Note: Percentages may not sum to 100 due to rounding. EdSource 6/10

Students' characteristics and attainment varied along with their starting levels

The characteristics, aspirations, behavior, and outcomes of first-time students in the Fall 2002 cohort who took a course in a remedial mathematics or writing sequence varied—sometimes substantially—depending on the level at which they entered a sequence. The pie charts on this page show the different levels at which students in the Fall 2002 cohort entered the writing and mathematics sequences.

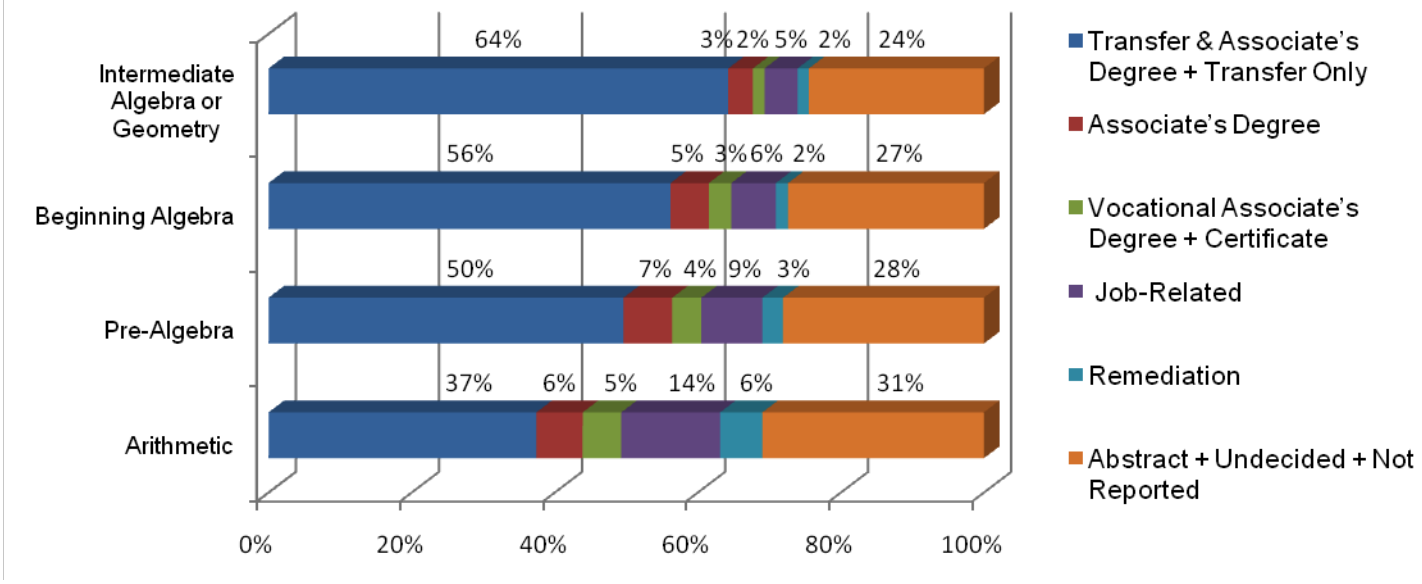
Compared with students who began at lower levels within each remedial sequence, a larger share of the students who began at higher levels of the sequences:

- Were of traditional college age when they entered community college.
- Aspired to more ambitious academic goals.
- Enrolled full time during their first year (12+ units per term), on average.
- Completed college-level coursework beyond the sequence.
- Transferred or completed a degree or certificate, although their rates of doing so were still low. (Even among students who began remedial writing only one level below college composition, 62% neither transferred nor completed a degree or credential.)

Hispanic and black/African American students were overrepresented among those who began at lower levels of the state's writing and mathematics sequences. Asian students were also overrepresented among those who began in lower-level remedial writing courses.

Across all starting levels, most students began taking a remedial writing or mathematics course during their first or second term of enrollment. More than half began immediately in Fall 2002 and another one in five students began in Spring 2003. Some deferred their first remedial course for longer periods of time, including until after Spring 2004.

Incoming aspirations of students in the sample who took a remedial mathematics course, by starting level



Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10

Overall, very few students who began at the lowest levels of remedial coursework ever completed the last course in the remedial sequence or beyond. This prevented many of these students from meeting their long-term college aspirations, although some appear to have had goals other than transfer or a degree. (See the figure on this page for an example.)

The analysis of correlations between course-taking patterns and academic outcomes yielded information about starting levels, delays, and interim benchmarks

Logistic regression was the primary analytical tool used for this portion of the study, which was conducted by Dr. Peter Riley Bahr of the School of Education at the University of Michigan.

Certain aspects of remedial course-taking behavior among first-time students who entered the community colleges in Fall 2002 appear to have had systematic relationships with these students' progress and ultimate achievement in mathematics and writing, controlling for other variables. (It is important to note, however, that we cannot say necessarily that a particular pattern of remedial course-taking "causes," "contributes to," or "leads to" success or failure. We can say only that particular patterns of remedial course-taking are paired in systematic ways with aspects of progress or success.)

Students' starting levels are related to subsequent course-taking in writing and mathematics, but not to delays in taking a first remedial course

- The skill-level of a student's first remedial mathematics or writing course does not appear to be related systematically to whether a student tends to delay this first course.
- With some exceptions, students who began at lower levels of the remedial mathematics or writing sequences were more likely to attempt—and less likely to delay—a second, more advanced course than students who began at the highest levels.

- However, even after accounting for these seemingly advantageous behaviors, the lower a student's starting level in a remedial mathematics or writing sequence, the less likely the student was to complete a college-level course in that subject or a course one level below.

Delaying a first remedial course is related to later course-taking and success, notably in writing

- Students who delayed their first remedial mathematics course were less likely to pass that course, with the exception of students who delayed until their first summer. In writing, delaying a first remedial course was not associated consistently with success in that course.
- In general, students who delayed their first remedial mathematics or writing course for more than one or two semesters were less likely to attempt a second, more advanced course in those subjects, even among students who remained in the system for a long period of time.
- Moderate delays of a student's first remedial writing course (i.e., until the second year) appear to be related negatively to a student's likelihood of completing a college-level writing course or a course one level below. However, only quite lengthy delays of a students' first mathematics course (i.e., until after the second year) appear to have similar consequences.

Passing the first remedial course is related to persistence in—and successful completion of—a writing or mathematics sequence

- Students who passed their first remedial mathematics or writing course were much more likely to attempt a second course, and much less likely to delay this course if they attempted it, than were students who did not pass their first course.
- In addition, there was a very modest positive relationship between passing the first remedial mathematics course and subsequent completion of a course one level below college mathematics, and likewise between passing the first remedial writing course and subsequent completion of a college-level writing course.

Students who delayed a second, more advanced course by more than a semester were less likely to complete the remedial sequence or a college-level course

- Generally speaking, even students who remained in the system for a long period of time were less likely to complete a college-level course or a course one level below if they delayed a second, more advanced course by more than one or two semesters. This was true in both mathematics and writing.

Completion of a college-level math or writing course is strongly related to a student's likelihood of transferring and/or earning various credentials

- Students who completed a college-level course in mathematics or writing were much more likely to transfer or complete an academic associate degree (versus neither completing a credential nor transferring) than students who did not.
- Remedial course-taking patterns matter for these ultimate outcomes *insofar as these patterns are associated with students' attainment in mathematics and writing*. In sum, particular aspects of remedial course-taking patterns appear to be associated with the likelihood of attaining key thresholds of mathematics and writing competency, and attainment of these thresholds is strongly associated with students' likelihood of completing credentials and transferring to a four-year institution.

Current policies and practices, and issues going forward

The descriptive statistics and quantitative findings presented above offer valuable baseline measures related to developmental education that can be used to help evaluate policies and practices implemented recently and going forward. As the qualitative section of this report describes, a number of forces are converging to support changes in the shape of developmental education in this state and nationally.

Higher expectations for college attainment and success raise the stakes for developmental education

In 2006, the Board of Governors (BOG) revised the state's Title 5 regulations to raise the minimum, statewide course-taking requirements for the associate degree. These new rules went into effect for students who entered in Fall 2009.

The higher minimum requirements (Title 5, §55063) establish that students must complete:

- [Transfer-level] Freshman Composition (or an equivalent English course); and
- [One level below transfer] Intermediate Algebra with Elementary Algebra as a prerequisite (or an equivalent mathematics course).

These higher minimum requirements were one catalyst for California's Basic Skill Initiative (BSI). The BSI documents and promotes "best practices" in developmental education, in part to improve students' chances of meeting the new degree requirements.

Another change to Title 5 regulations currently under consideration is raising similar questions. It would allow colleges to validate communication and computation prerequisites for courses outside the English and mathematics departments—e.g., a writing prerequisite for a history course—through a content review by faculty, without statistical validation as is now required. The current rules were one product of a lawsuit brought by MALDEF and settled by the system in 1991.

Supporters see the potential change as necessary to ensure the intended rigor of academic courses, and as a way to encourage earlier remediation among students who have not yet learned basic skills in English or mathematics. But the changes also pose implementation challenges for local colleges, and some worry a change could have a disproportionate impact on particular student groups.

Whatever decisions are made, changes to Title 5 will bring additional responsibility for colleges to provide effective developmental education and improve student success. These discussions inevitably circle back to ongoing efforts—in California and nationally—to rethink how developmental education is provided.

Can developmental innovation improve outcomes and ensure access?

Many stakeholders familiar with the BSI agree it has produced much-needed dialogue about the importance of improving student outcomes in developmental education in the state. And the initiative has drawn the system's attention to "best practices" in developmental education. Faculty development and ongoing reflection on student outcomes are central to this work, and various efforts in California are trying to build the system's capacity.

This new focus on the quality of developmental education and the need for more effective practices comes not merely from within the state, however. This is a period of intense scrutiny of developmental education by researchers, policymakers, philanthropic organizations, and national initiatives. This scrutiny has resulted in broad agreement that changes in practice related to developmental education are needed to:

- Improve students' rates of successful course completion, and
- Compress the amount of the time required for developmental students to become college-ready.

Various approaches to meeting these goals are increasingly cited. For example, research draws attention to the importance of better *integrating developmental instruction with a suite of support services* that ensure students stay engaged, receive assistance, and maintain a sense of forward progress toward their goals. *Contextualization* raises questions about the relationship between developmental courses and occupational or academic content in the rest of the curriculum. And the fact that students who begin at the lowest levels of remedial sequences are unlikely to complete those sequences has prompted some educators to think differently about *the structure and goals of remedial sequences*, through approaches such as acceleration and modularization.

In regard to state policies that support such innovation, California's position is mixed. On the one hand, some have argued that state categorical funding structures and other restrictions, such as the requirement that colleges spend half of funds on direct classroom instruction, constrain administrators' ability to "allocate college funding in ways designed to maximize student success" (Moore, Shulock, et al., 2007, pg. 40). On the other hand, California regulations allow for a variety of flexible course configurations, including open entry/exit courses, distance learning, supplemental assistance, and independent study.

Current fiscal constraints are of particular concern because of the time and resources needed for experimentation and the expenses associated with some models for providing extra supports to students.

Reducing the need for remediation remains a complicated goal to pursue

The state of California would benefit financially and in terms of the educational level of its citizenry if fewer students entered community college in need of developmental education. That ambitious goal is complicated by many factors. For example, at the statewide level, there is not a straightforward policy about what students should know and be able to do at the end of high school, and for which postsecondary paths. As a result, students do not necessarily understand what level of high school preparation could land them in remedial instead of college-level courses.

The diversity of assessment practices among the California Community Colleges also leaves the system's entrance expectations unclear. Pressure continues to increase for colleges to adopt a more uniform approach to the assessment of incoming students. A current proposal originating in the Chancellor's Office—the Online Common Assessment Project, or CCCAssess—would provide a structure for colleges to save money by using common, centrally-delivered assessments, while providing students and counselors more complete information.

The California Community Colleges are also becoming more involved with the state's Early Assessment Program (EAP), developed in 2004 by the California Department of Education, the State Board of Education, and the California State University (CSU). The EAP provides high school students with early feedback during the summer before their senior year about their preparedness for college-level classes in English and math. Many community colleges have agreed to accept some or all EAP results as a basis for exempting students from placement testing in English and/or mathematics, with more considering doing so. And some colleges have identified an EAP coordinator to conduct outreach to local high school students, in coordination with CSU.

Absence of clear and consistent data from the colleges is an obstacle to improvement

"The first step toward improving performance outcomes in developmental education is to get a firm handle on current student and institutional performance," argues Michael Collins, a program director with Jobs for the Future (Collins, 2009, pg. 17). He adds that one key step in doing so is to gather data that clarify the need for developmental education and illuminate how that varies among different groups of students, depending on their age, ethnicity, and full-time versus part-time status. And a new national initiative—the Voluntary Framework for Accountability—is working toward developing measures that could be used by community colleges and easy for the public to understand.

California's *Basic Skills Accountability Report* has helped highlight the need for more data standardization in the state and prompted an institutional response. For example, faculty have been addressing inconsistencies in how colleges have coded the course "levels" of their remedial sequences historically. The result is a series of rubrics that provide a common framework for coding the level of each remedial course within a sequence, more clearly defined in terms of levels *below the transfer level*. The rubrics related to credit courses define four levels below the transfer-level in writing (English), reading, and mathematics, with each level defined according to its general learning outcomes, or exit skills (ASCCC and CCCCO, 2010).

The new coding will enable more meaningful statewide data on student progress through remedial sequences. It could also provide a foundation for better articulating high school courses and noncredit adult basic education courses with credit instruction. Some worry the new coding system could institutionalize remedial course sequence structures that should be revised; others view common coding as a necessary first step for considering changes.

The conclusions and policy implications of this study

Current enrollment pressures, combined with financial constraints, have created something of a perfect storm for the California Community Colleges. That storm is testing their commitment to developmental education and their ability to strengthen the programs and services they provide.

But the community colleges cannot afford to ignore the rising call, both in California and nationally, for greater success rates for their students. As long as open access remains a core operating principle for these public institutions, improving developmental education and increasing student success are goals that go hand in hand.

The findings from this study have implications for college officials and state leaders as they continue to pursue both the access and success goals of the system.

Reducing the need for developmental education is a complex and long-term challenge. California's state leaders ought to consider every strategy available for improving high school students' preparation for community college. Current efforts to clarify academic expectations (such as the Early Assessment Program) and promote the use of common assessments are important first steps.

Delays in remedial course-taking are entwined with other issues and solutions need to be approached thoughtfully. For example, this study suggests that colleges might first focus on encouraging students to enroll early in remedial courses in writing. But deeper and more detailed research into local patterns would be an important precursor to the implementation of such a strategy on a given campus. Campuses might also want to examine their course schedules to determine ways they could encourage students to enroll in a given remedial sequence continuously, without interruption. Stronger support for students' success during their first year could also help students in completing remedial sequences.

Students who enter the community colleges at the lowest levels face daunting odds. Further, black/African American and Hispanic students in the cohort studied were overrepresented at the lowest levels of the mathematics and writing sequences. The same was true for Asian students in writing. This raises questions about strategies for better supporting these students. For example, colleges in five counties educate two-thirds of African American community college students. A state-led focus on these colleges could have great benefit.

Innovations in developmental education need to be implemented and evaluated. What works where, for which students, and under what conditions warrants extensive and careful investigation. But for local educators and the state to learn more effectively from these efforts, common frameworks for measuring and evaluating outcomes are also essential. The system's movement toward more standardized coding of course levels below transfer and toward other common metrics should be encouraged and supported.

The efficacy of the state's investment in developmental education warrants more attention. It is not clear that the colleges have sufficient resources or motivation to bring successful innovations to scale and fully integrate them into existing curricula and services. But when students attend college and never leave the developmental sequence, it is costly both for them and for the state. Helping students get through developmental sequences in less time would help address this issue. Making sure students are aware of their options could also be a good investment for the state and for those students who are currently at the greatest risk of leaving community college empty-handed. For example, California might be better served if more students were encouraged to participate in high quality career technical programs rather than the emphasis being placed so heavily on transfer courses.

Part One

Key policies and decisions that have shaped developmental education in the California Community Colleges

Part One: Key policies and decisions that have shaped developmental education in the California Community Colleges

Developmental education as a core mission of the California Community Colleges

From national think tanks to the California Legislature, those concerned with community colleges have identified "three fundamental areas of community college education—developmental, occupational, and academic transfer" (Pusser and Levin, 2009, pg. 5). But although this triad of functions reflects the reality of what the California Community Colleges do, the commitment to developmental education is neither as firmly entrenched nor as widely accepted as the other two commitments.

Various examinations of the history of the community colleges explain some of the reasons for continued ambivalence about the developmental education role. Pusser and Levin describe that, in 1964, "the principal twin missions of community colleges" articulated by the American Association of Junior Colleges (now the American Association of Community Colleges) were "job training and education for university transfer" (Pusser and Levin, 2009, pg. 17). Elsewhere, Callan notes that this same assumption informed how California viewed its community colleges in 1960: the core value was open access for "all Californians who were capable of benefiting from attendance" (Callan, 2009, pg. 5).

Callan points out that, at the time, there was little formal recognition that graduates from the state's K–12 education system might arrive at college unprepared for college-level academic work. In the years since, the proportion of community college students identified as needing developmental education has grown steadily, likely for several reasons. The state has seen a dramatic increase in the number and proportion of high school graduates who pursue postsecondary education, in part because of increasingly sophisticated workplace demands and the growing complexity of our society and economy. Demographics also play a role: the state's population has become more diverse at the same time that inequities in access and success among different student groups have become more visible and less tolerated. Simultaneously, California's K–12 education system has weakened in terms of the resources provided to schools compared with most other states (e.g., see EdSource, 2010b, Cards 10 and 26).

All of these factors have contributed to substantial growth in the number and proportion of community college students who are assessed as needing to complete one or more remedial courses in writing, reading, and/or mathematics prior to attempting college-level work. Every community college district in California offers such courses, through sequences leading to college-level work in English and mathematics.

Recently, the visibility of developmental education—or basic skills education as it is called most often in California—has increased. One catalyst was a comprehensive community college strategic planning process completed in 2004 that listed basic skills as a critical area of focus. Another was an increase in the system's minimum course-taking requirements for the associate degree. These paved the way for the state's Basic Skills Initiative, which has focused on professional development that brings knowledge about "effective practices" to the attention of local colleges, encouraging them to take stock of their developmental education practices and try new approaches. The state is also moving toward greater public reporting of basic skills outcomes through its new *Basic Skills Accountability Report* (CCCCO, 2009).

These state policy actions underscore the place of developmental education as a cornerstone of the work and purpose of the California Community Colleges. Indeed, the role of developmental education in enabling wide access to the colleges is intimately, and often tensely, intertwined with the system's efforts to maintain and raise standards for college-level instruction.

TERMINOLOGY

Developmental, remedial, pre-collegiate, or basic skills?

Any report pertaining to academic preparation for postsecondary study at a California community college must define its terms. Educators, policymakers, and researchers use a host of terms when discussing this topic, including "developmental," "remedial," "pre-collegiate," and "basic skills." As a recent report by The Carnegie Foundation for the Advancement of Teaching observes, "for better or worse, each brings its own history and values" (2008, pg. vii). Consistency with a set of generally accepted uses of these terms is virtually impossible.

As a result, this report can only strive for internal consistency. To that end, it uses each of the following terms for a particular purpose.

- **Developmental** is the broadest and most inclusive term used in this report, and is the predominant term used in the qualitative portions of this study. We use this term to refer to the full suite of *programs* and *services* that colleges provide to students who arrive underprepared to undertake college-level work, and to the *fundamental role* of these programs and services in the contemporary mission of the California Community Colleges. On occasion, the term may also refer to *students* who benefit from these programs and services, hopefully on the way to meeting their goals.
- **Remedial** is used as a technical term, primarily but not exclusively in this report's quantitative portions. We use this term to refer to *courses* and *course sequences* leading to college composition or college mathematics, acknowledging that these courses have traditionally been intended in California to help students master the skills and concepts they need to succeed in college-level work.
- **Basic skills** is an unavoidable term in California that appears in state regulations and the names of major initiatives. In this study, the term refers primarily to:
  - The particular subset of remedial courses, offered in the credit mode (see the box on page 7), that Title 5 regulations (§55000j, §55062) define as located *prior to* degree-applicable coursework within a remedial sequence. (For example, Intermediate Algebra is not a "basic skills" course because it applies toward an associate degree, but it is a "remedial" course as defined above.)
  - The particular exit expectations for what a student should know and be able to do at the end of a remedial course or sequence, as a foundation for subsequent study.

This report generally does not use the term "pre-collegiate" because the California Community Colleges define "college-level" somewhat differently than do the state's public four-year universities. Courses that transfer to a four-year university are typically denoted by the term "transfer-level."

Maintaining the integrity of college-level instruction while providing access to foundational skills: A brief history

The passage of Proposition 13 in 1978 began an important transition for both K–12 education and the California Community Colleges. Local governing boards lost their ability to increase revenues through property taxes and those revenues declined sharply. One effect was that state-provided funds became the primary source of support for the colleges. In the process, the traditional local autonomy of the colleges and the interest of state policymakers in ensuring accountability for and the effectiveness of state support were placed in a new tension. This new relationship helped lay the groundwork for debate about the consistency with which colleges maintain the rigor of degree-applicable and transferable coursework while ensuring an open-access pathway to these courses through developmental education—a conversation that continues today.

For example, a 1983 report by the California Postsecondary Education Commission (CPEC), *Promises to Keep*, called for the system to "establish an academic floor below which [remedial] instruction would not be offered." Students needing instruction below this level would be referred to local adult education programs (CPEC, 1983, pg. 105). The report also criticized the granting of associate degree credit for remedial coursework.

Several years later, in order to encourage timely student progress, the Commission for the Review of the Master Plan for Higher Education recommended that students be allowed to take no more than 30 semester (45 quarter) units of remedial coursework. The commission also recommended that the colleges establish "minimum academic skill levels appropriate for the different types of courses and programs offered" and provide "assessment, counseling, placement, and follow-up" for incoming students (Commission for the Review of the Master Plan for Higher Education, 1986, pg. 6).

Between the mid-1980s and the early 1990s, the California system undertook various efforts to increase consistency among colleges, such as prioritizing the expansion of matriculation services to enable more effective student transitions into the system. The Seymour-Campbell Matriculation Act defined matriculation in 1986 as "a process that brings a college and a student who enrolls for credit into an agreement for the purpose of realizing the student's educational objectives."

Under this process, students bore such responsibilities as expressing an educational intent at the time of enrollment, declaring a specific educational objective thereafter, and making timely progress. Colleges were charged with such responsibilities as orientation services, assessment, and counseling. This included advice on course selection and determination of students' language and computation skills, study and learning skills, aptitudes and interests, educational objectives, and need for special services or financial assistance. The act also established that assessment instruments used during the matriculation process should be chancellor-approved, be sensitive to cultural and language differences, and be used as an advisory tool to assist students in selecting a program of study.

Matriculation services expanded dramatically in the following years. Between the 1987–88 and 1989–90 academic years:

- The number of students receiving orientation services increased from 61,000 to more than 424,000.
- The number receiving counseling/advising services increased from 181,000 to nearly 929,300.
- The number receiving assessment services increased from 96,000 to about 482,000 (Board of Governors, 1991, pg. 2).

In the process, colleges identified many more students in need of remedial instruction. This put stress on the colleges' instructional resources. A majority of colleges "were unable to meet the demand for credit basic skills courses, despite large increases in course offerings," and "many colleges reported difficulties in finding enough qualified instructors" to teach these courses (BOG, 1991, pg. 37).

During this time period, the system's Board of Governors (BOG) also increasingly exercised its authority "in the arenas of educational policies and academic standards." For example, it distinguished more clearly in Title 5 regulations between degree-applicable and basic skills courses (BOG, 1987, pg. 3). It also passed various policies in connection with the implementation of matriculation services. Among other things, these policies:

- Called on colleges to offer, "in the non-degree applicable credit mode" (see the box on the next page), the "full range of pre-collegiate basic skills instruction needed to correct the skills deficiencies of those students who enroll with an intent to complete degree and certificate courses and/or programs," with these courses being "sequenced by levels" (BOG, 1987, pp. 5–6).
- Called on colleges to specify the skills and competencies required at each of these levels and for "entry-level degree- and certificate-applicable courses," based on "systematically derived evidence of a relationship between student assessment measures and students' performance in the course." Students were not to be excluded from a course based on a single test score (BOG, 1987, pp. 9).
- Held that assessment services should play a critical role in placing students properly by considering students' "language skills and computation skills . . . aptitudes, interests and educational goals . . . learning and study skills, and referral to specialized support services," as well as English proficiency and disability (BOG, 1997, pg. 14).
- Held that "no student may take more than 30 semester units (45 quarter units) in the pre-collegiate basic skills curriculum in order to meet the skills requisites for all courses that would be required to complete her/his chosen degree or certificate program or other educational objective" (pg. 11), consistent with the recommendation of the Commission for the Review of the Master Plan for Higher Education. Subsequent legislation—Assembly Bill 1725 (1988)—directed the BOG to adopt Title 5 regulations pertaining to the 30-unit limit, which the BOG did in 1990.

These examples are but a sampling of prior efforts to address questions such as how developmental sequences should be structured and how to encourage timely student progress through them. Today, these questions remain central to the system's efforts to sustain the rigor of college-level courses while maintaining open access to them through developmental education. But today's conversations are also informed by the system's 1991 settlement of an important lawsuit.

The MALDEF lawsuit and settlement

Current discussions about community college reform in California cite 1991 as a pivotal year. In that year, the system settled a lawsuit brought by the Mexican American Legal Defense and Education Fund (MALDEF). A number of key regulations under which the colleges currently do their work, such as regarding the validation of course prerequisites, trace back to this settlement.

In 1988, MALDEF filed a lawsuit—*Romero-Frias, et al. v. Mertes, et al*.—against Fullerton College, the system chancellor, and the Board of Governors. The suit contended that outdated assessments, used in lieu of full matriculation services, had the effect of tracking Latino students into required remedial coursework that prevented full participation in the transfer curriculum,

contrary to the Matriculation Act's provision that assessment instruments be used as an advisory tool (see Reyes, 1988; Times Wire Services, 1991; Berger, 1997; Moore, Shulock, et al., 2007; Wiseley, 2009). The limited availability of remedial course sections made it difficult for students to meet these additional course-taking requirements. In the words of one MALDEF attorney at the time, "One student . . . was forced to take remedial English, but because the number of classes offered was so limited, he couldn't attend because of a work schedule conflict and had to drop out" (Reyes, 1988).

The case was settled out of court in 1991. As part of the settlement, then-Chancellor David Mertes sent a letter outlining steps the system would take to resolve MALDEF's concerns (Mertes, 1991). These included intended revisions to Title 5 regulations regarding the validation of prerequisites, assessment using multiple measures, and students' right to challenge a prerequisite. In its response, MALDEF noted its particular concern that no test be used "for any purpose other than advisory counseling unless the test is from the Chancellor's approved list of instruments and the test has been locally normed and validated" (Brown and Romero, 1991).

Key regulations resulting from the settlement, and their still-contested meaning for local practice, are discussed in subsequent sections of this report.

TERMINOLOGY

Credit versus _noncredit_ basic skills courses in California

This study focuses primarily on student course-taking within *credit* remedial course sequences leading to college-level academic study. The report discusses noncredit "adult education" courses offered by community colleges only occasionally. But the difference is important for understanding the broad range of developmental education services offered by the California Community Colleges.

Neither credit nor noncredit basic skills courses transfer to the University of California or California State University, and neither applies toward a degree. In general:

- *Credit* basic skills courses are intended to prepare students for further postsecondary study at the college level, leading toward degrees and/or transfer. And as the Legislative Analyst's Office (LAO, 2008) notes, credit course units "are taken into account for financial aid purposes" (pg. 5).
- *Noncredit* basic skills courses provide adults with skills and knowledge for a high school diploma or equivalent, success in the workforce, parenting, and as an entry point to further postsecondary study. The LAO (2008) notes, "unlike credit courses, students taking noncredit basic skills courses do not receive grades and are typically permitted to join or leave a class at any time during the semester" (pg. 5).

  The California Community Colleges share responsibility for adult education with the K–12 system, depending on local practice. But as the California Budget Project (2009) reports, "noncredit instruction is a very small part of what most community colleges do, and a few colleges have no noncredit offerings" (pg. 6).

  In a recent survey of the colleges, only 31% reported offering any noncredit basic skills course levels in reading, only 29% in writing, and only 33% in mathematics. However, 56% of colleges reported offering one or more levels of noncredit English as a Second Language (ESL) coursework (Academic Affairs Division, 2008, pp. 12–13).

The need for developmental education

Today, little doubt exists about the widespread need for developmental instruction in the 112 California Community Colleges. Meeting this need is of growing importance, given the stakes for students in a changing economy where a high school education no longer provides reliable access to a living wage.

Coming to grips with this need in California is also of national importance: the California system served a total of 2.89 million students in 2008–09 alone, dwarfing the systems of other states (California Community Colleges Chancellor's Office Management Information System). One recent National Center for Education Statistics (NCES) report estimates that the California system served "about 23% of the nation's community college students" in fall 2005 (Provasnik and Planty, 2008, pg. 5).

Accurately quantifying the need for developmental education in California is difficult because of data limitations and inconsistency in the assessment processes used by the colleges. Currently, California does not collect statewide, student-level data on assessment recommendations or placement test results. The only current source for statewide information on the recommended placements of community college students is a survey of the California Community Colleges conducted for the state's *Basic Skills Accountability Report* (CCCCO, 2009).

These data suggest that, among credit and noncredit students assessed for Fall 2007, only 16% of those assessed in mathematics were deemed ready for transfer-level math—roughly the equivalent of having met the standards of a high school Algebra II course. Only 28% of those assessed in English (excluding reading) were ready for a transfer-level course in college composition, as were only 38% of those assessed in reading (CCCCO, 2009, Tables C1–C3).

Corresponding data for individual community colleges in California are not reported as part of the *Basic Skills Accountability Report*. The best approximation of the variation in local needs is provided by Hayward (2009): the proportion of students assessed in mathematics as ready for transfer-level coursework ranged from 0% to 32% among a sample of colleges in the state. The range in English (excluding reading) was 2% to 52%, and in reading (using a much smaller sample of colleges) was 8% to 53% (Hayward, 2009, pg. 2).

These data limitations place specific constraints on this study, which are discussed in more detail in Part Two.

Part Two

Course-taking data and outcome analysis

(Continued on next page.)

Part Two: Course-taking data and outcome analysis

The study design

This portion of our study uses student-level data to address two overarching questions:

- How can we describe remedial course-taking patterns within the California Community Colleges? *These results are presented in Section 2A.*
- Which remedial course-taking patterns correspond most closely with various student outcomes of interest, and to what extent does that correspondence vary as a function of student characteristics? *These results are presented in Section 2B.*

Overview: The database and analysis

This study looks at statewide patterns of remedial course-taking within 107 semester-based colleges. The student population of interest is first-time students who entered the system in Fall 2002 and, at some point between Fall 2002 and Spring 2009, enrolled in a remedial writing, reading, and/or mathematics course (as defined later).

The CCCCO provided Dr. Bahr with access to the Chancellor's Office Management Information System (COMIS). The study began with careful examination of the sequences offered by the colleges using course catalogs for the years 2002–03 to 2008–09. The process of constructing the data for the study included matching the course listings from student records with the sequence information. Each relevant course taken by a student in the cohort was coded to specify its "level" below college-level. The coding of writing and reading courses for this study was undertaken by Bahr and EdSource; the coding of mathematics courses was undertaken by Bahr based on prior work (Bahr, 2008, 2010b).

The resulting database made it possible to identify students based on various characteristics, follow their progress through remedial sequences to college-level courses, and determine their attainment within the system. This database was used to address the two overarching questions noted above, in considerable detail.

The seven-year timeframe considered in this study acknowledges that community college students are a diverse group who frequently need more than two or three years to complete a course of study, particularly if they enroll part-time and/or "stop out" at some point in their studies. By definition, students who take a course in a remedial sequence need additional time to reach college-level studies in mathematics and/or English. And allowing for a longer period of time is essential for examining such questions as whether and for how long students may delay their first or second remedial course in a sequence.

Because of changing policy contexts, this study's sample of interest is an imperfect analogue for students who are currently entering remedial sequences in the California Community Colleges. For example, students in the sample began community college prior to the current statewide requirement that students complete both Intermediate Algebra and Freshman Composition for the associate degree, which went into effect for all students entering in Fall 2009. (See discussion on page 61.) And this study cannot clarify whether the statewide Basic Skills Initiative—see discussion beginning on page 61—has produced measurable changes in students' patterns of remedial course-taking more recently.

That said, Sections 2A and 2B provide community college educators and policymakers with benchmark measures of student behavior and outcomes in developmental education as it has been

practiced in the California Community Colleges to date. These can serve as a baseline for evaluating policy changes going forward.

Section 2A: This section describes the **sequence structures** through which students took remedial writing, reading, and mathematics courses. Using simple frequency data, it then **describes the characteristics of the students** in the first-time Fall 2002 cohort who enrolled in these courses, and how students who entered the remedial sequences at different levels differed with respect to their characteristics, academic outcomes, and key course-taking variables.

Section 2B: To identify **the course-taking patterns that corresponded most closely with various student characteristics and outcomes**, Dr. Bahr used logistic regression as his primary analytical tool. The results of that work begin on page 46. His analyses address a series of questions about students' course-taking behaviors:

- Who tends to delay the first remedial course?
- Who tends to achieve a passing grade on first attempt in the first remedial course?
- After the first remedial course, who tends to attempt a second, more advanced course?
- Among students who attempt a second (more advanced) course, who tends to delay this second course?
- Who tends to complete successfully a remedial math course that is no more than one level below college algebra, or a remedial writing course that is no more than one level below college composition?
- Who tends to complete successfully a college-level course in math or writing?
- Does variation in remedial course-taking patterns have any bearing on students' long-term outcomes?

A key limitation of the available data related to the need for developmental education

Ideally, this study would provide a clear view of students' diverse developmental needs when they entered the California Community Colleges system, as documented through a consistent matriculation process, regardless of whether students actually took a remedial course. Unfortunately, as noted earlier, California currently does not collect statewide, student-level data on the academic readiness or recommended placements of students when they enter community college. (Further, variations among campuses in the assessment and placement process suggest that such data, if available, would not provide a consistent view of incoming students' developmental needs—see the box on pages 13–14.)

As a result, this study can identify only which students in the first-time Fall 2002 cohort *actually enrolled in* remedial courses within a writing, reading, and/or mathematics sequence at some point during their studies. These data do not represent all students who *needed* such instruction. Not all students take placement tests, and not all students who are assessed follow the placement recommendations they receive. Almost certainly, some students who could have benefited from remediation are not included among the ranks of those students who *actually enrolled in* remedial courses.

For example, faculty at **Evergreen Valley College** recently found that, in general, "the majority of [their] students who take a math assessment test do not enroll in a math course, and many enroll in a course other than the one in which they placed." To the latter point, although Vietnamese students at the college who are assessed in mathematics typically *place* into the course located three levels below the transfer level, these students typically *enroll* in transfer-level mathematics (University of Southern California Center for Urban Education and Evergreen

Valley College, 2009, pp. 12, 15).

As Moore, Shulock, and colleagues (2007) note, this key limitation makes impossible any statewide comparison of students who "need" developmental education with students who "do not," at least as determined through the colleges' own assessment processes.

Acknowledging this limitation, however, the following sections show that community college students in the study sample who enrolled in a remedial course constitute an important population that deserves attention and stands apart from other students in important ways.

Assessment practices vary widely among the California Community Colleges

Even if the California community college system did collect statewide, student-level data on placement test results and assessment recommendations, the meaning of these statewide data with respect to students' incoming needs would still be unclear. The assessment process for student placement is an area where California's tradition of local determination is both strong and debated.

The California Community Colleges assess students to determine their incoming needs and aptitudes, and to inform course placement and referral to services. The vast majority of assessments in mathematics, writing, and reading are proctored on the state's more than 100 community college campuses, though most colleges proctor at least some assessments at local high schools (Consultation Council Task Force on Assessment, 2008, pp. 28, 34, 40).

Title 5 regulations establish, for example, that:

- Colleges may not use assessment to exclude a student "from any particular course or educational program, except that districts may establish appropriate prerequisites" (§55521a5).
- No "single assessment instrument, method or procedure"—nor "two or more highly-correlated instruments"—may serve as a sole predictor of student success when placing students. Rather, assessment must consider "multiple measures" (§55521a3). The measures most commonly reported—after "objective tests (e.g., multiple choice)"—in an Academic Senate survey of colleges in 2004 included academic transcripts and personal interviews and information (ASCCC, 2004, pg. 26).
- Colleges must also rule out "disproportionate impact" on different student groups that "is not justified by empirical evidence demonstrating that the assessment . . . is a valid and reliable predictor of [student] performance" (§55502d).

Colleges tend to use a few commercial assessment instruments

The Consultation Council Task Force on Assessment described widespread use of certain computerized, commercial assessments by colleges in 2005–06:

- In **writing**, 80 colleges used a commercially developed test, with 37 colleges using ACCUPLACER and 22 using COMPASS.
- In **reading**, 91 colleges used a commercially-developed test, with 46 using ACCUPLACER and 23 using COMPASS.
- In **mathematics**, 100 colleges used a commercially-developed test, with 42 using the CSU Mathematics Diagnostic Test Project (MDTP), 41 using ACCUPLACER, and 18 using COMPASS (Consultation Council Task Force on Assessment, 2008, pg. 8).

Some colleges have developed their own tests. And in each subject area, a handful of colleges employ a *self*-assessment process in which students take an active role in determining the courses for which they are prepared (e.g., see Barr, 2005; Felder, Finney, and Kirst, 2007).

Other aspects of assessment practice differ more

There is concern that variation in local assessment *processes* leads to different treatment of—and consequences for—the same students depending on where they enroll (e.g., see Moore, Shulock, et al., 2007, pg. 31). Some sources of variation include:

- Policies for exempting students from placement assessment,
- How many students are assessed,
- The transparency of the assessment process, and
- The portability of assessment recommendations among colleges.

Statewide, 11.8% of first-time freshman were exempted from placement assessment for credit coursework in Fall 2007, and 66.1% received placement assessment services (CCCCO, 2009, Tables C6 and C7). Local exemption policies have some common characteristics. For example, the vast majority of colleges report exempting from assessment tests students who already hold a bachelor's or associate degree (Consultation Council Task Force on Assessment, 2008, pp. 60–62). And Title 5 regulations (§55532) provide that certain criteria—e.g., a student is "undecided about his or her educational objectives" or "does not intend to earn a degree or certificate"—may not be used as the sole basis for exempting a student.

But there is also variation with respect to whether colleges exempt students who intend to upgrade their job skills, who plan to advance their careers, or who do not enroll in an English, mathematics, or ESL course (Consultation Council Task Force on Assessment, 2008, pp. 60–62). A previous survey found that the colleges variously use coursework from other colleges, Advanced Placement test scores, and other considerations in exempting students from placement evaluation. At that time, 25 responding colleges reported that they "do not waive placement evaluation" (ASCCC, 2004, pg. 27).

In forthcoming research on the impact of community college assessment and placement practices on U.S.-educated language minority students, George C. Bunch and colleagues (Bunch, 2010) describe other sources of variation among colleges, such as local policies for when students may re-take an assessment. Colleges also varied in how they used multiple measures: these might consist of additional questions embedded in an assessment instrument; in other cases, students might need to specifically request or bring additional information to be considered. Clear information regarding what students have a right to expect is essential for navigating these processes, but the availability of such information (e.g., via college websites)—and the relative straightforwardness or technicality of the information provided—also varied, Bunch and colleagues report.

Finally, colleges do not necessarily accept one another's placement recommendations in writing, reading, or mathematics. This lack of portability of student assessment outcomes—and the "testing burden" it can place on students who enroll in more than one college—was one motivation for the Board of Governors to call, in March 2007, for an evaluation of the possibility of common assessments across the system. The possibility that poor portability of assessments posed challenges for students in the Fall 2002 first-time cohort considered in this study is very real: approximately one-third of those who took a remedial course changed colleges at some point during the seven-year timeframe studied.

The Consultation Council's task force report found that lack of portability is often driven by variations in how colleges structure their *curricula*—a topic explored in this report beginning on page 20. Colleges frequently cited "lack of alignment in curriculum" and concern that "other tests do not meet the needs of our curriculum" as reasons why they might not accept another college's placement recommendations (Consultation Council Task Force on Assessment, 2008, pp. 32, 38, 44).

Data sources and variables considered

In this section, Peter Riley Bahr, Ph.D. (assistant professor, University of Michigan, School of Education), summarizes the data and variables that form the basis of the subsequent descriptive statistics (Section 2A) and regression analyses (Section 2B).

The following provides a brief orientation to the data and variables used in this portion of the study to explore the remedial course-taking patterns of students who entered college for the first time in one of 107 semester-based California Community Colleges in Fall 2002.

Data sources and definitions

This study draws upon data from the Chancellor's Office Management Information System (COMIS), which is the repository of student records for all of California's community colleges. The focal group of students for this segment of the study is the Fall 2002 first-time cohort in all of California's semester-based (as opposed to quarter-based) community colleges.

As implemented here, the definition of a "first-time student" excludes students who were enrolled in an institution of higher education at some point in time prior to Fall 2002, as well as those students who held "special admit" status (enrolled concurrently in high school) during the first semester of attendance (Fall 2002). In addition, students who did not report a valid Social Security number (SSN), and those who applied to one of the semester-based community colleges in Fall 2002 but actually did not enroll in any coursework (neither for-credit nor noncredit) in that semester, are excluded. For those students who were retained in the analytical cohort, this analysis considers their course enrollments, receipt of financial aid, credential completion, transfer to a four-year institution, etc., through Spring 2009 (seven years).

Within this larger cohort of first-time students, the students of particular interest are the so-called "remedial cohorts"—in particular, the remedial math cohort, the remedial writing cohort, and the remedial reading cohort. For the purposes of this analysis, the remedial math cohort is defined as all students whose first nonvocational math course was remedial in nature, *regardless of when in a given student's academic career this first nonvocational math course was taken*. Comparable boundaries were applied to the remedial writing and remedial reading cohorts, respectively.

The determination of the status (remedial, college-level, vocational, etc.) and skill-level of a given math, writing, or reading course was made through a rigorous and painstaking cross-referential analysis of students' actual course enrollments and the course catalogs of the college at which a given course was taken. In the case of math, this coding process resulted in seven categories—college-level math, intermediate algebra or geometry, beginning algebra, pre-algebra, arithmetic, vocational math, and peripheral math courses—of which the first five are of primary interest in this study.

A detailed discussion of these math categories has been provided by Bahr (2010b) and is summarized briefly here:

- College-level math includes all math courses that fulfill the general education math requirement in the California State University (CSU) and/or University of California (UC) systems.
- Intermediate algebra and geometry are parallel courses, and both are considered to be one level below college math.
- Beginning algebra, pre-algebra, and arithmetic are two, three, and four levels below college math, respectively.

- Vocational math courses are not integrated fully in the remedial math sequence, fulfill the general education math requirement in neither the CSU nor UC systems, and typically are specific to a particular vocational program, though some community colleges offer a generic math course that fulfills the math requirement of the associate's degree but otherwise meets the definition of a vocational math course as defined here.
- Peripheral math includes a range of math courses from supplementary labs to courses intended to help students manage math anxiety.

The coding of writing and reading courses proved to be considerably more complex than the coding of math for a variety of reasons that are discussed elsewhere in this report (see pages 20–23). Appendix Two provides a set of definitions of the various writing and reading categories that resulted from our analysis of course-taking and course catalogs. The primary focus of this study with respect to writing and reading coursework is college-level writing and reading courses and the several levels of remedial writing and readings courses below college-level coursework.

Course-taking, attainment, and student variables

Variables that address remedial course-taking patterns

The primary focus of this analysis is students' course-taking behaviors in remedial math and remedial writing.

In that regard, we consider five aspects of course-taking:

1. **The skill-level of a student's first remedial course in math or writing**. As discussed in more detail in the next section, the skill-level of a student's first remedial *math* course is defined with respect to the lowest college-level math course (college algebra). For a given student, this variable may take on any one of four values:
    - Intermediate algebra or geometry (one level below college math),
    - Beginning algebra (two levels),
    - Pre-algebra (three levels), or
    - Arithmetic (four levels).

    Similarly, the skill-level of a student's first remedial *writing* course is defined with respect to the lowest college-level writing course (college composition). This variable may take on any one of five values, of which we combine into a single category the fourth and fifth levels below college writing.

    Although levels below college composition in *reading* are described from the perspective of how writing and reading sequences are *structured* in the California Community Colleges, *student course-taking patterns* in reading are not considered in the regression analyses or descriptive statistics, for reasons discussed in Appendix Three. However, a broad descriptive portrait of how students who took a remedial reading course compare with other students is provided beginning on page 25 (see also page 39).
2. **The number of units attempted (unit load) in a student's first remedial course.** The unit load of a student's first *math* course is treated as a dichotomous variable:
    - Less than three units, versus
    - Three units or more.

    Although we provide descriptive statistics for the course unit load of students' first remedial writing courses, *this variable was not considered in the subsequent regression analyses in the case of writing*. Compared with math, relatively few first remedial writing

courses were attempted for fewer than three units. (See the descriptive statistics in Appendix Five.)

3. **The length of delay between a student's semester of initial college enrollment and the semester of his/her first remedial math or writing course.** Both delay of first math and delay of first writing may take on any one of six values for a given student. These six values include:
    - No delay (enrollment in first math or first writing in Fall 2002),
    - A one-semester delay (enrollment in Spring 2003),
    - A two-semester delay (Summer 2003),
    - A three-semester delay (Fall 2003),
    - A four-semester delay (Spring 2004), or
    - A five-semester delay or greater (after Spring 2004).

    Note that the Winter intersessions offered by some community colleges present a significant methodological complication in this study. Although math and writing enrollments in the reduced intersessions are rare (math enrollments are particularly rare), they do occur. In this study, any information about relevant course enrollments in the Winter intersession was selectively combined with that of the following Spring to account for two key facets of course-taking: enrollment in a first remedial course in math/writing and enrollment in a more advanced course in math/writing than the most recent math/writing course taken.
4. **A student's grade in his/her first remedial math or writing course.** Grade in first math and grade in first writing both may take on any one of 10 values, but for the sake of the regression analyses were coded as dichotomous variables. The two conditions of these variables include:
    - A passing grade (A, B, C, Credit, or ungraded), or
    - A nonpassing grade (D, F, No Credit, Withdrawal, Incomplete with no further notation, or no grade recorded).
5. **The length of delay between a student's first math or writing course and his/her second math or writing course, if any.** Delay of second math and delay of second writing both are measured with respect to when a given student attempted his/her first remedial math or writing course, respectively. Each of these variables may take on any one of five values:
    - No delay (the second course was taken the very next semester),
    - A one-semester delay,
    - A two-semester delay,
    - A three-semester delay, or
    - A four-semester delay or greater.

Variables that address attainment

This analysis considers three aspects of student attainment:

- Whether a given student completed successfully a math or writing course that is **no more than one level below** college math or college composition, respectively;

- Whether a student completed successfully at least one math or writing course that is **deemed college-level**;
- Students' **credential and transfer outcomes**, which is treated as a six-category nominal variable, including:
    - Transfer to a four-year institution with a credential,
    - Transfer to a four-year institution without a credential,
    - The completion of an academic associate's degree without subsequent transfer,
    - The completion of a vocational associate's degree without subsequent transfer,
    - The completion of a certificate only, and
    - Neither the completion of a credential nor transfer to a four-year institution.

In cases in which a student did not transfer, but completed both an academic associate's degree and a vocational associate's degree, the student is categorized as having completed an academic associate's degree.

Variables that address global enrollment patterns

In addition to the remedial course-taking variables and the attainment variable, a wide array of other variables are explored in this study. Three of these address students' global enrollment patterns:

- A student's **average course unit load in the first year** was calculated by summing all units attempted by a student in the Fall and Spring semesters of the first year of attendance, and then dividing this sum by the number of regular semesters (Fall and Spring only) in which the student enrolled in any coursework in his/her first year. Note that average course unit load excludes entirely any course enrollments in the Winter intersession or Summer term.
- A student's **rate of course success in the first year** was calculated by dividing the number of courses in which the student achieved a passing grade (A, B, C, Credit, or a noncredit/ungraded enrollment) in his/her first year by the number of courses attempted during the first year.
- A student's total **duration of attendance** in the community college system is a simple count of the number of regular semesters and Summer terms (excluding Winter intersessions) in which the student enrolled in coursework of any kind. Duration of college attendance *does not assume enrollment in consecutive semesters/terms*, and those semesters in which a student did not enroll in coursework were not included in the count.

Variables that address demographic characteristics and goals

Six variables address students' demographic characteristics:

- **Age at college entry**;
- **Race/ethnicity**;
- **Sex**;
- **Citizenship status**;
- **Two indicators of a student's socioeconomic status-of-origin**, including:
    - Whether a student received a fee waiver in the first year of attendance, and

- The percentage of individuals in the student's self-reported residential zip code who hold a bachelor's degree or a higher credential.

A single measure of students' self-reported **academic goals**, information about which was collected at the time of college entry, also is included.

Section 2A: Description of remedial course-taking in writing, reading, and mathematics

Section 2A provides summaries of descriptive data from the course-taking database compiled for this study. The section:

- Describes the **sequence structures** through which students in the first-time Fall 2002 cohort took remedial writing, reading, and mathematics courses;
- Using simple frequency data, describes **the characteristics of the students** in the sample who enrolled in these courses; and
- Using the same data, describes **how students who entered the remedial sequences at different levels differed** with respect to their characteristics, academic outcomes, and key course-taking variables.

The structure of remedial sequences leading to college-level coursework

Before describing the *students* who took a course within a writing, reading, or mathematics sequence leading to college-level coursework, it is essential to describe the *structure* of these sequences, and how these structures vary across the California Community Colleges. This section describes writing and reading sequences first, then mathematics sequences.

The following descriptions are based on careful examination of the sequences of the 107 semester-based community colleges in California that provided remedial courses to first-time students who entered college in Fall 2002. We matched course listings from student enrollment records with course listings from the 2002–03 through 2008–09 course catalogs of the colleges. This process documented the remedial sequences offered by these colleges, as these were experienced by students in the sample.

Writing and reading sequences vary widely among the California Community Colleges

In order to identify sequence structures in writing and reading, we began with the first college-level writing class—typically Freshman Composition, defined here as the course offered by a given college that meets the Intersegmental General Education Transfer Curriculum (IGETC) 1A requirement. We then proceeded backward through the prerequisites and other recommended preparatory coursework (advisories) to the lowest level of remedial coursework offered by each college. (See Appendix Two for more information.) This coding inquiry, undertaken for this study by Bahr and EdSource, revealed wide variation.

Variation in *whether* colleges offer integrated writing and reading instruction

One key area of variation pertained to *whether colleges offered some form of integrated (i.e., combined) writing and reading instruction* within their respective remedial sequences. In all, 53 colleges (49.5%) offered separate remedial sequences for writing and reading. The remaining 54 colleges (50.5%) offered at least one integrated writing and reading course intended to improve students' reading and writing skills simultaneously.

As a result, students' course-taking paths varied depending on the college in which they enrolled. For example, **Bakersfield College** offered no integrated writing and reading courses. Rather, students in the sample participated in remedial writing and reading instruction through separate sequences. In contrast, **Mendocino College** offered only integrated reading and writing courses, so that all students moved through a single remedial sequence. (See Figure 1 on the next page.)

Figure 1: **Varieties of remedial writing and reading sequencing—a sample**

Community College	**Writing courses** below college composition	**Integrated writing/reading courses** below college composition	**Reading courses** below college composition	Description
Bakersfield College	1 level below 2 levels below 3 levels below		1 level below 2 levels below 3 levels below	Two distinct writing and reading sequences.
Mendocino College		1 level below 2 levels below 3 levels below		An integrated sequence.
West Hills College Lemoore	2 levels below 3 levels below	1 level below	2 levels below 3 levels below	A sequence with separate writing and reading courses at lower levels, but which "merges" one level below college composition.
Cypress College	1 level below	2 levels below 3 levels below	1 level below	A sequence that is integrated at lower levels, but which "forks" one level below college composition.
Merritt College	3 levels below 4 levels below	1 level below 2 levels below 3 levels below 4 levels below	3 levels below 4 levels below	Integrated courses compose the main sequence, in conjunction with individual writing and reading classes.
Los Angeles Southwest College	2 levels below 3 levels below	1 level below 2 levels below 4 levels below	3 levels below	A mostly integrated sequence is "interrupted" three levels below college composition by separate writing and reading courses.

Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002 through 2009 course catalogs of the colleges. EdSource 6/10

Variation in the *use* of integrated writing and reading instruction

The 54 colleges that offered some form of integrated writing and reading instruction also differed in *how they used integrated courses* within their respective remedial sequences. These colleges varied tremendously in this respect. (See Figure 1 on the previous page.)

Only 10 colleges offered integrated writing and reading courses at every remedial level. The approach taken by **Mendocino College**—i.e., a single, integrated writing/reading sequence—was comparatively unusual, however. More typically, these colleges offered curricula akin to **Merritt College** in Oakland, where integrated writing/reading courses compose the main sequence in conjunction with some individual writing and reading classes. (Again, see Figure 1.)

The presence of remedial *courses* that integrate writing and reading on a campus does not necessarily mean that the *faculty* teaching those courses is similarly integrated, however. At **Chabot College** in Hayward, for example, the presence of an integrated remedial sequence taught by the English department reflects an integrated faculty. (See the Acceleration section on pages 78–79 for further discussion.) At **Los Angeles Valley College**, in contrast, available remedial sections that focus on writing and reading together were elaborations of the *writing* sequence taught within the English department; a full reading (or developmental communications) sequence is taught separately within the psychology department.

***Figure 2:* Variation among colleges with respect to the *lowest level* of remedial writing and reading coursework offered below college composition**

***Lowest Level* of Coursework Below College Composition** Offered by Colleges in the Study	**Colleges**	
	Number	Percent
Writing (N=107)*		
Only 1 level below	0	0%
2 levels below	18	17%
3 levels below	48	45%
4 levels below	36	34%
5 levels below	5	5%
Reading (N=102)		
Only 1 level below	5	5%
2 levels below	28	27%
3 levels below	41	40%
4 levels below	20	20%
5 levels below	5	5%
6 levels below	3	3%

Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10

* Integrated writing/reading courses are considered part of the *writing* sequence for the purposes of this chart. See Appendix Three for further discussion.

Note: Percentages may not sum to 100 due to rounding.

Variation in the number of levels of writing and reading below college composition

Colleges also varied with respect to the number of course levels they offered in writing and/or reading below college composition, as experienced by students in the cohorts examined for this study. Most commonly, the *lowest level* of writing or reading colleges offered was located three levels below college composition. (See Figure 2 on the previous page.)

In addition, 37% of colleges that offered remedial reading separately also offered an additional, college-level course in reading (not included in Figure 2), such as READ 10 at **College of the Siskiyous** in Weed. These courses are intended to improve students' *college-level* reading skills, while providing them with an opportunity to earn elective credits that are transferable to CSU and/or UC.

English as a Second Language (ESL) course-taking is outside the scope of this report—but language minority students are included in the cohorts analyzed

This study does not examine patterns in English as a Second Language (ESL) course-taking among students in the California Community Colleges. In addition, this study cannot track the progress of language minority students through the remedial writing, reading, or mathematics sequences because statewide student-level data provided by the Chancellor's Office Management Information System (COMIS) offer no indication of a student's language status.

This does not mean that language minority students are not included among students in the first-time Fall 2002 cohort who enrolled in a remedial writing, reading, and/or mathematics course, however. For example, the relationship between remedial writing/reading sequences and ESL sequences is particularly complex and variable, and whether a student assesses in English or ESL is an event of potentially great consequence. Although there is no limitation on how long a student may take ESL courses, colleges pursue different policies regarding whether ESL coursework is established as "a pre-requisite to academic work in English or a supplement to that work" (Bunch, 2008, pg. 7). For example, students may be required to complete an ESL sequence before entering the remedial English sequence, which can affect dramatically the amount of time these students need to achieve their goals.

Past research also demonstrates that a stigma often is attached to ESL placement (Intersegmental Committee of Academic Senates ESL Task Force, 2006). This stigma is particularly strong for U.S.-educated language minority students (i.e., so-called "Generation 1.5" students), who "exhibit similarities with remedial students from monolingual English-speaking backgrounds," but whose "second-language issues require specialized attention that remedial English teachers are often not trained to provide" (Bunch, 2008, pg. 4; see also Bunch and Panayotova, 2008).

Mathematics sequences are structured more consistently among the California Community Colleges

Compared with writing and reading, the structure of remedial mathematics sequences is more consistent among the colleges.

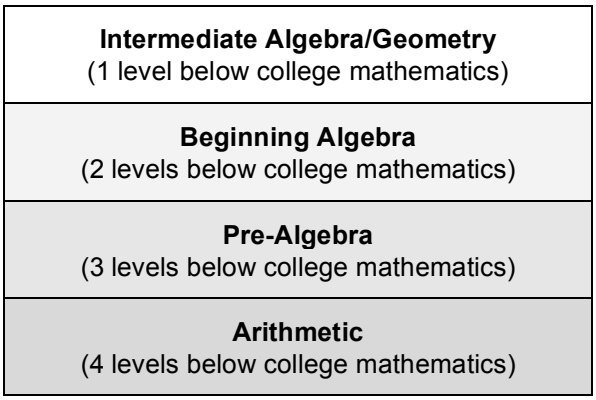
In general, colleges offered three or four levels of remedial coursework below college mathematics, defined here as fulfilling the CSU General Education B4 breadth requirement, which often corresponds with IGETC 2A. Unlike in writing and reading, however, mathematics levels are coded more clearly with respect to the content of instruction:

- In the case of writing and reading, the curricular variation among colleges with respect to structure and content meant that the most transparent and effective way of coding "levels" of remedial coursework was to document the number of "steps" a student would need to take in a sequence to reach college composition.
- In mathematics, the levels are coded more explicitly with respect to the *progression of content*, with the lowest level pertaining to basic arithmetic and leading subsequently through pre-algebra, beginning algebra, and intermediate algebra/geometry. (See Figure 3.) This coding, undertaken by Bahr based on prior work (Bahr, 2008, 2010b), is more analogous to that undertaken by the Academic Senate for California Community Colleges (ASCCC) in clarifying the conventions for coding levels below transfer using the CB-21 data element (ASCCC and CCCCO, 2010).

Most colleges in which students in the first-time Fall 2002 cohort enrolled offered most of the remedial mathematics courses shown in Figure 3 below. There were some variations, however.

- The course most likely to *not* appear within a community college's remedial mathematics sequence was Pre-Algebra.
- It was not uncommon for a given remedial course level, such as Beginning Algebra, to be offered both as a single-semester course and as a two-semester extended sequence (e.g., Beginning Algebra I followed by Beginning Algebra II).

Figure 3: **The typical remedial mathematics sequence below college math within the California Community Colleges, as experienced by Fall 2002 first-time students**



Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10

Descriptive statistics on students who enrolled in remedial courses

Using simple frequency data, this section provides a general descriptive portrait of students in the sample who enrolled in remedial courses in sequences leading to college-level coursework. Specifically, this portrait focuses on ***first-time students in Fall 2002 who enrolled in at least one remedial course in mathematics, writing, or reading at some time during their attendance*** in the California Community Colleges. This study tracks these students during the course of seven years (2002–03 through 2008–09). (Full descriptive data on them are available in Appendix Five.)

When informative, the following portrait compares these students with the overall population of *all* first-time students who began their studies in Fall 2002—a population that *includes* those first-time students who took remedial courses. (See page 15 for the criteria used to define this full Fall 2002 cohort.)

A few points to keep in mind:

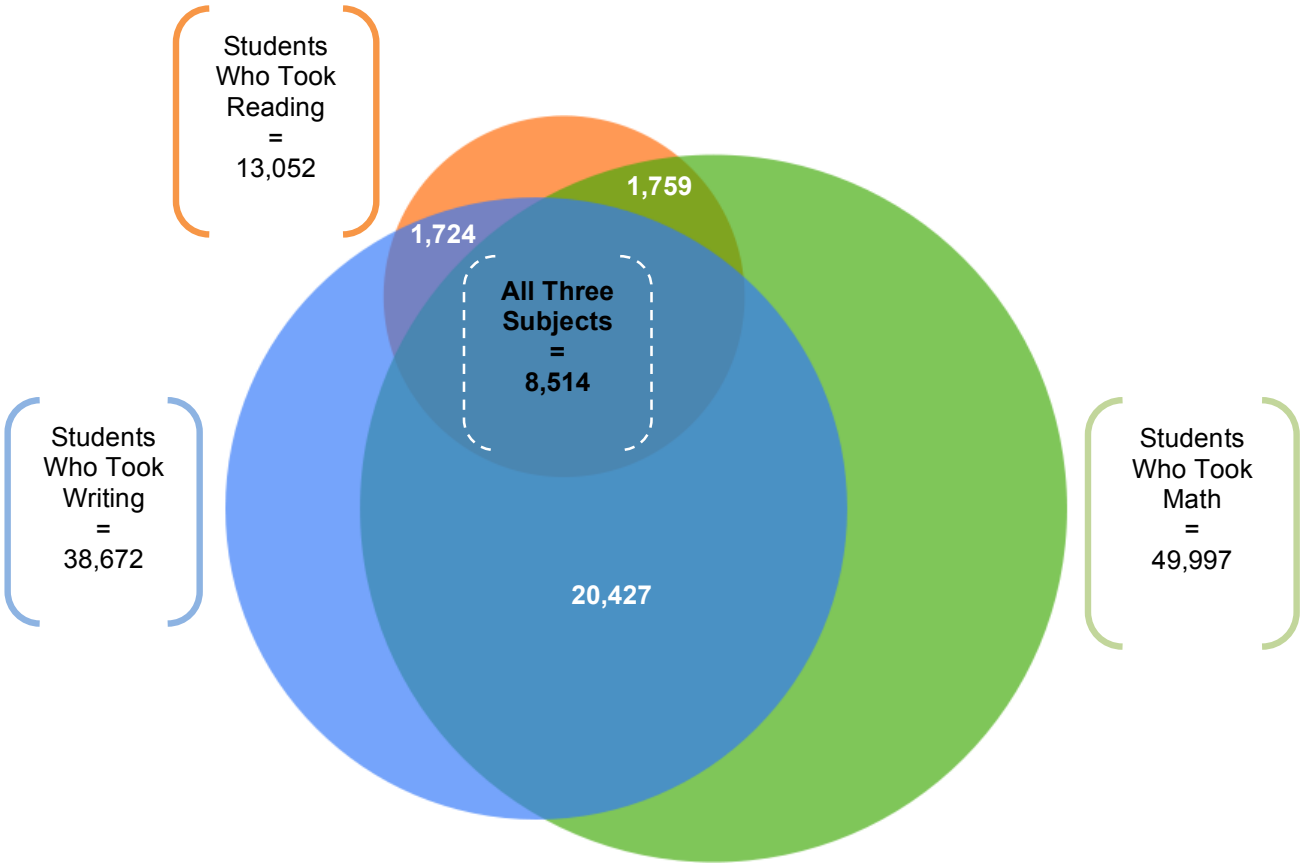
- These descriptive statistics do not control for other variations in student characteristics or behaviors. Rather, these observations simply document what happened with students and their incoming characteristics. More sophisticated analyses are reserved for Section 2B.
- The reader should note that, for the purposes of the remaining descriptive statistics in Section 2A—and also for the regression analyses in Section 2B—integrated writing and reading courses are considered to be part of each college's *writing* sequence. See Appendix Three for further discussion.
- Finally, to reiterate an earlier point, *this study can shed light only on students who actually enrolled in a remedial sequence at some point during their studies. It cannot describe students who may have needed such coursework but did not enroll in it.* Even so, those first-time students who enrolled in a remedial sequence leading to college-level coursework constitute an important population that stands out in interesting ways.

About half of Fall 2002 first-time students enrolled in a remedial course

Among the 122,427 first-time students identified for this study who began their community college studies in Fall 2002, 60,783 students—nearly 50%—enrolled in at least one course in a remedial writing, reading, and/or mathematics sequence at some point during the seven-year window considered. (See Figure 4.)

In all, 49,997 students (41%) enrolled in a course in a mathematics sequence, 38,672 students (32%) took a course in a writing sequence, and 13,052 (11%) took a course in a reading sequence. A great deal of overlap existed among these three groups. For example, 20,427 students (17%) in the Fall 2002 first-time cohort enrolled in at least one course in both the writing *and* mathematics sequences, but not in the reading sequence. Overall, slightly more than half of those who took a remedial course did so in more than one subject.

Figure 4: **Fall 2002 first-time students who enrolled in one or more remedial courses in writing, reading, and/or mathematics**



Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10

Developmental students tended to be of traditional college age

Most first-time students in the Fall 2002 cohort who enrolled in a remedial course—about four in five—were of "traditional college age" (19 years old or younger) when they entered community college. (See Figure 5a.) In comparison, somewhat more than half of the larger cohort was of traditional college age when they entered. Students who enrolled in each of the remedial sequences also were female in greater proportion.

Students who enrolled in a remedial *reading* course stand out in other respects. For example, these students were Hispanic in much greater proportion, compared with students who enrolled in the remedial writing or mathematics sequences, and compared with all first-time students. (See Figure 5b; see also the box on page 39.) Students who enrolled in a remedial reading course also received fee waivers during the 2002–03 academic year in greater proportion.

Figure 5a: **Age (at the time of college entry) of students who enrolled in a remedial sequence vs. all first-time students (Fall 2002 cohort)**

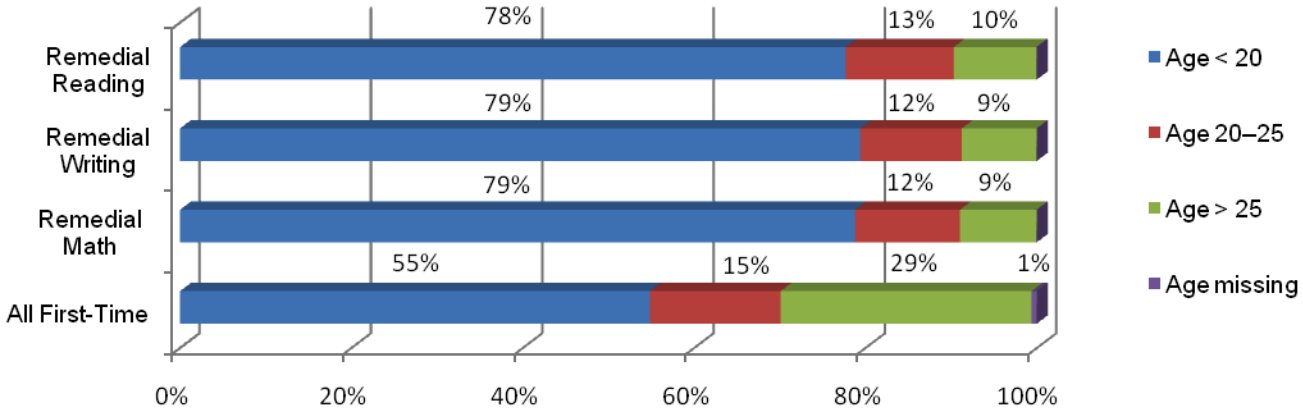
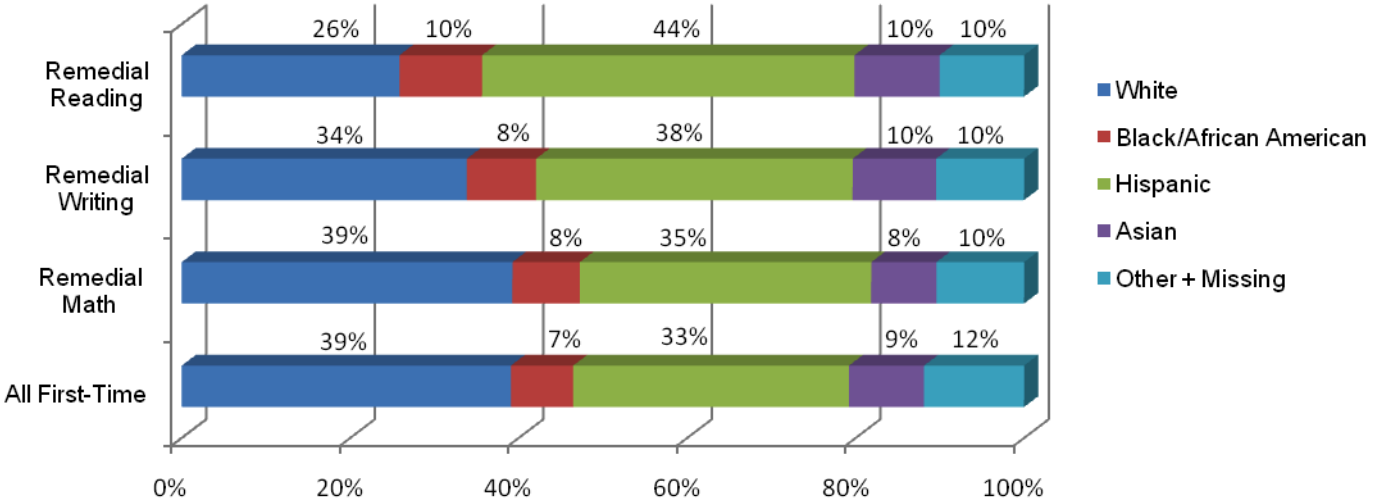


Figure 5b: **Race/ethnicity of students who enrolled in a remedial sequence vs. all first-time students (Fall 2002 cohort)**



Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10

Developmental students more often aspired to transfer and acted accordingly

Data on students' academic goals often are criticized for inaccuracy and the extent to which students may not have a clear or realistic goal when they enroll. That said, students in the sample who enrolled in a remedial course appear to have entered community college with high aspirations and made efforts to achieve them. More than half (across all three sequences) aspired to transfer, to transfer in combination with completing an associate degree, or to complete a terminal academic associate's degree. This is in contrast to 40% of all first-time students who expressed these ambitions. (See Figure 6a.)

In addition, large percentages of students across the remedial sequences (43%–46%) enrolled in an average of 12 or more units per semester (i.e., full-time) during the first year. In comparison, only 30% of all first-time students enrolled full-time. (See Figure 6b.)

Figure 6a: **Academic goals of students who enrolled in a remedial sequence vs. all first-time students (Fall 2002 cohort)**

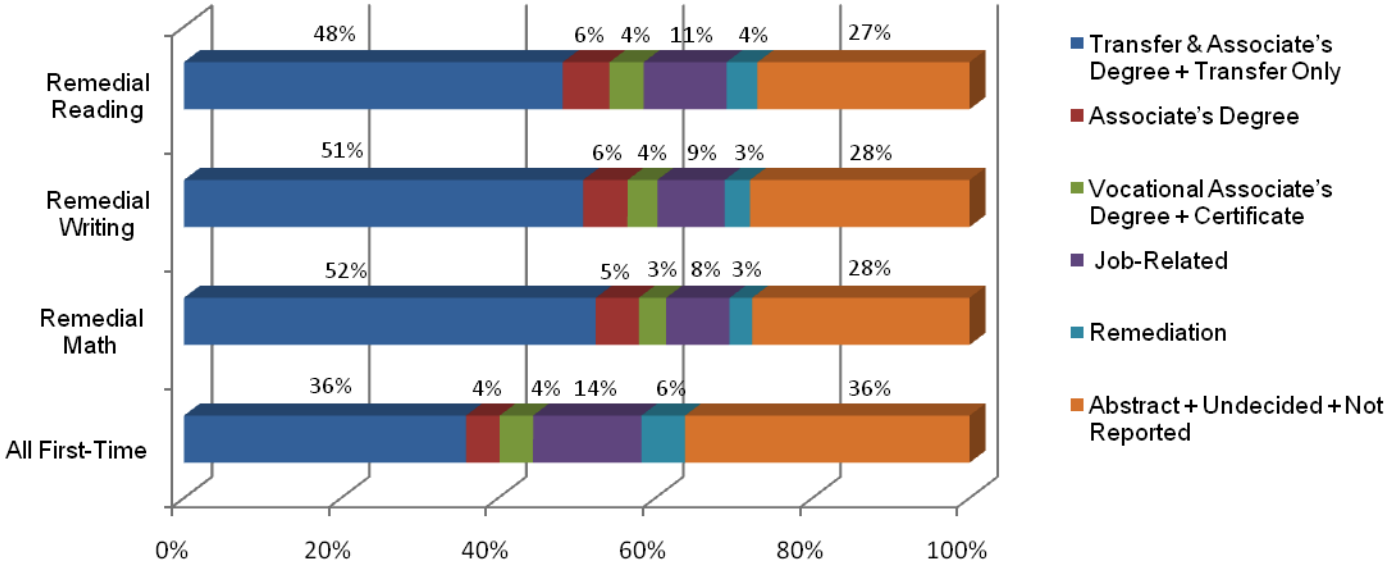
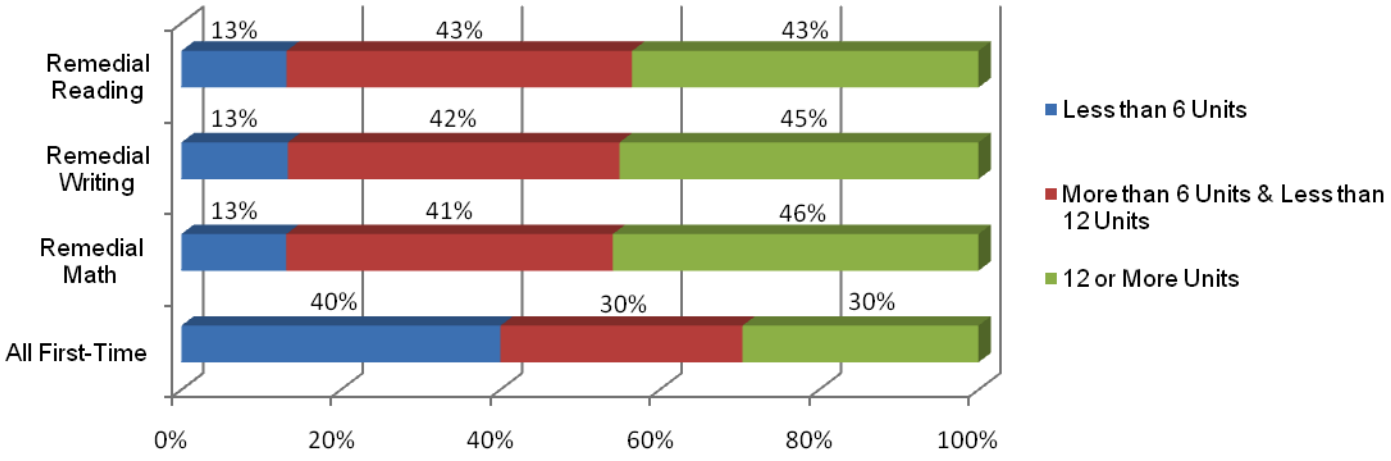


Figure 6b: **Average first-year unit loads of students who enrolled in a remedial sequence vs. all first-time students (Fall 2002 cohort)**



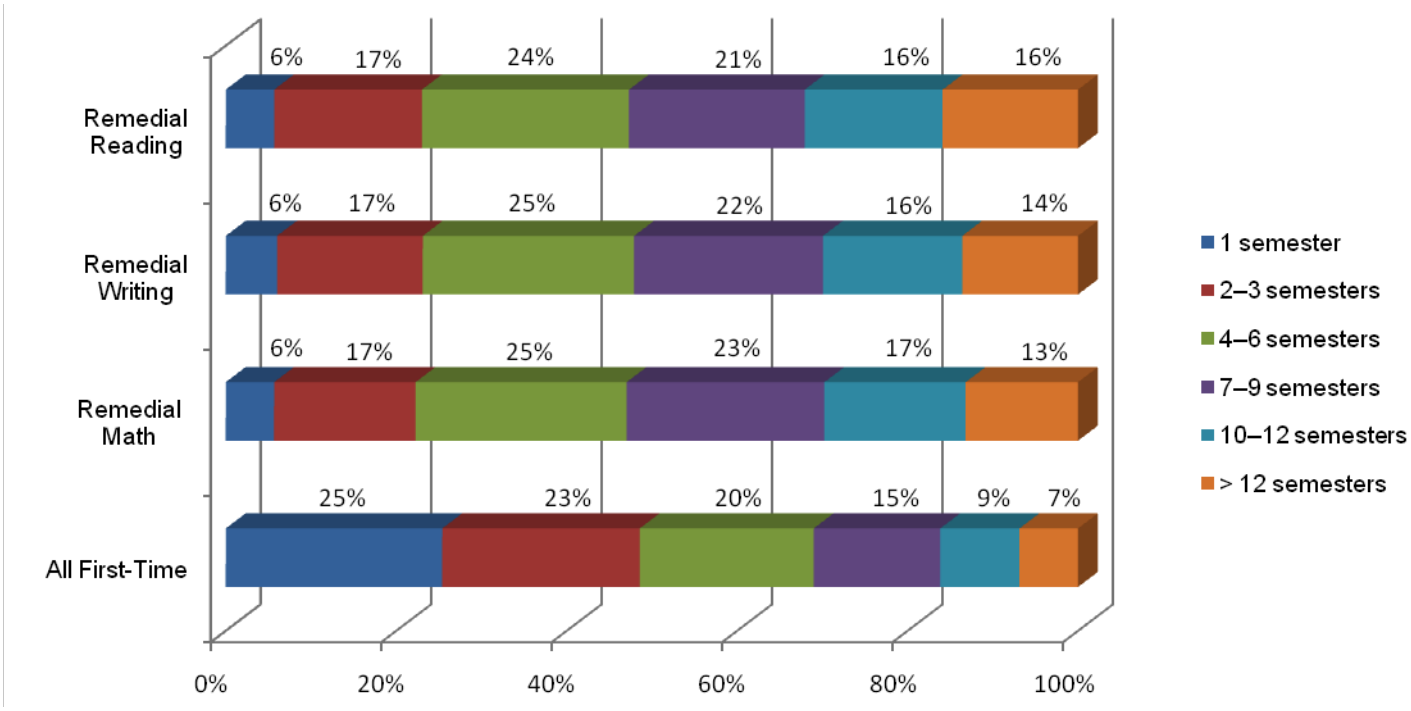
Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10

The population of first-time students who enrolled in a remedial course excludes many "drop-in" students (e.g., see Bahr, 2010a) who enrolled in community college for only the Fall 2002 semester. Only 6% of students who enrolled in a remedial course in each of the three sequences did this, compared with 25% of all first-time students. (See Figure 6c.)

This descriptive finding is difficult to interpret, however, because students' duration of attendance is related to whether they enter a remedial sequence. Simply put, enrolling for additional semesters provides additional *opportunities* to begin a remedial sequence, and departing the system early may preclude beginning a sequence. These "drop-ins" likely include both students who intended to take only a few classes and students who did not meet their goals.

Figure 6c: **Number of semesters enrolled among students who enrolled in a remedial sequence vs. all first-time students (Fall 2002 cohort)**

(Note: Semesters include Summer terms and need not be consecutive.)



Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10

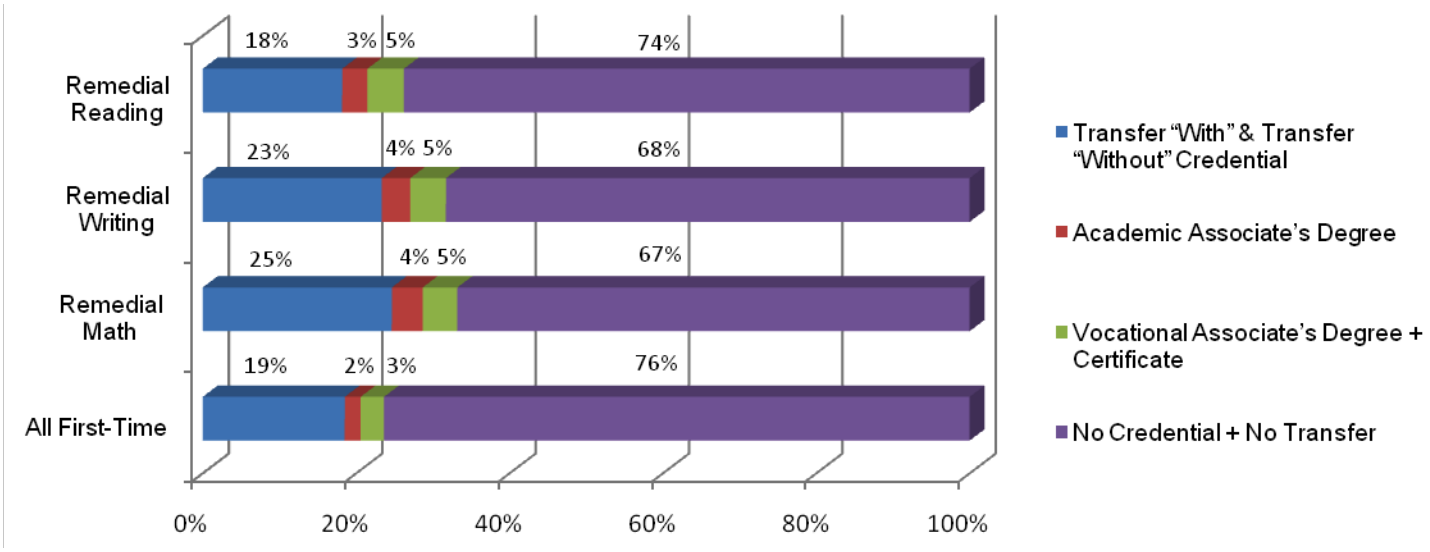
Greater proportions of developmental writing and mathematics students reached a completion benchmark—but most did not

Across all three sequences, greater percentages of students who enrolled in a remedial course earned 60 or more transferable credits by the end of seven years than among the overall first-time cohort. And in particular, students who enrolled in a remedial mathematics or writing course, respectively, transferred (with or without a credential) or completed a degree or certificate in greater proportion. (See Figure 7.)

Large proportions of *all groups* neither transferred nor completed a degree or credential, however:

- Roughly *two-thirds* of students who enrolled in each of the remedial *mathematics* and *writing* sequences, respectively, neither transferred nor completed a degree/credential.
- Nearly *three-quarters* of students who enrolled in the remedial *reading* sequence neither transferred nor completed a degree/credential.

Figure 7: **Ultimate academic outcomes of students who enrolled in a remedial sequence vs. all first-time students (Fall 2002 cohort)**



Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10

Variation among students based on their starting levels

The prior section provided a broad descriptive portrait of the students in the first-time Fall 2002 cohort who took a remedial course at some point during the seven-year period considered. But these students' characteristics, aspirations, and outcomes varied—sometimes substantially—depending on the level at which a student entered a sequence. This section uses simple frequency data to describe these differences among students who took a remedial writing or mathematics course.

This section includes:

- Summary tables of key descriptive statistics related to these differences within the writing and mathematics sequences, respectively. (See Appendix Five for complete descriptive statistics for the Fall 2002 first-time cohort.)
- Discussion of notable descriptive observations based on students' starting levels.

Unfortunately, this section cannot provide a summary of the most common remedial course-taking *trajectories* that first-time students in the Fall 2002 cohort undertook on their way to college-level study. In addition to the variation in how colleges organize remedial sequences described earlier, there was ***tremendous variation*** in how students actually moved through—or did not move through—these sequences. Appendix Four provides a snapshot of this dizzying variety of student trajectories. (To summarize this behavior in a form that can be understood and analyzed, we use the economical set of remedial course-taking *variables* outlined beginning on page 16.)

In addition, because not all colleges offer a separate or complete remedial reading sequence, the following descriptive statistics do *not* attempt to describe differences among students as a function of beginning *reading* level. In addition, the subsequent quantitative analyses—presented in Section 2B—cannot track student behavior and progress through remedial reading sequences. See Appendix Three for further explanation. As before, integrated writing and reading courses are considered to be part of each college's *writing* sequence.

Also as before, these descriptive statistics do not control for other variations in student characteristics or behaviors. These observations simply document what happened with students and their incoming characteristics—in this case, as these vary among students who began at different levels of the remedial mathematics and writing sequences. Again, more sophisticated analyses are reserved for Section 2B.

Student characteristics and outcomes in the *remedial writing sequence*: It depends on where you start*

The **38,672 students** in the Fall 2002 first-time cohort **who took a remedial writing course** entered the writing sequence at **different levels below Freshman Composition (FC)**…

1,195 students (3%) began **4+ levels below** Freshman Composition (FC).	4,355 students (11%) began **3 levels below** Freshman Composition (FC).	12,932 students (33%) began **2 levels below** Freshman Composition (FC).	20,190 students (52%) began **1 level below** Freshman Composition (FC).

Across the different starting levels identified above, students varied with respect to…

Age at college entry

- 61% of those who began 4+ levels below FC were 19 years old or younger, while 18% were 20–25 years old and 21% were older than 25.
- 83% of those who began 1 level below FC were 19 years old or younger, while 10% were 20–25 years old and 7% were older than 25.

Race/ethnicity

- Black/African American, Hispanic, and Asian students were overrepresented among those who began at lower levels of remedial writing.
- White students were overrepresented among those who began at the highest level of remedial writing (1 level below FC).

Socioeconomic status

- 55% of those who began 4+ levels below FC received a fee waiver in 2002–03.
- 36% of those who began 1 level below FC received a fee waiver in 2002–03.

Academic goals

- 32% of those who started 4+ levels below FC aspired to transfer (with or without a degree), and 15% enrolled for the purpose of remediation. 17% of those who started 3 levels below FC aspired to a vocational degree, a certificate, or other job-related goals.
- 55% of those who began 1 level below FC aspired to transfer (with or without a degree); 10% aspired to a vocational degree, a certificate, or other job-related goals.

First-year unit load

- 33% of those who began 4+ levels below FC enrolled full-time (12+ units per term) on average during their first year; 24% enrolled in fewer than 6 units per term.
- 49% of students who began 1 level below FC enrolled full-time (12+ units per term) on average during their first year; only 11% enrolled in fewer than 6 units per term.

Highest writing course completed

- Only 21% of those who began 3 levels below FC, and 17% of those who began 4+ levels below FC, completed FC or higher. Half as many completed a writing course one level below FC.
- 50% of those who began 1 level below FC completed FC or higher; another 26% completed their starting-level course.

Academic outcome

- 80% of those who began 3 levels below FC, and 83% of those who began 4+ levels below FC, neither transferred nor completed a degree/credential within seven years.
- 38% of students who began 1 level below FC transferred or completed a degree/credential within seven years; 62% did not.

* See Appendices Five and Six for supporting descriptive data.

Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10

Student characteristics and outcomes in the *remedial mathematics sequence:* It depends on where you start*

The **49,997 students** in the Fall 2002 first-time cohort **who took a remedial mathematics course** entered the mathematics sequence at **different levels below college mathematics**…

11,363 students (23%) began in **Arithmetic, 4 levels below** college mathematics.	10,325 students (21%) began in **Pre-Algebra, 3 levels below** college mathematics.	16,843 students (34%) began in **Beginning Algebra, 2 levels below** college mathematics.	11,466 students (23%) began in **Intermediate Algebra/Geometry, 1 level below** college mathematics.

Across the different starting levels identified above, students varied with respect to…

Age at college entry

- 64% of those who began in Arithmetic were 19 years old or younger, while 18% were 20–25 years old and 18% were older than 25.
- 92% of those who began in Intermediate Algebra/Geometry were 19 years old or younger; only 6% were 20–25 years old and 2% were older than 25.

Race/ethnicity

- Black/African American and Hispanic students were overrepresented among those who began in Arithmetic.
- Asian and white students were overrepresented among those who began in Intermediate Algebra/Geometry.

Gender

- 62% of those who began in Arithmetic were female.
- Male and female students began in Intermediate Algebra/ Geometry in similar numbers.

Socioeconomic status

- 51% of those who began in Arithmetic received a fee waiver in 2002–03.
- 29% of those who began in Intermediate Algebra/Geometry received a fee waiver in 2002–03.

Academic goals

- 37% of those who began in Arithmetic aspired to transfer (with or without a degree); 19% aspired to a vocational degree, a certificate, or other job-related goals.
- 64% of those who began in Intermediate Algebra/Geometry aspired to transfer (with or without a degree); only 6% aspired to a vocational degree, a certificate, or other job-related goals.

First-year unit load

- 31% of those who began in Arithmetic enrolled full-time (12+ units per term) on average during their first year; 22% enrolled in fewer than 6 units per term.
- 61% of those who began in Intermediate Algebra/Geometry enrolled full-time (12+ units per term) on average during their first year; only 6% enrolled in fewer than 6 units per term.

Highest math course completed

- Only 24% of those who began in Pre-Algebra and 13% of those who began in Arithmetic completed Intermediate Algebra/Geometry or a college mathematics course.
- 51% of those who began in Intermediate Algebra/Geometry completed a college mathematics course; another 22% completed their starting-level course.

Academic outcome

- 74% of those who began in Pre-Algebra and 82% of those who began in Arithmetic neither transferred nor completed a degree/credential within seven years.
- 51% of students who began in Intermediate Algebra/ Geometry transferred or completed a degree/credential within seven years; 49% did not.

* See Appendices Five and Six for supporting descriptive data.

Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10

Notable descriptive observations related to students' starting levels

In addition to the overall differences just described in student characteristics and academic outcomes among students beginning at different levels of the remedial writing and mathematics sequences, additional patterns deserve special mention. In some cases, these additional descriptive observations are of particular salience for policy. In other cases, they prompt interesting questions for further research.

Most students began taking remedial courses during their first or second term of enrollment

One question of particular policy salience in California—see discussion beginning on page 63—is the extent to which new students delay taking remedial courses, and the effect this may have on student success. The basic frequency data below describe *when* students who took a remedial course began doing so.

For the most part, students in the Fall 2002 first-time cohort who enrolled in a remedial course in a writing or mathematics sequence began doing so during their first year of enrollment, most commonly during their first term. (See Figure 8 on the next page.) Across starting levels, more than half of these students began taking remedial courses immediately in Fall 2002 and roughly another one in five students began the following Spring 2003.

That said, roughly 10%–12% of students at each level of the writing and mathematics sequences, respectively, deferred their first remedial course in the sequence until their second regular academic year (Fall 2003 or Spring 2004). In addition, between 9%–16% of students at each level of the respective writing and mathematics sequences deferred their first remedial course until *after* their second regular academic year (beyond Spring 2004).

(Note: More sophisticated regression analyses of any correspondence between delaying a first remedial course and other student outcomes or characteristics are reserved for Section 2B.)

Figure 8: **Across starting levels, most students who took a remedial course in writing or mathematics began doing so during their first year of enrollment**

Term of first remedial writing course		The **38,672 students** in the Fall 2002 first-time cohort **who took a remedial writing course** entered the writing sequence at **different levels below Freshman Composition**…			
		1,195 students (3%) began **4+ levels below** Freshman Composition.	4,355 students (11%) began **3 levels below** Freshman Composition.	12,932 students (33%) began **2 levels below** Freshman Composition.	20,190 students (52%) began **1 level below** Freshman Composition.
Year 1	Fall 2002	**55%**	**52%**	**58%**	**60%**
	Spring 2003	**17%**	**21%**	**19%**	**18%**
	Summer 2003	1%	2%	1%	1%
Year 2	Fall 2003	8%	7%	6%	6%
	Spring 2004	4%	5%	4%	4%
Later		15%	12%	12%	10%

Term of first remedial math course		The **49,997 students** in the Fall 2002 first-time cohort **who took a remedial mathematics course** entered the mathematics sequence at **different levels below college mathematics**…			
		11,363 students (23%) began in **Arithmetic, 4 levels below** college mathematics.	10,325 students (21%) began in **Pre-Algebra, 3 levels below** college mathematics.	16,843 students (34%) began in **Beginning Algebra, 2 levels below** college mathematics.	11,466 students (23%) began in **Intermediate Algebra/Geometry, 1 level below** college mathematics.
Year 1	Fall 2002	**51%**	**52%**	**57%**	**59%**
	Spring 2003	**19%**	**20%**	**18%**	**19%**
	Summer 2003	1%	2%	1%	1%
Year 2	Fall 2003	7%	7%	7%	7%
	Spring 2004	5%	5%	5%	4%
Later		16%	15%	12%	9%

Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10
Note: Percentages may not sum to 100 due to rounding.

Most students passed their first remedial writing or mathematics course

In general, most students passed their first remedial course in writing or mathematics, across different starting levels in the sequences. Of those who did not pass, close to half withdrew from the course. Withdrawals were more common in the mathematics sequence. (See Figures 9a and 9b.)

Across starting levels, most students who took a first remedial course in writing or mathematics also attempted a second, more advanced course in those subjects. However, fewer than half of students who entered the remedial mathematics sequence at the Arithmetic level did so. (See Figures 9a and 9b.)

***Figure 9a:* Most students passed their first course in the remedial *writing* sequence, and most attempted a more advanced course**

Remedial course-taking behavior	The **38,672 students** in the Fall 2002 first-time cohort **who enrolled in a remedial writing course** entered the writing sequence at **different levels below Freshman Composition**…			
	1,195 students (3%) began **4+ levels below** Freshman Composition.	4,355 students (11%) began **3 levels below** Freshman Composition.	12,932 students (33%) began **2 levels below** Freshman Composition.	20,190 students (52%) began **1 level below** Freshman Composition.
Passed first course	**58%**	**58%**	**60%**	**63%**
Failed first course	24%	25%	23%	20%
Withdrew from first course	18%	17%	17%	17%
Attempted a higher-level course	54%	57%	63%	62%

***Figure 9b:* This was also true in the remedial mathematics sequence, except that slightly less than half of students who began in Arithmetic attempted a more advanced course**

Remedial course-taking behavior	The **49,997 students** in the Fall 2002 first-time cohort **who enrolled in a remedial mathematics course** entered the mathematics sequence at **different levels below college mathematics**…			
	11,363 students (23%) began in **Arithmetic, 4 levels below** college mathematics.	10,325 students (21%) began in **Pre-Algebra, 3 levels below** college mathematics.	16,843 students (34%) began in **Beginning Algebra, 2 levels below** college mathematics.	11,466 students (23%) began in **Intermediate Algebra/Geometry, 1 level below** college mathematics.
Passed first course	**52%**	**54%**	**50%**	**52%**
Failed first course	28%	25%	26%	25%
Withdrew from first course	20%	21%	24%	24%
Attempted a higher-level course	48%	58%	54%	62%

Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10
Note: **Passed** = A, B, C, Credit, Ungraded / **Failed** = D, F, No Credit, Missing. Percentages may not sum to 100 due to rounding.

Data on the racial/ethnic distribution of students across remedial levels raise important questions about differences in college readiness

To the extent that policymakers and community college educators are especially interested in fostering increased academic success among Hispanic/Latino, African American, and other historically lower-achieving populations, the racial/ethnic distribution of students across different levels of California's remedial writing and mathematics sequences is of high interest. This also has important implications for how policymakers think about the success of K–12 schools in preparing students of different racial and ethnic groups for college.

As previously noted, Hispanic and black/African American students were overrepresented among first-time students in the Fall 2002 cohort who began at the lowest levels of the state's writing and mathematics sequences. Asian students were also overrepresented among those who began in lower-level remedial writing courses.

Figures 10a and 10b (on the next page) provide a different look. They show the distribution of students across remedial levels *within* each of the four largest racial/ethnic groups: black/African American, Asian, Hispanic, and white.

- Students in all four ethnic groups tended, on average, to have a longer road ahead to complete the remedial sequence in *mathematics* than in writing, assuming this was their goal.
- Black/African American students were the most likely among the four groups to begin remedial coursework at the lowest levels of a sequence. This was true in both writing and mathematics.
- *In the remedial writing sequence:* The largest proportion of students within each racial/ethnic group began one level below Freshman Composition, with white students being by far the most likely to do so.
- *In the remedial mathematics sequence:* Large numbers of black/African American, Hispanic, and white students began at the Arithmetic level. Black/African American and Hispanic students were the most likely to do so, however.

Figure 10a: The distribution of students across remedial writing levels *within four racial/ethnic groups*

Race/ethnicity of students enrolling in remedial **writing**	Number (proportion) of students in group who began **4+ levels below Freshman Composition**	Number (proportion) of students in group who began **3 levels below Freshman Composition**	Number (proportion) of students in group who began **2 levels below Freshman Composition**	Number (proportion) of students in group who began **1 level below Freshman Composition**
Black/African American (N=3,176)	213 (7%)	580 (18%)	1,121 (35%)	1,262 (40%)
Asian (N=3,830)	170 (4%)	556 (15%)	1,335 (35%)	1,769 (46%)
Hispanic (N=14,537)	548 (4%)	1,966 (14%)	5,422 (37%)	6,601 (45%)
White (N=13,090)	156 (1%)	901 (7%)	3,711 (28%)	8,322 (64%)

Figure 10b: The distribution of students across remedial mathematics levels *within four racial/ethnic groups*

Race/ethnicity of students enrolling in remedial mathematics	Number (proportion) of students in group who began in **Arithmetic**	Number (proportion) of students in group who began in **Pre-Algebra**	Number (proportion) of students in group who began in **Beginning Algebra**	Number (proportion) of students in group who began in **Intermediate Algebra/Geometry**
Black/African American (N=3,996)	1,568 (39%)	873 (22%)	1,042 (26%)	513 (13%)
Asian (N=3,865)	592 (15%)	661 (17%)	1,327 (34%)	1,285 (33%)
Hispanic (N=17,301)	5,178 (30%)	4,032 (23%)	5,275 (30%)	2,816 (16%)
White (N=19,629)	2,987 (15%)	3,794 (19%)	7,351 (37%)	5,497 (28%)

Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10

Note: Percentages may not sum to 100 due to rounding.

Hispanic students are notably overrepresented among students who took a remedial reading course

Although this report does not analyze differences among students who took a remedial *reading* course based on their starting levels, enrollments in remedial reading among Hispanic students in the Fall 2002 first-time cohort deserve special mention.

Altogether 44% of students who enrolled in a remedial reading course at some point during the seven-year time period were Hispanic. In contrast, Hispanic students comprised only 33% of the overall first-time cohort, 35% of students who took a remedial mathematics course, and 38% of students who took a remedial writing course.

This overrepresentation raises important questions that cannot be answered here. For example, to what extent do these enrollments include language minority students who might have different instructional needs than native language speakers? It is impossible to draw firm answers from the available data and, in any event, this likely varies by college.

Consider one local example drawn from the qualitative research for this report. Nearly half of credit basic skills students at **Merced College**, located in the San Joaquin Valley, in 2007–08 were Hispanic, according to the 2009 *Basic Skills Accountability Report*. Another 22% percent were white, 10% were black/African American, and 10% were Asian (CCCCO, 2009, college-level Table A3).

The college offered 89 sections of credit basic skills reading in that year, compared with six sections of credit basic skills ESL (college-level Tables B3, B4). Younger students (no more than 24 years old) contributed 301.9 FTES in credit basic skills reading courses, but only 3.7 FTES in credit basic skills ESL. Although Merced College offered 39 sections of *noncredit* ESL, students who were 25 years of age or older comprised the vast majority (roughly 85%) of FTES in these courses (college-level Tables B7, B8).

According to one dean at the college, students taking credit basic skills courses who might also be considered ESL students—frequently “Generation 1.5” students—enroll predominantly in developmental English. He notes that knowing exactly how many students might be potential ESL students is difficult because most do not identify themselves as such through assessment.

Some students who entered the remedial writing and mathematics sequences at the lowest levels may have had goals other than transfer

As noted earlier, very few students among the Fall 2002 first-time cohort who began at the lowest levels of remedial writing and/or mathematics ever completed the last course in the remedial sequence or the first college-level course beyond it. This likely prevented many students from meeting their long-term college aspirations.

Some students who began taking remedial courses at the lowest levels appear to have had goals other than transfer or an academic degree, however. Roughly one in five students who entered the mathematics sequence at the Arithmetic level declared an intent to pursue either a vocational associate degree (3%), a certificate (3%), or "other job-related" goal (14%). And 15% of students who entered the writing sequence four or more levels below Freshman Composition declared remediation as their purpose for enrolling.

In addition, many students who began at these lowest levels were older when they entered community college. Nearly two in five students who began in Arithmetic, or began four or more levels below Freshman Composition, were older than traditional college age when they first enrolled in a community college. About one in five was older than 25 years of age.

Finally, many students who began at these lowest levels took a low-unit first course. Altogether 24% of students who began in Arithmetic and 25% of students who began four or more levels below Freshman Composition took a course that provided fewer than three units. Such low-unit courses were uncommon at higher levels of both sequences.

It seems likely that, for some students who entered the remedial mathematics and writing sequences at these lowest levels, not completing the last course in the sequence or the first college-level course beyond it did not constitute a "failure." The 14% of Arithmetic-starters who declared an "other job-related" goal, for example, may have achieved their goals *without* completing a college mathematics course or achieving a credential or transfer. Their achievements are not documented in the outcomes as analyzed.

Most students who began only one level below Freshman Composition achieved neither transfer nor a credential

One important question for further research is why such a large proportion of students who began only one level below Freshman Composition neither transferred nor completed a degree or credential within the seven-year time period studied. Despite the relatively high rate at which these students passed their first writing course (see previous Figure 9a), *62% neither transferred nor completed a degree/credential*.

Given this, it is notable that most of these students also entered the remedial mathematics sequence—at widely varied starting levels. (See Figure 11a.) Only 32% of students who started one level below Freshman Composition successfully completed college-level math, and only another 10% completed Intermediate Algebra/Geometry. (See Figure 11b.)

This may not fully explain the low rate at which these students transferred or completed some kind of credential, however. These descriptive data cannot illuminate, for example, whether the quality of remedial writing instruction was adequate to prepare students for broader success in college-level coursework.

Figure 11a: **First-time students who entered remedial *writing* one level below Freshman Composition also entered *mathematics* at a variety of levels…**

Students who entered the remedial writing sequence one level below Freshman Composition (N=20,190)	
FIRST* mathematics course *attempted	Percent of students
College-level math	12%
Intermediate Algebra/Geometry	18%
Beginning Algebra	27%
Pre-Algebra	15%
Arithmetic	13%
Vocational math outside the sequence *only*, or did not *attempt* a math course	15%

Figure 11b: **…Ultimately, fewer than half completed Intermediate Algebra/Geometry or higher**

Students who entered the remedial writing sequence one level below Freshman Composition (N=20,190)	
HIGHEST* mathematics course *completed	Percent of students
College-level math	32%
Intermediate Algebra/Geometry	10%
Beginning Algebra	13%
Pre-Algebra	5%
Arithmetic	4%
Vocational math course outside the sequence, or did not *pass* a math course	36%

Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10

Section 2B: Quantitative analysis of remedial course-taking patterns and student outcomes

In this section, Peter Riley Bahr, Ph.D. (assistant professor, University of Michigan, School of Education), discusses the structure and findings of his regression analyses. ***Regression tables referenced in this section are contained in Appendix Seven****; see also Appendix Eight for charts summarizing the findings.*

Analytical methods

I use logistic regression (Long, 1997; Powers and Xie, 2000) as the primary analytical tool in this section of the report. Logistic regression is appropriate when the outcome of interest is dichotomous (having only two conditions). For example, I analyze whether a student delayed his or her first remedial math or writing course, whether he or she passed that first math/writing course on the first attempt, etc.

In the execution of these regressions, I employ a number of categorical independent variables. The interpretation of the results of a regression analysis when the independent variable of interest is categorical depends upon comparisons to an excluded category of that variable, called a "referent." To illustrate, in the regression analysis of passing or not passing first math on the first attempt, I include a measure of the amount of time that passed between first enrollment in college and the attempt of this first remedial math course (i.e., length of delay of first math). The excluded category is "no delay," meaning that the student enrolled in his/her first math course in the first semester of college attendance. The "effect" of each successive degree of delay (a one-semester delay, a two-semester delay, etc.) is measured with respect to the relationship between no delay and the likelihood of passing the first math course on first attempt. We may find, for example, that students who delayed their first remedial math course by one semester were less likely to pass that first math course on the first attempt than those who did not delay.

Finally, one rather unusual aspect of the regression analyses should be mentioned briefly here, though it will receive further elaboration in subsequent sections of this report. In particular, as I analyzed each outcome of interest (e.g., delay of first math/writing, passing first math/writing on the first attempt, attempting a second math/writing course), I divided the analytical cohort into segments based on how long students remained in the community college system. For example, in the analysis of the attempt of a second math/writing course, I analyzed separately students who remained in the system for two to three semesters, four to six semesters, seven to nine semesters, 10 to 12 semesters, and more than 12 semesters. The purpose of this approach was to disentangle the "effects" of various facets of remedial course-taking patterns on a given outcome of interest from the "effect" of persistence (duration of attendance) on the outcome. As I discuss in detail later, both course-taking patterns and outcomes are tied inextricably to duration of attendance.

The reader will note that I did not mention students who remained in the system for only one semester. By virtue of the definition of the remedial math/writing cohort (those students whose first nonvocational math/writing course was remedial in nature), it is not possible for a student who is included in a remedial cohort to both depart from the system after only one semester of attendance and to delay his/her first course in a given subject. Yet, delay of first math/writing is central to the analyses executed here. Thus, in all regression models I exclude (at a minimum) those students who departed from the community college system after only one semester. In addition to this constraint, I also exclude from the regression analyses those students who were missing data on the course success ratio, age, and/or sex.

Partial relationships

One point that the reader should keep in mind concerning the interpretation of the results of the regression analyses is the meaning of "partial relationships." The value of regression analysis lies in its capacity to aid exploration of relationships between two variables (say, for example, variable A and variable B) while accounting for, or "subtracting out," any relationship between variable A and a given variable C and, likewise, any relationship between variable B and variable C.

Consider, for example, the oft-noted relationship between race/ethnicity and academic attainment in its myriad forms. It is well established that black/African American students experience a disadvantage, relative to white students (the referent in this example), on a number of measures of academic attainment. However, we know that this relationship between race/ethnicity (variable A) and attainment (variable B) is not a consequence of race itself but, instead, is a consequence of the correlation between race/ethnicity and other predictors of attainment (Bahr, 2010c). One of these predictors is students' socioeconomic status-of-origin. Compared with white students, black/African American students originate disproportionately from backgrounds of lower socioeconomic status. In turn, students who originate from backgrounds of lower socioeconomic status tend, on average, to reach lower levels of attainment than do students who originate from backgrounds of higher socioeconomic status. Therefore, if we wish to understand the relationship between race/ethnicity (variable A) and attainment (variable B), we must account for differences in socioeconomic status (variable C) because variable C is correlated with both variable A and variable B. The so-called "residual" relationship between variable A and variable B that we observe after controlling statistically for variable C is a partial relationship.

Authors who seek to describe these partial relationships frequently use phrases such as "net of other variables" or "all else being equal" or even "ceteris paribus" (a Latin phrase that may be translated "with other things the same") to describe the relationship between variable A and variable B after accounting for differences in variable C and other potentially confounding variables (D, E, F, etc.) that are included in the regression model. Here, I often forgo this language in the interest of improved "readability" and ask the reader to remember that all observed relationships that I describe with respect to the regression models are partial relationships—conditional on the other variables included in a given regression model.

Statistical significance

Another point of clarification should be raised here, namely a clarification concerning the meaning of statistical significance. Strictly speaking, the phrase "statistical significance" used in reference to a regression coefficient is a statement about the likely value of the partial relationship between two variables (the predictor variable and the outcome variable) in the population from which the analytical sample was drawn. To say that a coefficient is "statistically significant" typically indicates that the likely size of this relationship in the population from which the sample was drawn is greater than or less than zero; or, said another way, that a relationship between these two variables is likely to exist in the population. One also might say that the relationship found in the sample, and observed in the regression model, is unlikely to be due to chance alone.

The analyses presented in this report focus on segments of a population, not samples from that population. Consequently, although the interpretation of statistical significance in this study is debatable, it certainly lacks the weight accorded in an inferential study. In harmony with this lesser weight, I take a simplified approach to handling statistical significance. In all regression tables, coefficients that met the widely accepted threshold of statistical significance ($p \leq 0.05$) or exceeded it ($p \leq 0.01$; $p \leq 0.001$) are denoted with a single asterisk (*). In other words, in contrast to the common practice of marking differing thresholds of statistical significance with differing numbers of asterisks, I do not distinguish between differing p-values so long as $p \leq 0.05$.

Coefficients that did not meet this threshold are unmarked.

Cautionary considerations regarding data and methodology

A number of issues regarding the data and methodology for this study deserve special cautionary attention and consideration. One of these issues in particular, discussed at length earlier in this report, is the absence of a shared system of assessment practices and tests in California's community colleges. (See discussion on pages 12–14.)

Why is this variation consequential for this study? As explained earlier (see pages 12–13), the main problem that this inter-college variability presents for this study is that it is not possible to define the segment of any given cohort of first-time students who *require* remedial assistance with math, writing, or reading. The only means of identifying these students is by their *participation* in remedial coursework (i.e., course-taking behavior). In effect, students self-select into the analytical cohorts of primary interest in this study—the remedial math cohort, the remedial writing cohort, and the remedial reading cohort—by enrolling in a first course in math, writing, or reading that is remedial in nature.

How does this affect the interpretation of analyses? This question perhaps is best answered with an example. Consider, for instance, the dichotomous "outcome" of whether or not a student delayed his/her first remedial math course by at least one semester, which is one aspect of remedial course-taking patterns that is of interest in this study. For the purposes of this example, those students in the Fall 2002 first-time student cohort who enrolled in remedial math in their first semester of attendance (Fall 2002) will be considered "timely" enrollees, while those who waited to enroll in their first remedial math course until Spring 2003 or later will be considered "delayed" enrollees.

Consider that, because one cannot identify in advance who *should* be taking remedial math coursework, only those students who remain in the system for at least two semesters may be categorized as "delayed" enrollees, while "timely" enrollees may include both those who attended for only one semester and those who remained in the system for longer periods of time. Hence, the outcome of *delay of first remedial math* is intertwined inextricably with students' duration of attendance. First-time students who remain in the community college system for longer periods of time have more opportunity to enroll in a first math course that is remedial in nature, with the result that they are included in the analytical cohort for remedial math. Those students who depart from the system early without taking a remedial math course, despite needing it, are excluded entirely from the analytical cohort for remedial math. In this case, the very definition of *delaying* first math hinges on student retention (or persistence).[2]

In fact, we see in these data that, of those students who were included in the remedial math segment of the Fall 2002 first-time cohort, fully 25% enrolled in their first remedial math course at least one calendar year after beginning college. On the other hand, of all of the Fall 2002 first-time students, nearly one-half (49%) remained in the community college system for less than four semesters (not necessarily consecutive semesters). How many students would have been, and probably should have been, counted in the remedial math cohort but dropped out before displaying the identifying behavior, namely enrollment in a remedial math course? One cannot know because assessment tests and practices vary across the community colleges.

In terms of the effect of this problem on the interpretation of the results of this analysis, the question one must ask is whether students who remain in the community college system for shorter periods of time may be systematically different in important ways from students who

[2] This problem, by the way, is one of several reasons why this study does not employ event history analysis (e.g., Bahr, 2009) as the primary analytical tool in this phase of the analysis.

remain in the system for longer periods of time. The answer to this question is unequivocally affirmative, but a discussion of these differences is outside the scope of this report and, in any case, is detailed elsewhere (Bahr, 2010a).

A second methodological problem revolves around the effort to disentangle and measure the relationship between certain course-taking patterns in a given subject and ultimate attainment in that subject. Again, I elaborate this problem through an example. In this example, I treat *delay of first remedial math* as a predictor (or correlate) of students' ultimate attainment in math, and I allow for five potential categories of this variable based on when a student enrolled in his/her first remedial math course: Fall 2002 (no delay), Spring 2003 (delay of one semester), Summer 2003 (two-semester delay), Fall 2003 (three-semester delay), Spring 2004 (four-semester delay), or sometime after Spring 2004 (five-semester or greater delay). Ultimate attainment in math will be measured by whether a given remedial math student eventually completed successfully a college-level math course (e.g., college algebra). The question is, in what way is the length of delay of first math associated with students' ultimate attainment in math?

This example illustrates three problematic issues. First, we face the same problem of self-selection detailed earlier: some of the students who departed from the system after a relatively short amount of time may have enrolled in a first math course that was remedial in nature (and, therefore, have been included in the remedial math cohort) if they had remained for a longer period of time. As a closely related matter, but perhaps more problematic, among those students who were included in the remedial math cohort, only those students who remained in the system for *X* amount of time may have delayed their first remedial math course by *X* amount. In other words, analytically speaking, we face both self-selection into the cohort (problem #1) and self-selection into particular values of the variable *delay* (problem #2), both in part a function of duration of attendance. Again, the question one must ask is whether students who remain in the system for longer periods of time are systematically different from students who remain for shorter periods of time.

Third, we face a confounding relationship between delay, duration of attendance, and ultimate attainment in that the structure of the remedial hierarchy generally dictates a minimum amount of time required to complete the necessary coursework and advance to college-level competency. Case in point, consider *Student A* who begins in Fall 2002 with arithmetic, and who must complete that arithmetic course and three other courses (pre-algebra, beginning algebra, and intermediate algebra) before advancing to a college-level math course. *Student A* must remain in the system for a minimum of five semesters to complete the remedial math sequence and then complete a college-level math course. In contrast, consider *Student B* who also begins with arithmetic, but who delays this first math course for one year, until Fall 2003. If both *Student A* and *Student B* remain in the system for six consecutive semesters (i.e., Fall 2002, Spring 2003, Summer 2003, and so on), only *Student A* will be able to complete a college-level math course. Structurally speaking, it is not possible for *Student B* to complete a college-level math course. There simply is not enough time remaining in the six consecutive semesters of college attendance for *Student B* to advance through the necessary math coursework.

Analytically speaking, why does this matter? The problem here is that any analysis of the relationship between delay of first math, duration of college attendance, and ultimate attainment in math for these two students will appear to suggest that delay is associated negatively with attainment. Strictly speaking, delay *is* associated negatively with attainment in this case, but only insofar as the structure of the remedial math sequence prescribes a relationship between where a student begins in the remedial math sequence and how long a period of time is required to reach a college-level math course (Bahr, 2010b). The question one must ask is whether the same relationship between delay and attainment would hold if both students remained in the system for nine consecutive semesters, rather than six. If not, then any measured relationship between delay

and attainment is a function of the structure of remedial math and not a unique "effect" of delay *per se*.

To the extent that the data allow, in the analyses presented here I seek to disentangle these sorts of relationships (e.g., to disentangle the relationship between delay and attainment from the relationship between persistence and attainment) and to estimate the magnitude of the relationships between the variables that are of interest in this study. For example, if a relationship between delay and attainment exists that is independent of persistence, is this relationship of consequential size?

I seek to accomplish these objectives by presenting a series of statistical models for any given outcome, each of which applies a different set of constraints to the analytical sample. The constraints, which vary from model to model, always involve confining the analytical segment of a given remedial cohort to students who remained in the community college system for a particular length of time (e.g., 2–3 semesters, 4–6 semesters, 7–9 semesters, 10–12 semesters, more than 12 semesters). This allows one to compare and contrast the observed relationship between, for example, delay of first math and ultimate attainment in math for students who remained in the system for varying amounts of time. Patterns and trends that emerge across a set of models are deemed to be informative about the nature of the relationship between a given predictor and the outcome of interest. To reiterate, the focus here is on emergent patterns across models and not individual coefficients in any one model.

However, given the complications that have been described, even these careful analyses and guarded conclusions should be approached with caution and a critical point of view. Although a given coefficient may be large and statistically significant, it does not follow necessarily that it is meaningful. Before any conclusions are reached, one must consider carefully who (which students) are included in a given model, and how the constraints of the data and the various constraints that are placed on the model may influence the observed relationships.

Results

In this section, I discuss the results of the regression analyses of various aspects of course-taking behavior in remedial mathematics and remedial writing. This section is organized around a series of questions about each aspect of course-taking behavior.

1. Who tends to delay the first remedial course?
2. Who tends to achieve a passing grade on the first attempt in the first remedial course?
3. After the first remedial course, who tends to attempt a second (more advanced) course?
4. Among students who attempt a second (more advanced) course, who tends to delay this second course?
5. Who tends to complete successfully a remedial math course that is no more than one level below college algebra, or a remedial writing course that is no more than one level below college composition?
6. Who tends to complete successfully a college-level course in math or writing?
7. Does variation in remedial course-taking patterns have any bearing on students' long-term outcomes?

For each question, a set of six (or, in some cases, five) logistic regression models is presented, first for remedial math and then for remedial writing. Within a given set, each regression model explores the same outcome (e.g., delay of first math, achieving a passing grade in first math) but focuses on a different segment of the relevant population. As each question is answered, the

outcome from the previous set of regression models is included as an independent variable (a predictor) in, or a constraint on, subsequent sets of regression models. For example, the "outcome" of delaying first math (question #1) is used as a predictor of the likelihood of passing first math (question #2), and so on.

Who tends to delay the first remedial course?

Among the first aspects of remedial course-taking behavior that may be observed in these data is *when* a student enrolls in his/her first remedial course in a given subject. Students may enroll in this first course in their first semester of attendance or in the second, third, or some later semester. I describe the latter as a *delay* of first math or first writing, and I analyze this behavior as a simple dichotomous variable. In other words, either the student enrolled in a first remedial course in a given subject in the first semester of attendance (*delay* = 0) or the student delayed his/her first course until a later semester (*delay* = 1).

In Table 1, I present the results of a series of logistic regressions of delay of first math on selected variables: the skill-level of that first math course, student's average course unit load in his/her first year, student's course success ratio in his/her first year, student's age at college entry, student's race/ethnicity, student's sex, student's self-reported citizenship, student's self-reported academic goal, whether the student received a fee waiver in his/her first year, and the percentage of individuals in the student's self-reported residential zip code who hold a bachelor's degree or a higher credential. Model 1-1 limits the analytical cohort to those students who remained in the system for at least two semesters but no more than three semesters (not necessarily consecutive semesters). Model 1-2, 1-3, 1-4, and 1-5 limit the analytical cohort to those students who remained in the system for four to six semesters, seven to nine semesters, 10 to 12 semesters, or more than 12 semesters, respectively. Model 1-6 includes all students who remained in the system for at least two semesters but also includes duration of community college attendance as an additional independent variable.

Note that use of the skill-level of a student's first math course (or first writing course) as a predictor in this set of models assumes that this variable is a property of the student, not a property of the course. Without this assumption, it would not make sense to include the skill-level of the first course in a model that predicts the likelihood of delaying the first course. This assumption has value here because it allows us to explore whether students who began the remedial sequence at different levels were more or less likely to delay their first course in a given subject.

In the first five models in Table 1, only one highly consistent pattern emerges. After controlling for other variables, students who enrolled in a lower average course unit load in their first year tended also to be more likely to be counted among the students who delayed their first math, and all the more so as one considers groups of students who remained in the system for progressively longer periods of time. One *might* interpret this observation as indicating a strategic delay of first math by students who enrolled part-time in their first year. That is, students who attended part-time (especially those who attended *very* part-time) may have been well aware that they would be attending college for a lengthy period of time and, consequently, may have actively delayed their first math course.

However, the more likely explanation is tied to the definition of the remedial math cohort: those students whose first nonvocational math course was remedial in nature. Part-time students likely have a lower chance of enrolling in a first remedial math class in any given interval of time than do full-time students simply because part-time students take fewer classes. On the other hand, the longer a part-time student remains in the system, perhaps the more likely he/she is to enroll in a first remedial math course. In fact, one may expect that, for all students (both part-time and full-time), the likelihood of enrolling in a first remedial course increases as duration of attendance

increases. Yet, it is likely that the slope of this increasing likelihood is smaller in magnitude for part-time students than it is for full-time students due to the lower unit load of part-time students, resulting in a widening gap between part-time and full-time students as duration of attendance increases. A widening gap, in fact, is observed in this case: as we examine segments of the remedial math cohort who remained for longer periods of time, the differences in the likelihood of delaying a first math course across the several levels of average course unit load grow larger. So, in all likelihood, the appearance of strategic decision-making in the delay of first math actually is a consequence of the manner in which the remedial math cohort is identified: remedial math students are identified by their enrollment in a first math course that is remedial in nature, and part-time students have a lower chance of enrolling in a math course in any given semester than do full-time students simply because they enroll in fewer units of coursework.

Interestingly, one trend is not evident, though it might have been anticipated. Generally speaking, there does not appear to be a sizeable or consistent difference in the likelihood of delay of first math across different starting points in the remedial math hierarchy, after accounting for other variables. Students who began the remedial math sequence at differing levels appear to be about equally likely to have delayed their first math course.

With remedial writing (Table 2), we find a similar relationship between average course unit load in the first year and delay of first remedial writing, and a similar absence of a consistent pattern of relationships between where students began in the remedial writing hierarchy and delay of first writing. In addition, it appears that, net of other variables, older students were somewhat more likely to have delayed their first remedial writing course than were younger students, which is not a relationship that we observe with the timing of students' first remedial math course. Likewise, black/African American students, male students, and foreign students appear to have been more likely to delay first writing than were white students, female students, and students who are U.S. citizens, respectively. None of these relationships is observed consistently for delay of first math.

The question, of course, is whether delaying first math or first writing has any consequences for students academically speaking. To answer this question, I turn next to students' performance in first math and first writing.

Who tends to achieve a passing grade on the first attempt in the first remedial course?

In Table 3, I present the results of the logistic regression of whether or not a student passed his/her first remedial math course on selected independent variables. The outcome is coded *1* for a passing grade and *0* for a nonpassing grade (including withdrawal). The regression models presented in Table 3 impose the same restrictions as those imposed in Tables 1 and 2. Likewise, the same independent variables are included, but two additional independent variables have been added in Table 3: degree of delay of first remedial math and the unit load of the first remedial math course.

Several patterns are observed in Table 3. First, net of other variables, students who began the remedial math sequence at the lower levels generally were more likely to pass their first math course than were students who began at higher levels. The difference is especially noteworthy for the two lowest levels: pre-algebra (three levels below college math) and arithmetic (four levels below college math).

Second, delays of first math generally appear to be associated with a lower likelihood of passing the course, once other variables are controlled. However, the magnitude of the "effect" of delay on achieving a passing grade is not as simple to determine as it might appear. Case in point, in model 3-1, the consequences of delaying first math on the likelihood of achieving a passing grade appear to be quite severe for students who experienced lengthy delays. However, one must keep in mind that this model includes only those students who remained in the system for two to three

semesters. The only way such students could delay their first math course for a lengthy period of time is to drop out of college and then return at a later date (i.e., sporadic or inconsistent college attendance). So, the "effect" of a lengthy delay is confounded by another predictor of lower performance, namely stop-outs.

A less problematic "effect" of delay on performance in first math may be observed in models 3-3, 3-4, and 3-5, which address students who remained in the system for progressively longer periods of time. Here, we find that the effect of delay on performance in first math is modestly negative but still meaningful. Students who delayed their first math course were somewhat less likely to pass their first math course.

The one exception is students who enrolled in first math in the first summer following enrollment in college. These students do not appear to have suffered the same disadvantage. In fact, controlling for other variables, these students were as likely to pass their first math course as students who enrolled in first math in the first semester of college attendance. Given that summers are very unpopular times to enroll in math (Bahr, 2009), this absence of an association is likely due to the fact that only highly motivated students would have chosen to enroll in a first math course during the summer.

Not surprisingly, a student's average rate of course success is strongly and positively associated with performance in first math. In addition, older students and female students tended to be more likely to pass their first math course than were younger students and male students, respectively. Black/African American students were consistently less likely to pass first math than were white students. Finally, there appears to be a modest negative relationship between very low course unit loads (less than six units) in the first year of attendance and the likelihood of passing first math.

Turning to writing (Table 4), one does not observe a consistent relationship between the skill-level of first writing and success in the course, nor a consistent relationship between delay of first writing and success, nor the consistent advantage for older students, nor the consistent disadvantage for black/African American students, all of which were found with math. Female students, though, still tended to be consistently more likely to pass first writing than did males, just as with math. Likewise, a student's rate of course success in the first year again is strongly associated with performance in first writing.

Finally, like math, average course unit load is associated positively with performance in first writing and, in fact, appears to have a more consistent pattern. Increases in course unit load in the first year of attendance are associated with progressive increases in the likelihood of achieving a passing grade in first writing, all else being equal. Given the various statistical controls included in these models, including delay of first writing and duration of attendance (an implicit control), one might speculate that greater course unit loads in the first year increased students' exposure to academic reading and writing, resulting in better performance in the first remedial writing course even when this course was delayed. In future research, it may be useful to examine more closely the relationships between delay of first writing, course unit load, and performance in first writing to determine if a performance advantage in first writing accumulates over time and/or over courses taken.

After the first remedial course, who tends to enroll in a second (more advanced) course?

An arguably poorly translated, but often quoted, tenet of the Chinese philosopher Lao Tzu reads, "The journey of a thousand miles begins with one step." I have considered the first step of the remedial math and writing sequences in the previous two sections. Here, I consider the second step—the attempt of a more advanced math or writing course—which surely is as important as the first step.

In Table 5, I present, as before, a series of logistic regression models of whether or not a student

attempted a second, more advanced math course. The phrase "more advanced" refers to a math course that is of a higher skill-level than the student's first remedial math course and may include a college-level math course. The outcome is coded *1* if the student attempted a more advanced course and *0* otherwise. The same constraints again are applied, and the same independent variables are included, but now I add to the independent variables whether or not a student passed his/her first remedial math course.

As in previous sets of models, several general patterns emerge. First, just as students who began the remedial math sequence at the lower end of the skill continuum tended to be more likely to pass their first math course than were students who began in Intermediate Algebra/Geometry, students who began at lower levels also tended to be more likely to attempt a more advanced math course, net of other variables.

In this regard, context is important. For the students considered in this study, the minimum statewide course requirement in mathematics for the Associate's degree was Elementary Algebra, though some students were required by their local colleges to complete at least Intermediate Algebra. As discussed on page 61, Intermediate Algebra became a statewide minimum expectation in California only with students who began in Fall 2009.

Here, we find that students at the bottom two levels of remedial math (Arithmetic and Pre-Algebra) tended to be more likely than students at the top of the remedial math ladder to attempt a second math course, which seems reasonable because Arithmetic and Pre-Algebra generally are not terminal points in mathematics. However, we also find no consistent difference in the likelihood of attempting a second math course between students who began one level below college math (Intermediate Algebra or Geometry) and students who began two levels below college math (Beginning Algebra). It is unclear the extent to which local variation in the minimum course-taking requirement in math for the Associate's degree explains this observation.

Second, net of other variables, students whose first math course was at least three units tended to be more likely to attempt a more advanced math course. This finding is particularly interesting because, although math courses of lower skill are more likely to be offered for fewer units, here I control statistically for the skill-level of the first course, as well as whether a student achieved a passing grade in his/her first math course. Therefore, the positive relationship between the unit load of the first math course and the likelihood of attempting a more advanced math course is independent of the skill-level of, and grade achieved in, the first course. This finding counters the intuitively reasonable assumption that easing students into math with low-unit courses will increase the likelihood that they will enroll in more advanced math courses, and it counters the assumption all the more when one considers that the unit load of the first math course is not consistently associated with an increased likelihood of achieving a passing grade (see Table 3).

It is interesting to note, however, that this positive relationship declines in magnitude as we examine segments of the population who remained in the system for longer periods of time. Said another way, the cost of a low-unit first math course on the likelihood of attempting a second math course declines as duration of attendance increases. This finding hints at the possibility of a confounding relationship. In particular, it seems reasonable that the low-unit (often modular) math courses lengthen the time required to move up to the next, higher-level math course. As has been suggested in this report, anything that lengthens the time required to remediate successfully creates a structural obstacle for students, one solution to which is to remain in the system for a longer period of time. Here, we see what may be interpreted as evidence of this problem occurring "in process" as students move up (or not) from first math to a second, more advanced math course, in part as a function of remaining in the system (or not) long enough to enroll in this more advanced course.

The relationship between delay of first math and the attempt of a more advanced math course is,

again, somewhat confusing at first glance. To disentangle this relationship, one may look to Models 5-3, 5-4, and 5-5, which address students who remained in the system for longer periods of time. In these models, it appears that minor delays of first math have, at most, a modest negative relationship with the likelihood of attempting a more advanced math course. However, even among students who remained in the system for a very long period of time, students who delayed their first remedial math course until their second year after initial enrollment appear to have paid a price in terms of the likelihood of attempting a second math course. Therefore, it appears that delays of first math of more than a semester or two likely hamper students' progress into a second, more advanced math course.

The single strongest relationship evident in Table 5 concerns whether or not a student passed his/her first math course. Those who passed their first math course were consistently more likely to attempt a second math course than those who did not pass, once other variables were controlled. Yet, interestingly, the difference between those who passed and those who did not pass declines as duration of attendance increases. This suggests the possibility that the cost of initial failure of first math—the "discouraging effect" of poor performance in first math that was documented by Bahr (2010c)—may be reduced if students are retained for longer periods of time.

Of the remaining patterns of note, average course unit load in the first year is positively associated with the likelihood of attempting a more advanced math course. Additionally, the oldest group of students (more than 25 years of age) generally were less likely to attempt a second math course than were the youngest (less than 20 years of age).

The set of regression models that address the attempt of a more advanced writing course, which are presented in Table 6, differ from the models for math only in that the indicator of the unit load of first writing is excluded. (See pages 16–17 for explanation.) Despite this exclusion, the findings are fairly similar.

- Students who began two and three levels below college writing (as opposed to three and four levels below college math) were more likely to attempt a more advanced writing course than were students at the top of the remedial writing hierarchy.
- Moderate delays of first writing were moderately costly in terms of the likelihood of attempting a more advanced writing course, but lengthy delays were very costly even for students who remained in the system for long periods of time.
- Passing one's first writing course is the single strongest predictor of attempting a more advanced writing course, but this relationship shrinks as students remain in the system for progressively longer periods of time.
- Average course unit load in the first year is positively related to the likelihood of attempting a more advanced writing course.
- The oldest students were less likely to attempt a more advanced writing course than were the youngest students.
- Lastly, unlike math, it appears that female students were more likely to attempt a second writing course than were male students.

Among students who attempt a second (more advanced) course, who tends to delay this second course?

Just as I considered how the delay (or not) of a first remedial math/writing course varies across a set of student behaviors and characteristics, so I also consider how the delay of a second (more advanced) remedial math/writing course varies among those students who attempted such a course. As before, though, considerable caution must be exercised in the interpretation of these results because delay (or not) of a second remedial course in math/writing involves a multilayered self-selection process, one aspect of which is the assumption that students remained in the system

long enough to attempt a more advanced course.

In Table 7, I present a series of logistic regressions of delay of second math on selected variables. This outcome is coded *0* if a student enrolled in a more advanced math course in the semester immediately following his/her first math course. It is coded *1* if the student delayed the more advanced math course by one or more semesters. Note that, because this outcome presumes that students enrolled in a second (more advanced) math course, I exclude from these models all students who did not enroll in a second math course. In addition, I exclude all students who remained in the system for fewer than four semesters because it is not possible for a student who remained in the system for less than four semesters and who delayed his/her first math course by even one semester to then delay his/her second math course. These two constraints are more severe than the constraints applied in previous models.

Two particularly strong predictors of delay of second math are evident in Table 7, as well as several predictors of lesser strength. First, among students who attempted a second math course, those who delayed their first math course until the Spring 2003 or Spring 2004 were especially likely to delay their second math course, net of other variables. This makes sense in light of the nature of the semester system. As noted earlier, the summer is an unpopular time to take math courses. Consequently, students who wait until the Spring term to enroll in a first math course create for themselves a nearly automatic delay of their next math course, unless they are inclined to enroll in a second math course during the Summer term.

Second, controlling for the other variables included in the model, students who did not pass their first math course were especially likely to delay their second math course. This, too, makes sense because students who did not pass (who failed or withdrew from their first math course) typically must repeat this course in a later semester.

Third, all else being equal, the skill-level of a student's first math course generally was inversely associated with the likelihood of delaying a more advanced math course if such a course was attempted. That is, students who began the math sequence at the lower end of the math hierarchy, and who attempted a more advanced math course, appear to have been less likely to have delayed their second math course.

Finally, a student's average course unit load in the first year of attendance was inversely associated with the likelihood of delaying a second math course: lower course unit loads in the first year were associated with a greater likelihood of delaying a second math course. Interestingly, unlike the relationship between course unit load and delay of *first* math, the relationship between course unit load and delay of *second* math does not grow stronger as one considers groups of students who remained in the system for longer periods of time. Instead, the strength of the relationship declines. Therefore, the explanation that was offered for the relationship between course unit load and delay of *first* math does not appear to apply to delay of *second* math. One possible explanation is that, among part-time students, those who remained in the system for longer periods of time were more likely to transition to full-time or near-full-time status than were those who remained in the system for shorter periods of time. If true, this would be expected to reduce the observed "effect" of first-year, part-time status on delay of second math, as is observed here.

In the analysis of delay of a second writing course (Table 8), we find essentially the same relationships as observed for remedial math. The only exception is that students who began at the very bottom of the remedial writing hierarchy (four or five levels below college writing) do not appear to have experienced a consistently lower likelihood of delaying second writing, relative to students who began at the top of the remedial writing hierarchy. However, although the coefficients for students at the bottom of the remedial writing sequence in Models 8-1 and 8-2 are not statistically significant, they are of comparable size and the same direction as the coefficients

associated with students who began two and three levels below college writing, suggesting that the same pattern of prompt enrollment in second writing may apply to students who began at the lowest rung of the remedial writing hierarchy.

Who tends to complete successfully a remedial math course that is no more than one level below college algebra, or a remedial writing course that is no more than one level below college composition?

Having considered the delay of a first remedial course, performance in the first remedial course, the attempt of a second (more advanced) remedial course, and the delay of the second remedial course, I now turn to the first of the measures of attainment: whether a student completed successfully a remedial math/writing course that is one level below college-level coursework or a higher-level course. This outcome variable is coded *1* for students who completed a math/writing course that is no more than one level below college math/writing, and *0* otherwise. Note that my use of the phrase "or a higher-level course" indicates that students who did not pass (or skipped) the remedial course that is one level below college competency, but who passed a college-level course in the subject, are designated here as having completed a course that is no more than one level below college competency (i.e., a value of *1* on this outcome variable).

For these sets of models (Tables 9 and 10), I apply all of the same constraints employed in the preceding analysis of delay of second math/writing (i.e., attempted a second math/writing course, remained in the system for at least four semesters), except that I also exclude those students who began their remedial math/writing coursework at one level below college-level coursework. These students needed only to pass their first math/writing course in order to have achieved the outcome of interest in these models.

Among the patterns evident in Table 9, students who began the remedial math sequence at the lower end were substantially less likely than were students who began at the upper end to complete a math course that is one level below college math or higher, after controlling for other variables. Although consistent with prior research (Bahr, 2010b), this patterns seems incongruent with the patterns evident in earlier models. In particular, students who began at the lower end of the sequence were more likely to pass their first math course (Table 3), more likely to attempt a second math course (Table 5), and less likely to delay their second math course (Table 7) than were students who began the upper end of the sequence.

Although only substantial delays of *first* math (more than four semesters) appear to have had negative consequences for students' likelihood of completing a math course that is one level below college math or higher, both moderate and longer delays of *second* math appear to have been consequential even for those students who remained in the system for long periods of time. Consider, for example, students who remained in the system for more than 12 semesters (Model 9-4). Net of other variables, those who postponed *first* math by five or more semesters (i.e., attempted first math sometime after Spring 2004) suffered a small decline in the likelihood of completing a math course that is one level below college math or higher. However, in the same model, students experienced a somewhat more sizeable decline in the likelihood of completing a math course that is one level below college math or higher if they delayed their *second* math course for three semesters or longer. Thus, only very lengthy delays of *first* math appear to be detrimental to students' attainment of this outcome, but moderate delays of *second* math appear to be detrimental.

Some additional patterns are observed in Table 9. First, but not terribly interesting, students who experienced lower rates of course success in their first year were less likely than were students who experienced higher rates of course success to complete a math course that is one level below college math or higher. Second, students who were older than 25 years of age were also less likely to do so than were students of traditional college age. Third, and much more interesting, students who passed their first math were modestly more likely to complete a math course that is

one level below college math or higher than were students who did not pass their first math course. Although the latter finding may seem to be a "common sense" observation, in fact it is rather surprising. One must remember that the models include only those students who attempted a second math course, and the models control for a number of important covariates. Yet, we find here evidence of a residual effect—a "ripple" or "echo" of sorts—of performance in first math on subsequent attainment in math.

Concerning remedial writing (Table 10), many of the same patterns are evident as were observed for remedial math. A few exceptions should be noted, however. One of these exceptions is the relationship between delay of first writing and subsequent successful completion of a writing course that is one level below college writing or higher. In Model 10, we observe evidence that even modest delays of first writing (delays into the second year following initial enrollment) may be consequential for students' attainment, even among students who remain in the system for long periods of time, and even after accounting for delay of second writing and other variables. This differs from math in that delay of first math appears to be important only when the delay is quite lengthy. Second, the residual effect of passing (or not) first writing is less consistent than that of math. Finally, black/African American students appear to suffer a fairly consistent disadvantage, relative to white students, in the likelihood of completing a writing course that is no more than one level below college composition.

Who tends to complete successfully a college-level course in math or writing?

An outcome of arguably greater importance is the successful completion of a college-level course in math or writing. I analyze the successful completion of a college-level math course in Table 11 and the successful completion of a college-level writing course in Table 12. These sets of regression models are comparable to those presented in Tables 9 and 10, except that students who began the remedial sequence at one level below college math/writing are included in the analyses presented in Tables 11 and 12. These students were excluded in the analyses presented in Tables 9 and 10.

The relationships observed in Tables 11 and 12 are reasonably similar to those presented in Tables 9 and 10, if not somewhat more clear and unambiguous. For both math and writing:

- The lower a student's first course in the remedial sequence, the less likely was he/she to complete a college-level math/writing course, all else being equal.
- Only *lengthy* delays of *first* math appear to be consequential for the successful completion of a college-level math course, but even moderate delays of *first* writing appear to be associated negatively with the likelihood of completing a college-level writing course.
- A delay of second math/writing of more than one semester is associated with a lower likelihood of college-level math and writing attainment, even among students who remain in the system for long periods of time.
- Lower rates of course success in the first year are associated negatively with college-level math and writing attainment.
- Passing the first writing course appears to be associated with a greater likelihood of completing a college-level writing course, net of variables. The same relationship is *not* consistently evident with math.
- Black/African American students were less likely to complete a college-level math or writing course than were white students—the stubborn racial gap in successful remediation documented in prior work (Bahr, 2010c).
- Students who were older than 25 years of age were less likely to complete a college-level

math or writing course than were students of traditional college age.

Does variation in remedial course-taking patterns have any bearing on students' long-term outcomes?

The bottom line for many stakeholders in the community college system is degree attainment and, as a component of the process of degree attainment, transfer to a four-year institution. Thus, I ask here whether variation in remedial course-taking patterns in math and writing has any relationship to students' long-term credential and transfer outcomes, *over and above any relationship between remedial course-taking patterns and attainment in math and writing*. To answer this question, I used multinomial logistic regression (Long, 1997; Powers and Xie, 2000) to analyze variation in credential completion and transfer across all of the variables considered in previous models, plus a three-category indicator of the highest-skill math/writing course completed successfully by a given student. This indicator is coded *0* if the student completed a college-level math/writing course, *1* if the student completed a math/writing course that is one level below college math/writing but not a higher-level math/writing course, and *2* for all other outcomes.

Note that one can think of multinomial logistic regression as a series of logistic regression models, all run simultaneously, and each of which compares a different outcome with a single "excluded" outcome. The excluded outcome here is the least desirable, namely neither the completion of a credential of any kind nor transfer to a four-year institution.

As with previous models, I excluded some groups of students. Students who were included in the analysis were those who remained in the system for at least 10 semesters and who attempted a second math/writing course. These students are by no means representative of the larger remedial math/writing cohorts, but this tight set of inclusion/exclusion criteria was important to reduce the confounding associations between delay of first/second math and writing, duration of attendance, etc.

The results of this analysis are presented in Tables 13 and 14. Although there are a number of interesting findings in these tables, I focus on those that concern the relationships between remedial course-taking patterns and long-term credential and transfer outcomes; and, as before, my attention is on systematic configurations of relationships.

In that regard, there are few such systematic configurations of relationships between remedial course-taking patterns and long-term outcomes, once attainment in math/writing and other variables are taken into account. For math (Table 13), one finds what appears to be a consistent positive association between delaying first math and a greater likelihood of transferring *without* a credential versus neither completing a credential nor transferring. Conversely, one observes a somewhat less consistent negative relationship between delay of second math and a lower likelihood of transferring *without* a credential versus neither completing a credential nor transferring. One also notes that students who began at the lower end of the remedial math hierarchy experienced a greater likelihood than did students who began at the upper end of transferring *with* a credential versus neither completing a credential nor transferring, which has been observed in prior work (Bahr, 2010d). Finally, one may note a counterintuitive relationship between passing first math and both transfer outcomes. Students who passed their first remedial math course on the first attempt experienced a lower likelihood of transferring (versus neither completing a credential nor transferring) than did students who did not pass, once other variables (including math attainment) are controlled.

Systematic configurations of relationships are even less evident in the analysis of remedial writing. In fact, none of the relationships noted for math are replicated for writing. The only finding that may hint at such a systematic configuration is a disadvantage in the likelihood of both transfer outcomes (versus neither completing a credential nor transferring) for students who experienced particularly long delays (greater than three semesters) of their second writing course.

In sum, the analyses presented in Tables 13 and 14 suggest that, to the extent that the remedial course-taking patterns examined here have a relationship to students' long-term outcomes, such relationships are indirect, operating through the mediating variables of students' math/writing attainment.

This finding does not mean that variations in remedial course-taking behavior do not matter for students' ultimate outcomes. One may observe in these models that students who completed a college-level course in math or writing were much more likely to transfer or complete an academic Associate's degree (versus neither completing a credential nor transferring) than were students who did not attain this level of math/writing competency. In turn, the previous analyses indicate, for example, that students who delayed their first or second remedial course and/or did not pass their first remedial course tended to be less likely to complete college-level courses in math and/or writing. So, remedial course-taking patterns matter for students' outcomes, but only insofar as these patterns are associated with students' attainment in math and writing. In sum, particular aspects of remedial course-taking patterns appear to be associated with the likelihood of attaining key thresholds of math and writing competency, and attainment of math and writing competency is strongly associated with students' likelihood of completing credentials and transferring to a four-year institution.

Summary of findings

Certain aspects of course-taking appear to have systematic relationships with students' progress and ultimate achievement in math and writing. Here, I summarize the findings concerning the systematic relationships that were observed in these analyses. The reader is reminded, though, that we cannot say necessarily that a particular pattern of remedial course-taking "causes" or "contributes to" success or failure, or even (more cautiously) "leads to" success or failure. We can say only that particular patterns of remedial course-taking and certain aspects of progress or success are paired in systematic ways.

Findings: Level of first remedial math/writing course

- The initial skill-level of a student's first math/writing course does not appear to be related systematically to whether or not a student tends to delay this first course. However, students who began in the lower portion of the remedial math sequence (three or four levels below college math) tended to be more likely to pass their first course, though the same advantage does not hold for students who began in the lower portion of the remedial writing sequence.
- Moreover, students who began in the lower portions of the math/writing sequence (three or four levels below college math; two or three levels below college writing, but not four or five levels below college writing) were more likely to attempt a second (more advanced) math/writing course than were students who began at the top of the remedial math/writing hierarchy. Among students who attempted a second math/writing course, those who began two, three, and four levels below college-level were less likely to delay their second course than were students who began at the top.
- Yet, even after accounting for these seemingly advantageous behaviors, the further down the remedial math/writing hierarchy that students begin, the less likely they are to complete successfully a math/writing course that is one level below college math/writing or to complete a college-level math/writing course.

Findings: Unit load of first remedial math course

- Students whose first math course is of a lower unit load (less than three units) do not appear to be advantaged systematically with respect to the likelihood of passing this first

math course. However, they appear to be less likely to attempt a second math course and more likely to delay the second math course if they attempt it.

Findings: Delay of first remedial math/writing course

There are obvious structural consequences of delaying first math/writing for students. Delays of any kind increase the risk that students will depart from the system prior to achieving their goals with respect to math and writing skills. However, these structural consequences were not my primary focus in this segment of this study. Instead, I focused on whether there are other associations between delay and progress/outcomes in math and writing, aside from the decidedly negative structural consequences.

- With the exception of students who delay first math until their first summer, delays of first math tend to be associated with a lower likelihood of passing the course. The same is not true of writing.
- Delays of first math/writing of more than one or two semesters are associated with a lower likelihood of attempting a second (more advanced) course, even among students who remain in the system for a long period of time. Delays of first math/writing also create a nearly automatic delay of second math/writing (among those who attempt a second course) if the first math/writing course is postponed until the Spring semester.
- However, delay of first math appears to have long-term consequences for students' achievement of math competency (whether college math or one level below college math) only if the delay is quite lengthy.
- On the other hand, even moderate delays of first writing appear to have lasting consequences on students' achievement of writing competency.

Findings: Success in first remedial math/writing course

- Students who passed their first remedial math/writing course were much more likely to attempt a second course, and much less likely to delay this course if they attempted it, than were students who did not pass. Put another way, failing or withdrawing from one's first remedial math or writing course has consequences, both in terms of dropping out of the sequence (not attempting a second math course) and, for those who continue in the sequence, in terms of delaying the next (higher) course.
- In addition, a very modest positive relationship was noted between passing first math and the subsequent completion of a math course that is one level below college competency and, likewise, between passing first writing and the subsequent completion of a college-level writing course.

Findings: Delay of second math/writing course

- Holding constant all of the other variables considered in this analysis, delaying second math/writing appears to have negative consequences for students' attainment of math/writing skill (both college-level competency and one level below college competency). Generally speaking, even students who remained in the system for a long period of time suffered a lower likelihood of achieving either of the levels of math/writing competency considered here if the delay was longer than one or two semesters.

Part Three

Current policies and practices, and issues going forward

Part Three: Current policies and practices, and issues going forward

The current policy status of developmental education in California in relation to college-level expectations

The descriptive statistics and quantitative findings presented in previous pages offer the state and the California Community Colleges a valuable set of baseline measures for evaluating efforts to balance high standards for college-level courses with wide access to those courses.

For the past several decades, providing developmental education to students who need it has been crucial to achieving that balance. Since the Fall 2002 cohort began their studies, efforts to address the rigor of community college's academic expectations have included:

- Higher minimum academic expectations for the associate degree, and
- Ongoing efforts to revise state regulations pertaining to the validation of communication and computation (i.e., basic skills) prerequisites for transfer-level courses outside the English and mathematics departments.

These efforts, expressed through recent or potential changes to Title 5 regulations, necessarily focus a bright light on the issue of improving student outcomes in developmental education.

Higher requirements for the associate degree help stir renewed focus on developmental education

Prior to Title 5 regulations that went into effect in Fall 2009, the minimum statewide requirements for the associate degree specified that a student must at least complete a course one level below Freshman Composition (in English) and Elementary Algebra (in mathematics). Some colleges had higher local requirements, resulting in variation across the system. Among more than 50 colleges responding to a survey by the statewide Academic Senate (ASCCC) published in Spring 2003, 25 colleges required Freshman Composition and 10 colleges required Intermediate Algebra (ASCCC, 2003, pg. 32).

The ASCCC recommended increasing the statewide minimum requirements and, in September 2006, the Board of Governors (BOG) revised Title 5. The higher requirements went into effect for students who entered in Fall 2009.

The new rules (Title 5, §55063) establish that students must complete both of the following with a satisfactory grade as part of their studies for the associate degree:

- [Transfer-level] Freshman Composition or another English course at the same level and with the same rigor, approved locally.
- [One level below transfer] Intermediate Algebra or another mathematics course at the same level, with the same rigor and with Elementary Algebra as a prerequisite, approved locally.

These changes raised concerns about access among instructional officers and student services officers in the state, however. They argued the higher standards would put a college degree out of reach for many underprepared students unless colleges improved their capacity to provide effective developmental instruction. To resolve this concern, the ASCCC and the statewide organizations of Chief Instructional Officers and Chief Student Services Officers proposed what would become the Basic Skills Initiative (BSI).

The BSI aims to cultivate effective practices and support practitioners

During the past several years, the BSI has focused on "best practices" in developmental education, in an effort to make greater student success an institutional responsibility for colleges. Since September 2007, the BSI has been supported by categorical state funds—initially in the amount of $33.1 million each year, but reduced to $20 million in the 2009–10 state budget approved in July 2009, due to the state's fiscal crisis.

The BSI is intended to draw on and enrich the expertise of practitioners. The initiative has produced several literature reviews of effective practices, most notably *Basic Skills as a Foundation for Student Success in California Community Colleges* (Center for Student Success, 2007). This document is popularly called the "Poppy Copy" because of the color of its cover. A revised version was recently published as *Student Success in Community Colleges: A Practical Guide to Developmental Education* (Boroch, Hope, et al., 2010).

In its second edition in July 2007, the Poppy Copy defined "basic skills" as:

> "those foundation skills in reading, writing, mathematics, and English as a Second Language, as well as learning skills and study skills which are necessary for students to succeed in college-level work" (Center for Student Success, 2007, pg. 13).

In many respects, the literature review offered an extended critique of the "one instructor in one classroom for a standard class time" model of developmental education (Center for Student Success, 2007, pg. 140). Instead, it focused on:

- **Organizational and administrative practices**, such as integrating academic and student support services and ensuring that students complete basic skills instruction early.
- **Program components**, such as making orientation, assessment, and placement for new students mandatory; integrating counseling with academics; and conducting regular program evaluations whose results are used for continuous improvement.
- **Staff development practices**, such as making faculty development in teaching and learning for basic skills instruction a priority connected to a college's mission; and supporting relationships among colleagues so faculty can find intrinsic reward in basic skills teaching.
- **Instructional practices**, such as employing "a variety of instructional methods" including active learning, learning communities where cohorts of students take multiple courses together, and/or contextual learning opportunities that make basic skills relevant for valuable occupational or academic activities.

To broaden the implementation of such practices, the Poppy Copy introduced a template for colleges to use in collecting baseline performance data and assessing where, how, and how broadly they employ (or might employ) these effective practices. Colleges did this in exchange for a share of basic skills categorical funds, with the results informing ongoing action and expenditure plans. These plans detailed the actions and long-term goals each college intended to undertake to improve its institutional capacity for developmental education.

College action plans provide a window into the current practice of developmental education

The action plans submitted by colleges provide a window into the current practice of developmental education around the state. According to an Academic Senate analysis, certain "effective practice" strategies were highlighted most frequently in the plans that colleges submitted for 2007–08 (Fulks, Alancraig, et al., 2008, Chapter 18, pg. 9):

- Strategy A 3.2: "Based upon the institutional structure, a dedicated administrator or lead faculty is/are clearly identified and accorded responsibility for college-wide coordination

of basic skills programs." Colleges that have established a coordinator position appear to vary widely in the percentage of time an individual is able to devote to this role, from 100% reassignment to no reassigned time and no stipend (Fulks, Alancraig, et al., 2008, Chapter 18, pg. 6).

- Strategy B 3.1: "A proactive counseling/advising structure that includes intensive monitoring and advising serves students placed into developmental education courses."
- Strategy B 3.2: "Counseling and instruction are integrated into the developmental education program."
- Strategy C 2.1: "Developmental education faculty are involved in the design, planning, and implementation of staff development activities related to developmental education."
- Strategy D 2.1: "Developmental courses/programs implement effective curricula and practices for English (e.g., reading/writing integration, writing across the curriculum, and use of writing labs)."

According to Finton and Fulks (2008), however, the 10% of colleges with the highest basic skills success rates in the state regularly cited only one of these strategies: A 3.2. There was little overlap between the plans of these colleges and those with the *lowest* basic skills success rates. Further analyses concluded that colleges in the state began the BSI self-assessment process from many different starting points. The most successful colleges appeared to have "more plans to research, evaluate and generate data, perhaps informing resource allocation and structural decision-making more completely," while the least successful colleges appeared "to be in the developmental stage for many of the identified effective practices" (Finton and Fulks, 2008, pg. 14).

One critique of colleges' action plans, and the literature review on which they are based, is that they have focused little specific attention on equity in basic skills outcomes among different student groups. For example, Dowd and colleagues have argued that these documents tend to disconnect effective practice from "students' communities, cultures or lived experiences," with faculty development "not rooted in communities outside the college" (Dowd, Lord, et al., 2009, pg. 33). A new literature review drafted by the Academic Senate, *Practices that Promote Equity in Basic Skills in California Community Colleges* (ASCCC, 2010), focuses on these topics.

Can revised policies for communication and computation prerequisites encourage earlier remediation?

A potential change to Title 5 regulations is again raising questions about the relationship between developmental and college-level courses: namely, possible revision of state regulations governing how communication and computation (i.e., basic skills) prerequisites are validated and established.

How to encourage timely remediation remains a question for the colleges

Among students in this study's Fall 2002 first-time cohort who took a remedial course, the majority began doing so during their first year of enrollment; half or more began during their first term. But in the regression analyses of this cohort, students who delayed their first remedial writing course were less likely to attempt a second, more advanced course. The same was true in mathematics among students who delayed their first remedial mathematics course until Fall 2003 or later. And even moderate delays of a student's first remedial writing course appeared to have long-term consequences for whether the student would complete the last writing course in the remedial sequence.

Ensuring that more students complete any needed developmental instruction early and quickly is

a longstanding topic of concern for the California Community Colleges. The state has a financial stake in moving students through the system more quickly; indeed, timely student progress was one rationale for the 1986 proposal by the Commission for the Review of the Master Plan for Higher Education to limit remedial course-taking in the credit mode to 30 semester units, for example. Today, the Poppy Copy highlights institutional policies that "facilitate student completion of necessary developmental coursework as early as possible in the educational sequence" as one key practice for fostering student success (Center for Student Success, 2007, pp. 17–19).

Stakeholders inside and outside the system have suggested various strategies to encourage students to begin remediation early, if needed. One is advising. A 2004 report by the Academic Senate, for example, highlighted the importance of matriculation—and orientation in particular—for encouraging students to enroll in any needed remedial courses "right from the start" of their community college studies (ASCCC, 2004, pg. 18).

State funds for matriculation services have been cut severely since 2007–08, however. State categorical funds for matriculation services were cut by nearly 52%, from $101.8 million to $49.2 million, between 2008–09 and 2009–10.[3] Lawmakers also identified these funds for "flexibility" through 2012–13, giving community college district boards discretion to use these funds for alternative purposes. (For more information, see EdSource, 2010a.)

Even before these cuts, however, leveraging earlier remediation through matriculation services posed challenges. For example, only 48% of first-time freshmen enrolling in credit coursework in Fall 2007 received orientation services (CCCCO, 2009, pg. 13). The Consultation Council Task Force on Assessment had such statistics in mind when it argued that "simply requiring all directed students be subject to required matriculation services would make a big difference in providing the guidance students need" (Consultation Council Task Force on Assessment, 2008, pg. 5). But this requires resources in a time of increasing fiscal constraint.

A 2008 report by the Legislative Analyst's Office (LAO) suggested another approach to encouraging earlier remediation. The report recommended that the Legislature:

> "amend statute to require underprepared students (who are not exempted by districts) to take appropriate remedial classes based on their assessment results . . . beginning in their first semester . . . and every semester thereafter until they advance to college-level proficiency" (LAO, 2008, pg. 15).

The LAO also proposed stiff consequences for any nonexempt student who avoided assessment: these students "would be placed in beginning-level remedial math and English courses" (LAO, 2008, pg. 16).

A Strategic Plan Assessment Action Planning Group (APG) requested by then-Chancellor Diane Woodruff in mid-2008 debated and ultimately set aside the LAO's idea. One concern was that the LAO's proposal would create a legislative mandate that could not be funded. The APG's May 2009 End-of-Year Report documented several additional concerns (see Strategic Plan Assessment APG, 2009, pp. 2–3):

- Not all "underprepared" students are the same. Some need extensive help, while others need only "refresher" instruction to be successful in college-level work.
- "[D]oing more of the same is not enough." Given that traditional approaches to sequencing and instruction have not provided sufficient likelihood of student success, the

[3] This comparison considers the 2008–09 state budget as revised in February 2009 and the 2009–10 budget passed in July 2009.

LAO's proposal could not succeed without new approaches to developmental education.

- There was concern that consignment of underprepared students to predominantly remedial courses would disengage many students from college.
- There was also "considerable resistance" to preventing underprepared students from accessing college-level coursework outside the English and mathematics departments. This resistance stemmed from two concerns: that colleges could not provide enough remedial course sections and instructors to meet the demand that would result from the proposal; and that faculty in other disciplines could face declining enrollments in their courses, resulting in declines in enrollment-based funding.

One proposal for encouraging earlier remediation has recently gained momentum: revision of the Title 5 regulations pertaining to the validation of communication and computation (i.e., basic skills) prerequisites outside the English and mathematics departments. Although such prerequisites would not require a student to complete remediation at a particular time, some in the system hope that more effective use of prerequisites could influence student course-taking by specifying clearer requirements for some college-level courses.

The validation of communication and computation prerequisites

The current Title 5 regulations that govern the validation of such prerequisites were adopted in response to the Chancellor's Office's settlement with the Mexican American Legal Defense and Education Fund (MALDEF). The changes were sufficiently complex that the system produced several supporting documents in subsequent years to guide local districts and colleges in meeting their obligations (Board of Governors, 1993; ASCCC, 1997; CCCCO, 1997).

The current regulations (§55003) were one attempt by the system to balance academic standards for college-level coursework with the widest appropriate access to the curriculum. The regulations say that a prerequisite should be established when a student would be *highly unlikely* to pass a course without certain prior knowledge and skills. Once established, colleges must provide reasonable access to a needed prerequisite so students can make timely progress toward their educational goals. Students must also be advised of their right to challenge a prerequisite, with one of the legitimate grounds for a challenge being that a college does not provide sufficient access to needed coursework.

Local boards also must establish policies to ensure that courses with established prerequisites are "taught in accordance with the course outline of record, particularly those aspects of the course outline that are the basis for justifying the establishment of the prerequisite or corequisite" (§55003). This means that faculty should teach these courses in such a way that a student *actually is* highly unlikely to pass if they have not met an established prerequisite.

Generally, the process for establishing a prerequisite involves a content review, through which faculty "identify the necessary and appropriate body of knowledge or skills students need to possess prior to enrolling in a course" (§55000c). However, the process for establishing a communication or computation prerequisite outside the English or mathematics disciplines, respectively, is more complex. A college must prove statistically through "sound research practices" that a student would be highly unlikely to pass a particular course without a proposed communication or computation prerequisite (§55003e).[4]

The regulations also set a high standard for closing off student access to a discipline or curriculum based on a communication or computation prerequisite. Such prerequisites "may not

[4] Exceptions to this requirement include cases in which "baccalaureate institutions will not grant credit for a course unless it has the particular communication or computation skill prerequisite" (§55003e1).

be established across the entire curriculum unless established on a course-by-course basis" (§55003g).

In lieu of prerequisites, faculty may also establish advisories for recommended preparation. Advisories require a content review of the target course to "list skills that it would be a good idea for students to have but which are not necessary to pass the class" (ASCCC, 1997, pg. 1).

Why some are in favor of revising Title 5 on the validation of communication and computation prerequisites

Currently, computation and communication prerequisites for transfer-level courses outside the mathematics and English departments are relatively uncommon. Few colleges employed them extensively at the beginning of the Basic Skills Initiative, though mathematics prerequisites were the most commonly used, followed by writing prerequisites. (See Figure 12 on the next page.)

Shulock and Moore argue that misunderstanding of the MALDEF settlement, which did not disallow prerequisites or mandatory placements, leads many in the California system to "assume they are unable to require most anything of students" (Shulock and Moore, 2007, pg. 13). They see prerequisites and mandatory placements as a corrective to the system's tendency to err in favor of maximizing students' curricular access rather than providing direction leading to success.

In addition, some describe the statistical validation requirement as "onerous." Colleges may not have sufficient research capacity to conduct the necessary validation studies, they argue (Moore, Shulock, et al., 2007; Lieu, 2010). Even with that capacity, the required evidence may be difficult to document because faculty, having made adjustments over time to the needs of underprepared students, may no longer teach the target course in a way that requires a proposed prerequisite in practice (Moore, Shulock, et al., 2007; Mahon, 2009; Lieu, 2010).[5]

Fulks and colleagues argue that prerequisites can provide "scaffolding" for student success and clearer course-taking pathways, and enable faculty to better meet the objectives and standards of the courses they teach. Fulks cites data showing increased success in Psychology B1A and Sociology B1 among **Bakersfield College** students who had completed a reading prerequisite, and in Economics 1 among **De Anza College** students who had completed different levels of mathematics. The latter data show, for example, that students who had completed Intermediate Algebra or higher were much more likely to pass Economics 1 in Fall 2008 (Fulks and others, 2008, Chapter 16, pg. 13–14).

The statewide Academic Senate is leading an effort to revise the Title 5 regulations governing validation of communication and computation prerequisites to require content review based on faculty expertise *but not statistical validation*. Resolution 9.02, passed in Spring 2009, called for regulatory revisions, with colleges to "conduct research on the effect(s) of the prerequisites" and provide procedures by which students can challenge prerequisites. Resolution 9.05, passed in Fall 2009, focused on ensuring the rigor and consistency of faculty content review systemwide.

The Assessment Action Planning Group (APG) also expressed support for a "project to develop statewide pre-requisites for a limited set of general education courses using content review" (Strategic Plan Assessment APG, 2009, pg. 5). Whereas the Academic Senate's resolutions focused primarily on enabling local flexibility, the APG's recommendation sought to prevent any declining enrollments that might occur if individual colleges implement new prerequisites but their neighboring colleges do not.

---

[5] Grubb and Associates (1999) have called this one form of "hidden or submerged remediation," which is problematic to the extent that courses intended to focus on college-level work effectively become remedial courses detached from their intended goals. Berger (1997) describes the frustration and poor articulation of curricula that can result, such as when faculty struggle to assign meaningful grades to underprepared students who work hard and make progress but cannot meet the standards outlined for a course.

Figure 12: **Few colleges employed communication or computation prerequisites extensively at the beginning of the Basic Skills Initiative, though mathematics prerequisites were the most commonly used**

	*Percent of **colleges** offering each response, by subject*			
Colleges' responses regarding the number of transfer-level courses (in history, psychology, economics, etc.) specifying each of the following kinds of **prerequisites** (2006–07, 64 colleges responding)	**Writing** Courses as Prerequisites	**Reading** Courses as Prerequisites	**Mathematics** Courses as Prerequisites	**English as a Second Language** Courses as Prerequisites
None/NA	**33%**	**58%**	20%	**64%**
Few	**33%**	25%	**34%**	17%
Some	23%	13%	**33%**	16%
Many	11%	5%	13%	3%

Data: Academic Affairs Division, CCCCO, *Report on the System's Current Programs in English as a Second Language (ESL) and Basic Skills*, Graphs 41–44. EdSource, 6/10

Note: Percentages may not sum to 100 due to rounding.

Complications, concerns, and counterarguments

Many of the practical concerns about the Legislative Analyst's proposal to mandate immediate remediation also apply to the discussion of prerequisite regulations. To the extent that such prerequisites became more common, critics worry that "doing more of the same" in developmental education could result in many students failing to meet prerequisites, constraining access to higher-level coursework. The possibility that disciplinary faculty outside the English and mathematics departments could face reduced enrollments, and thus reduced funding, also remains a complication for local implementation. And colleges would need to provide enough developmental course sections and instructors to enable students to meet additional prerequisites.

Some also see value in the statistical validation of communication and computation prerequisites as opposed to content review alone. The report of the Assessment APG noted that some research studies demonstrate "the value of prerequisites" while others reveal "student success in spite of not fulfilling a prerequisite" (Strategic Plan Assessment APG, 2009, pp. 4). For example, empirical evidence for a proposed writing prerequisite might show that readiness for a particular history course demands a less rigorous prerequisite than was assumed. Such a finding could be a starting point for further inquiry into curricular alignment (e.g., into the effectiveness of developmental instruction, or whether the history course is being taught at the level of rigor intended).

Finally, some express strong concern about the possible impact of new prerequisites on access to the transfer-level curriculum among different racial and ethnic groups. The report of the Assessment APG cited concern that "an increase in prerequisites" could have "a disproportionate effect on specific groups and block their access to college courses and programs" (Strategic Plan Assessment APG, 2009, pg. 4). As the description of the Fall 2002 cohort of first-time students presented earlier showed, African American and Latino students were overrepresented at lower levels of the state's mathematics and writing sequences. To the extent these students have "further to go" in a sequence and are less likely to complete a sequence, they could be shut out of a growing number of content courses.

Approaches to prerequisites vary across colleges

Whether or not Title 5 is revised, local community college educators appear to take different approaches to the use of prerequisites in balancing academic standards with student access. The research for this study provides a narrow but illuminating look at this diversity.

As noted earlier, this study's examination of student progress through remedial writing and reading sequences involved identifying the *structure* of these sequences at different colleges. This provided an opportunity to examine the extent to which English faculty in different colleges had established formal prerequisites and/or advisories for the 4,285 transfer-level English courses (other than Freshman Composition) in which students from the Fall 2002 first-time cohort enrolled during their studies.[6] This allowed exploration of questions such as:

- To what extent did colleges formally require completion of *Freshman Composition* as a condition for access to other transfer-level English courses?
- To what extent did colleges formally require—for students referred to remediation through assessment—completion of a particular course within the remedial sequence, *below* Freshman Composition, as a condition for access to other transfer-level English courses? (This provides additional avenues into transfer-level coursework in the discipline.)
- To what extent did colleges establish advisories, or specify no direction at all, for transfer-level English courses instead of prerequisites?

The results of this inquiry are shown in Figure 13 on the next page. Among all the transfer-level English courses *other than Freshman Composition* taken by students in this study:

- An estimated[7] 78% of these courses specified a formal *prerequisite*. Although the majority of these were Freshman Composition prerequisites, a fair number specified completion of a course within the remedial sequence.
- An estimated 14% of these courses specified an *advisory or recommendation*, with an advisory that students complete the course one level below Freshman Composition being most common.
- An estimated 8% of these courses specified no prerequisite or advisory on prior preparation.

Analysis of college-level policies sheds further light. All 107 colleges in the study had established a Freshman Composition prerequisite for at least one transfer-level English course. But students' formal options for accessing the transfer-level English curriculum as a whole varied by college. For example:

- 20 colleges had established a Freshman Composition prerequisite for *all other transfer-level English courses* taken by students in this study. At least formally, these colleges provided the "narrowest" gateway into the transfer-level English curriculum, with all paths leading through Freshman Composition.
- At the other end of the spectrum, we estimate that Yuba College had the "widest"

[6] Because this study's analysis of mathematics course-taking is built on prior documentation of remedial mathematics sequences across California by Bahr (2008, 2010b), similar documentation of prerequisites and advisories within math departments was not performed for mathematics.

[7] The percentages and proportions presented in this section should be considered *fair estimates—not* precise figures—because of variation in how some courses reported in COMIS are named from year to year.

gateway in the study, having established Freshman Composition prerequisites for fewer than one in five of the other transfer-level English courses taken by students in this study. A few transfer-level courses required completion of the remedial course two levels below Freshman Composition. The vast majority of transfer-level English courses taken at Yuba College by students in this study specified no prerequisite or advisory, meaning that—at least formally—the college provided students a wide variety of both charted and uncharted paths into the transfer-level English curriculum.

- Most colleges fell somewhere in the middle. For example, we estimate that Orange Coast College had established prerequisites for most (about six in 10) of the transfer-level English courses (non-Freshman Composition) taken by students in this study, and advisories for the rest. Most prerequisites specified Freshman Composition.

Prerequisites and advisories that are formally specified in colleges' course catalogs (or the lack thereof) are a limited source of information that might not accurately reflect actual practice, however. The extent to which formal prerequisites are enforced, or the extent to which advisories affect student course-taking behavior, could vary substantially from what catalogs describe. Research by Perin (2006) suggests that the *enforcement* of prerequisites also varies among colleges, including in California, for example.

Figure 13: How colleges used prerequisites and advisories to direct students on the preparation needed for transfer-level English courses *other than Freshman Composition*

Varieties of Direction on Prior Preparation Provided in Course Catalogs (Prerequisites and Advisories)	**Estimated* Percentage of Transfer-Level English *Courses*** (non-Freshman Composition) Employing Each Direction, Systemwide	**Number of *Colleges*** Employing Each Direction for Transfer-Level English Courses (non-Freshman Composition)
Prerequisites:	**78%**	**107**
Freshman Composition	57%	107#
1 level below Freshman Composition	18%	51
2 levels below Freshman Composition	2%	19
Advisories or Recommendations:	**14%**	**46**
Freshman Composition	6%	22
1 level below Freshman Composition	7%	27
2 levels below Freshman Composition	1%	9
None	**8%**	**48**

* These are *estimated* percentages because of variation in how some courses reported in COMIS are named from year to year. These percentages should be considered fair estimates, not precise figures. Percentages may not sum to total due to rounding.

20 colleges established Freshman Composition as a prerequisite for **all** other transfer-level English courses.

Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10

Potential new regulations raise the stakes for developmental education

Proposed revisions to Title 5 removing the statistical validation requirement for communication and computation prerequisites—drafted by a task force convened by (but not limited to) the Academic Senate—were presented to the Board of Governors (BOG) for a first reading in May 2010. However, the proposal raised questions about how to ensure that colleges' obligations to watch out for and address disproportionate impact on different student groups in light of the 1991 MALDEF settlement are clearly articulated, and about the role of institutional research in grounding faculty judgments in documented local needs. At this writing, these issues are unresolved. The prerequisite task force plans to present further information to the BOG in July, with the potential for new revisions to be approved by the end of 2010.

If a new proposal is approved, it will take time—perhaps not until Fall 2013—for any new prerequisites to appear in colleges' course catalogs. Local district boards electing to permit the new approach will need to adopt new district policies on prerequisite validation, and local curriculum committees will then need to decide how to proceed. Two of their greatest concerns will be ensuring the rigor of faculty content review processes and avoiding disruptive shifts in student enrollments among departments. The statewide Academic Senate is drafting a new document in place of its 1997 *Good Practice for the Implementation of Prerequisites* to help local faculty move forward and meet their obligations under Title 5. The Senate also plans to provide professional development to help ensure a consistent standard of content review across the system.

Regional or statewide coordination of prerequisites to prevent students from "shopping" for courses among multiple colleges remains an open and challenging question. Prerequisite validation based on content review requires faculty to align the demands of the target course with the learning outcomes of the proposed prerequisite course, as these are articulated in the respective course outlines of record. These outlines vary among colleges with respect to their specificity, however, thus making coordination of prerequisites across a region or statewide more difficult in practice.

Finally, the views of the statewide Student Senate for California Community Colleges (SSCCC) on the role of prerequisites are instructive (Fulks, 2009). When surveyed in the spring of 2009, these student leaders generally viewed accurate, mandatory placements and use of prerequisites favorably, to the extent these increase student success and support a more coherent distribution of skill levels within students' classes. However, students argued that the system should not raise expectations without providing the matriculation and counseling services that students need to understand their placements and their prospects. In addition, the students cautioned:

> "Basic skills courses are not seen as relevant to our choices of study; no one goes to school to study 'Basic Skills' or conduct remedial coursework. Taking non-transferable prerequisites is perceived as a waste of time and money; it could delay our completion of transfer or of a certificate or degree program.
>
> "Our colleges' supply of such courses hasn't met student need and demand. Mandatory placement is going to prove difficult not only to us, but to instructors and our colleges, should availability of the classes not change" (quoted in Fulks, 2009, pg. 25).

Whatever decisions are ultimately made, it is clear that changes to Title 5 will bring new responsibility to provide needed developmental courses and improve student success, just as when the system increased its minimum statewide requirements for the associate degree. These discussions inevitably circle back to ongoing efforts—in California and nationally—to rethink how developmental education is provided.

Different approaches to the practice of developmental education

Many stakeholders familiar with California's Basic Skills Initiative (BSI) agree that it has produced much-needed dialogue about the importance of improving student outcomes in developmental education. It has pushed colleges to address the fact that substantial proportions of their students access some form of developmental education while enrolled, and to provide resources that colleges can direct toward professional development for faculty. These efforts will become all the more important if revised Title 5 regulations enable local colleges to establish additional communication and computation prerequisites.

This new focus on the quality of developmental education and the need for more effective practices comes not merely from within the state, however. This is a period of intense scrutiny of the practice of developmental education by researchers, policymakers, philanthropic organizations, and other national stakeholders. This scrutiny is raising far-reaching questions about how developmental education might best meet diverse student needs.

This scrutiny is prompting innovation in California and elsewhere. This section documents examples and raises important questions about the integration of support services with developmental instruction, the connection of developmental instruction with occupational or academic contexts in which foundational skills are used, and the structure of the remedial sequence itself. First, this section addresses the role of faculty in college-level innovation.

The role of faculty inquiry and development in local innovation

Faculty familiarity with a rich menu of research-based options for effective practice in developmental education, such as those documented in the Poppy Copy, is only a first step on the road to improving student outcomes on a campus. Next is the "how to" step (Dowd, Lord, et al., 2009, pg. 34), which requires making judgments about which practices provide the most meaningful response to local problems, and piloting and evaluating the outcomes of new approaches over time.

As the BSI makes clear, faculty inquiry and development are central to the improvement of local outcomes. This is especially important because faculty who teach basic skills courses in the California Community College often do not have training specific to this task. A survey of the colleges by the Chancellor's Office (Academic Affairs Division, 2008) examined the extent to which faculty who taught credit basic skills courses at the beginning of the BSI were "hired with or later received specific training in developmental education." There was a great deal of variation among colleges in this regard. Although more than half of colleges reported that most of their faculty who taught reading and ESL had such training, among faculty teaching writing and mathematics such training was clearly less common. (See Figure 14 on the next page.)

Faculty development is complicated by the fact that so many developmental courses are taught by part-time faculty, who may be more difficult to integrate into a college's development and inquiry efforts. Course sections taught by full-time faculty appear to have been most common in reading, at least in the experience of many colleges, according to the same survey. But many colleges reported that no more than half of their credit basic skills sections in writing, reading, and/or mathematics were taught by full-time faculty. (See Figure 15 on the next page.) The inclusion of part-time faculty in professional development for developmental education connected with their colleges has been one concern for BSI leaders. For example, the initiative's Summer Teaching Institute in 2008 funded the attendance of campus teams comprised mostly of part-time faculty.

A growing number of initiatives around the state propose that making effective developmental education practices central to the work of individual colleges—that is, taking the "how to" step—requires a culture of evidence-based inquiry. Faculty and administrators need to know more about current programs. What is working? What is not? Based on what evidence? What alternatives

might be undertaken?

The institutional research function within the California Community Colleges provides capacity for this work. However, the work of institutional researchers to date has been oriented primarily toward accountability reporting and strategic planning, rather than improvement of student learning through faculty inquiry and experimentation, according to the Research and Planning (RP) Group (2009). Its recent survey of colleges found that, in general, college administrators view research and data as being more widely integrated into the work of their colleges than do faculty. According to the authors of the study, these findings suggest that the role of institutional researchers in enabling faculty to use data to inform their practice in concrete ways remains to be fully developed on campuses.

Figure 14: Specific training in developmental education for faculty teaching credit basic skills courses in writing and mathematics was relatively uncommon at most colleges at the beginning of the Basic Skills Initiative

	*Percent of **colleges** offering each response, by subject*			
Colleges' responses regarding the percent of faculty teaching *credit basic skills/ESL courses* who were hired with, or later received, specific training in developmental education (2006–07, 64 colleges responding)	**Writing**	**Reading**	**Mathematics**	**English as a Second Language**
0%–25% of credit basic skills faculty had training	**39%**	28%	**50%**	22%
26%–50% of credit basic skills faculty had training	22%	16%	23%	8%
51%–75% of credit basic skills faculty had training	22%	16%	14%	19%
76%–100% of credit basic skills faculty had training	17%	**41%**	13%	**52%**

Data: Academic Affairs Division, CCCCO, *Report on the System's Current Programs in English as a Second Language (ESL) and Basic Skills*, Graphs 25–28. EdSource, 6/10

Note: Percentages may not sum to 100 due to rounding.

Figure 15: Colleges were most likely to report in *reading* that more than half of basic skills course sections were taught by full-time faculty at the beginning of the Basic Skills Initiative

	*Percent of **colleges** offering each response, by subject*			
Colleges' responses regarding the percent of credit basic skills/ESL course sections taught by full-time faculty (2006–07, 64 colleges responding)	**Writing**	**Reading**	**Mathematics**	**English as a Second Language**
0%–25% of credit sections taught by full-time faculty	11%	6%	14%	20%
26%–50% of credit sections taught by full-time faculty	38%	25%	33%	28%
51%–75% of credit sections taught by full-time faculty	**47%**	**55%**	**45%**	**42%**
76%–100% of credit sections taught by full-time faculty	5%	14%	8%	9%

Data: Academic Affairs Division, CCCCO, *Report on the System's Current Programs in English as a Second Language (ESL) and Basic Skills*, Graphs 33–36. EdSource, 6/10

Note: Percentages may not sum to 100 due to rounding.

Consistent with the goals of the BSI, recent efforts are providing community college faculty with frameworks through which to conduct inquiry and reflect on their practice. These include, but are not limited to:

- A three-year project by the Carnegie Foundation for the Advancement of Teaching and the William and Flora Hewlett Foundation—**Strengthening Pre-collegiate Education in Community Colleges (SPECC)**—that provided grants to 11 community colleges in California. Each college received funding during three years to support faculty inquiry groups (see The Carnegie Foundation for the Advancement of Teaching, 2008). These groups developed and evaluated new approaches to teaching and learning in basic skills courses on their campuses using evidence and data, including the use of assessment to inform the direction of faculty experimentation (e.g., see Bond, 2009). One outcome of SPECC was online case studies through which faculty documented their research questions, the approaches to developmental teaching and learning they undertook in response, and what they learned. Various practices at the core of SPECC, including online documentation of faculty inquiry, continue in projects such as the **Faculty Inquiry Network (FIN)**.
- Efforts by the **University of Southern California Center for Urban Education (CUE)** to work with California community colleges through its Equity Model. The goal is to facilitate faculty inquiry toward more equitable college access and success. Campus inquiry teams disaggregate student data by race and ethnicity, develop benchmarks for improvement, and identify potential leverage points for improving student outcomes. The model supported the **Evergreen Valley College** example referenced early in this report. In that case, faculty discovered that "the majority of students who take a math assessment test do not enroll in a math course, and may enroll in a course other than the one in which they placed." These findings resulted in new goals for enrolling students in the courses into which they had placed, and further inquiry into the role of matriculation (USC CUE and Evergreen Valley College, 2009, pg. 15).
- A new RP Group-led effort—**Bridging Research, Information & Culture (BRIC)**—that, in 2010–11, will assist 15 colleges in strengthening their capacity for evidence-based inquiry projects. The project also intends to make institutional research more efficient, in order to free up time to support campus inquiry. Three colleges—**Las Positas College**, **Los Angeles Southwest College**, and **Porterville College**—began piloting the project in Spring 2010.

Building the system's capacity for faculty inquiry through creation of a "permanent statewide professional learning network" is also the goal of the current phase of the BSI, led by faculty from the **Los Angeles Community College District** (Basic Skills Initiative, 2009, pg. 5). (Faculty from the **Foothill-De Anza Community College District** led two prior phases of the BSI, which included the Summer Teaching Institute noted above.)

Under the current phase, 34 colleges have joined four regional pilot networks: Bay Area, Los Angeles, Sacramento/Central Valley, and San Diego/Imperial Valley. Efforts to date have included a Leadership Institute held in June 2009, which provided for discussion of how to set shorter- and longer-term outcome goals and the development of regional inquiry projects focused on "encouraging the campus at large to take ownership for professional learning" (Basic Skills Initiative, 2009, pg. 22). An online portal enables the regional networks to share information, document their work to date, and stay informed of regional workshops and events.

One long-term goal of the current phase is establishment of a permanent center to serve as a repository for faculty expertise and a hub for the continued growth and support of the network and faculty inquiry. Planning is being undertaken with grant support from several foundations.

Making support for student success explicit and pervasive

Like much of the national research and policy literature, the Poppy Copy drew attention to the importance of better integrating developmental instruction with a suite of support services that ensure students stay engaged, receive assistance, and maintain a sense of forward progress toward their goals. The Poppy Copy calls on colleges to ensure a "comprehensive system of support services exists [that] is characterized by a high degree of integration among academic and student support services," and states that counseling support should be "substantial, accessible, and integrated into academic courses/programs" (Center for Student Success, 2007, pp. 4–5). The importance of support is heightened all the more by this study's finding that students who did not pass their first remedial math or writing course on the first attempt were less likely to attempt a second, more advanced course in those subjects, holding constant other variables.

Integrating these many services poses challenges. Shulock, Moore, and colleagues have argued, for example, that state categorical funding structures often create "administrative silos [that] serve as barriers to collaboration between academic affairs and student affairs in addressing the whole student" (Shulock, Moore, et al., 2008, pg. 13), motivated in part by mistrust that local decision makers can or will use funds in meaningful ways to achieve institutional priorities (Shulock and Moore, 2007, pg. 25). They argue that, as a result of these restrictions and others—such as the requirement that colleges spend half of funds on direct classroom instruction—administrators have inadequate "flexibility to allocate college funding in ways designed to maximize student success" (Moore, Shulock, et al., 2007, pg. 40).

Perhaps in testament to such challenges, an analysis of colleges' 2007–08 basic skills action plans by the Academic Senate showed that 43% cited integration of counseling and instruction as an area for investment and action (Fulks, Alancraig, et al., 2008, Chapter 18, pp. 9–10). And lab requirements for credit basic skills courses in reading, writing, mathematics, and ESL—whether students met these in centralized learning centers or decentralized subject-area labs coordinated with other support services—were the exception rather than the rule in California at the beginning of the BSI, especially in mathematics and ESL (Academic Affairs Division, 2008, pp. 14–16).

The recent work of the Student Support Partnership Integrating Resources and Education (SSPIRE) initiative provides one window into both new and longstanding efforts to integrate support services with developmental instruction. Nine colleges received grants during three years to implement new approaches through a partnership between the James Irvine Foundation and MDRC.

The SSPIRE colleges each undertook efforts to better integrate support services—e.g., counseling and financial aid—into the structure of students' educational experiences, with ongoing reflection on data throughout the initiative. The nine colleges each undertook one of four primary approaches (see Weissman, Cerna, et al., 2009):

- *Learning communities:* **American River College**, **College of Alameda**, **De Anza College**, **Mt. San Antonio College**, and **Santa Ana College** either created new learning communities or built on existing ones. These communities linked multiple academic courses and revised curricula to include counseling and support staff, or linked academic courses to a "support course" taught by a counselor. Depending on whether learning communities were new or established, the number of students served by these programs at a given college ranged from 50 to closer to 1,000 students per year (Weissman, Cerna, et al., 2009, pp. 18–21).
- *Case management:* **Taft College** and **Victor Valley College** each undertook a case management approach, with advisors handling a small caseload. Case managers ensured that students received financial aid support, academic advising, and career counseling, for

example. However, SSPIRE leaders note that this approach is difficult to bring to a great level of scale "without substantially adding staff and cost" (Weissman, Cerna, 2009, pg. 92).

- *Study center:* **Merced College**, driven in part by results from its participation in the Community College Survey of Student Engagement (CCSSE), established a study center on campus where students can access academic assistance. Coordinators and faculty actively recruit developmental students to use the center, particularly "students who are at risk of failure or dropping out" (Weissman, Cerna, et al., 2009, pg. 47).
- *Summer bridge program:* **Pasadena City College** established a summer bridge program through which developmental mathematics students review math concepts and skills and receive counseling support (Weissman, Cerna, et al., 2009, pg. 60–61).

These grant-funded efforts in California to buttress instruction with stronger student support provide models that other colleges might consider. But they often also raise questions about how colleges can prioritize and sustain programs on behalf of more students. **Chaffey College's** Student Success Centers provide an example of academic support services at scale. The centers were a result of the college's Basic Skills Transformation Project, which responded to declining basic skills outcomes in the late 1990s. Undertaken with Partnership for Excellence funds formerly provided by the state during multiple years, the project included adopting new assessments, revising courses, integrating the college's former basic skills department into the disciplines, and replacing its former basic skills lab with the Student Success Centers.

Faculty lead the Student Success Centers and coordinate them with classroom instruction. The centers are often, but not always, discipline-specific. They include a Math Success Center, a Writing Success Center, a Language Success Center, and others. The centers provide supplemental instruction and directed learning activities (which combine independent exercises with follow-up tutoring) connected with academic or career technical courses, as well as drop-in assistance. (See Chaffey College, www1.chaffey.edu/success/index2.shtml.) The centers also coordinate with other services. For example, the college's Extended Opportunity Programs and Services (EOPS) conduct academic support within the success centers. (EOPS includes academic tutoring, financial support, and other services for students who are educationally or socioeconomically disadvantaged.)

Institutional research conducted by the college has found that students who use the centers are "more likely to successfully complete a course than students who were enrolled in the same section and did not access a success center," and that utilization of the centers has the "largest impact on the success rates of first-time college students" (Chaffey College Office of Institutional Research, 2009b, pg. 8). Other research that followed students during three years found that students who "enrolled in at least one course with a [success center] requirement" in their first term (Fall 2006) were more likely than students who did not take such a course to:

- Enroll in a course with a success center requirement in the following two semesters;
- Use a success center in connection with a course *not* requiring that students do so in their first and next two semesters;
- Persist to the following Fall semester; and
- Earn a certificate, degree, or transfer by the end of Spring 2009 (Chaffey College Office of Institutional Research, 2009a, pp. 1–2).

Contextualization—The role of student interest and identity

Contextualized teaching and learning involves connecting developmental learning with its *application* and *relevance* in academic or occupational contexts. The idea is that students should encounter foundational skills within the context of a practice that is meaningful on its own terms, with a clearer view of why these skills are important and who students might become by using them. To this end, instructors "[model] the skills necessary to complete a task [and also help] students articulate the thinking that accompanies the completion of the task" (Center for Student Success, 2009, pg. 8).

This contextualized approach contains an implicit critique of how writing, reading, and mathematics are frequently taught within remedial sequences. Grubb and Associates (1999) argue, for example, that remedial sequences and instruction frequently break student literacy and numeracy into small, discrete skills to be remediated separately and *prior to* learning the content or practice of a field. For example, a writing sequence may start at the lowest level with sentences, followed by paragraphs, then short essays, then eventually longer essays. Grubb calls this "skills and drills" or "part-to-whole" instruction (Grubb and Associates, 1999, pp. 28, 30). From a curricular perspective, some also say this style of organization recreates a K–12 experience that students are presumed to have missed or failed to understand previously (e.g., Epper and Baker, 2009, pg. 5).

The Integrated Basic Education and Skills Training (I-BEST) Program, a statewide program undertaken by the **Washington State Board for Community and Technical Colleges (SBCTC)**, is perhaps the most widely cited program nationally that integrates developmental instruction with career-technical learning. The program was designed in response to research showing that Adult Basic Education (ABE) and adult ESL students (25 years or older) who "took at least one year's worth of college-credit courses and earned a credential had an average annual earnings advantage," but that few met this "tipping point" (Prince and Jenkins, 2005, pg. 1).

Through I-BEST, adult literacy and career-technical instructors collaborate to provide ABE students with instruction in such areas as computer applications, early childhood education, and nursing. As described by a recent evaluation by Community College Research Center (CCRC), "[s]tudents receive college credit for the workforce portion of the program (though not for the basic skills instruction)" (Jenkins, Zeidenberg, and Kienzl, 2009, pg. 5). The state currently cites more than 140 I-BEST programs across all 34 colleges in the Washington system (Washington SBCTC, 2009) and makes clear the priority of these courses by funding them at a higher per-FTE rate than traditional ABE courses.[8]

The CCRC evaluation shows that I-BEST enrollees appear more likely than other ABE students to pursue credit-bearing coursework and earn awards such as certificates. However, it also notes that I-BEST may be less suited to adult students with the lowest incoming skills. To this point, the Washington State Board (Washington SBCTC, 2005) found during early piloting of I-BEST ESL programs that students with the lowest levels of English proficiency were generally not selected for I-BEST because the programs require reading and interpreting "simple charts" and "graphs and labels," as well as "easily understanding learned phrases and new phrases containing familiar vocabulary" (Washington SBCTC, 2005, pg. 5).

A recent literature review of contextualized approaches by the Center for Student Success documents a small number of California programs with an occupational focus (see Center for Student Success, 2009, pg. 20). One of these—a noncredit program focused on providing students

[8] Unlike in California, where responsibility for adult basic education rests with community colleges *or* the K–12 sector depending on local agreement (e.g., California Budget Project, 2009), all community colleges in Washington State provide such instruction.

with pathways into the utilities and construction trades—is part of a wider network of state-supported Career Advancement Academies, assisted by the Career Ladders Project. These academies are commonly organized in the form of learning communities that position basic skills instruction within a career-technical pathway of regional importance. Three Career Advancement Academy programs currently operate in the East Bay, Central Valley, and Los Angeles, respectively. Each involves partnerships between one or more community college districts, multiple colleges, adult schools, and other local agencies (e.g., chambers of commerce and workforce investment boards). (For more information, see the Career Ladders Project, www.careerladdersproject.org/projects/career.php.)

Because responsibility for adult basic and secondary education in California is split between the K–12 and community college sectors (e.g., California Budget Project, 2009), not all community colleges in the state offer noncredit developmental instruction. Course offerings that explicitly integrate *credit* developmental instruction into an occupational context appear to be relatively uncommon in California. Wiseley (2009) surveyed chief instructional officers, administrators of occupational education programs, and Perkins project directors about any such credit courses offered in 2006–07, such as integrated or "linked" courses, and verified these by examining course outlines and materials. Among 35 colleges that responded, "only 11 courses of sufficient length and content" could be verified (Wiseley, 2009, pg. 69). These included 10 integrated or "hybrid" mathematics courses, and one linked writing course (Wiseley, 2009, pg. 68).

Contextualized developmental instruction need not have a specifically occupational focus, however. Again, the Center for Student Success (2009) provides some examples, such as the Academy for College Excellence (ACE, formerly the Digital Bridge Academy) at **Cabrillo College**. The program is intended to enable at-risk students to succeed in college-level studies. Student cohorts enroll full-time in learning communities, beginning with a two-week Foundation Course. In this course, students—large proportions of whom entered community college without a high school diploma or graduated from continuation high schools—"reevaluate their past educational experiences and think critically about what they want from their community college education" (Navarro, 2008, pg. 6).

Student cohorts then take six linked academic courses. Teams conduct primary research projects as they might do in college-level courses, such as projects on social justice–related topics of interest to them, which in turn provide context for literacy and mathematics learning (such as through analyzing data). The process of conducting research and presenting findings publicly, and explicit reflection on the relation of behavior (e.g., attending class) to academic success (see Navarro, 2008, pg. 7), are intended to help students see themselves as academically knowledgeable individuals who can act to meet their goals.

The ACE program recently received $3.6 million in grant funding from the Bill & Melinda Gates Foundation and the William and Flora Hewlett Foundation. According to the press release, "[t]he grants will fund the program's expansion to three additional California community colleges and one out-of-state community college" (Academy for College Excellence, 2010). The ACE program is discussed further in this next section.

Different approaches to the remedial sequence

Students' chances of completing any kind of credential or transfer decrease as their "starting level" in a remedial sequence moves lower. Considered longitudinally, remedial sequences provide students with "many opportunities to exit" (Bailey, Jeong, and Cho, 2008, pg. 10). This has prompted some educators to think differently about the structure and goals of their remedial sequences.

Acceleration

Acceleration is one approach to thinking differently about remedial sequencing. The approach can take a number of different forms.

The English sequence at **Chabot College** in Hayward is one California example. Developed more than a decade ago, the sequence resulted from a reorganization of English instruction at the college, including the integration of writing and reading within the sequence. In its current form, students who assess as not ready for English 1A (called "Critical Thinking and Composition") may choose from two paths, both of which integrate writing and reading:

- A two-semester "Reading, Reasoning and Writing" sequence (English 101A and 101B), with each course offering 3 hours of lecture and 2 hours of individualized instruction.
- A one-semester, accelerated version of "Reading, Reasoning and Writing" (English 102).

Both paths are shorter than many English sequences encountered by community college students in California, but the English 102 path potentially enables students to enter English 1A as early as their second term. Both paths also share the common premise that students should practice, with support, the literacy tasks expected in transfer-level courses (an assumption shared by the Cabrillo College ACE program). Students read book-length works that serve as spurs to discussion and writing, for example.

Analyses of student progress conducted with the college's institutional research office (Hern, Arnold, and Samra, 2009) show that:

- Students with a range of incoming ACCUPLACER scores take each pathway, with most students appearing to be more likely to pass English 102 than English 101A.
- Students *who subsequently enroll in transfer-level English 1A* are equally as likely to pass the course regardless of whether they entered via the one-semester or two-semester path. In other words, the paths appear to provide equally effective preparation, on average.
- *However*, students taking the one-semester path are *nearly twice as likely to actually enroll* in English 1A. This lower attrition rate means that, in practice, developmental English students at Chabot are nearly twice as likely to make it through English 1A if they take the one-semester path rather than the two-semester path.

Another approach to acceleration is to allow students who assess just below the college level to enroll directly in college-level courses with additional instructional support. For example, Bailey argues that "the distinction between developmental and nondevelopmental students is arbitrary—the dichotomous categorization does not match the underlying continuity" (Bailey, 2009, pg. 23). Although some students clearly enter community college unprepared to succeed "even in augmented college-level courses" (pg. 26), the fact that a student scores slightly above or slightly below the college-level cut score on an assessment need not justify an entirely different entry point into the curriculum, especially if a different entry point makes attrition more likely.

The **Community College of Baltimore County** (CCBC) in Maryland has undertaken this approach though its Accelerated Learning Project (ALP). Prior to the project, students assessed at one level below the college level were directed to Basic Writing II (ENGL 052). But faculty discovered that two-thirds of students who began at this level never passed College Composition (ENGL 101), just one level higher, with most never even enrolling in the course (see CCBC, faculty.ccbcmd.edu/~padams/ALP/Site Folder/theproblem.html).

Students assessing at this level can now enroll directly in ENGL 101, in conjunction with a new version of ENGL 052 in support. The main course is configured such that eight students assessed at the ENGL 052 level join 12 students assessed at the ENGL 101 level in a common section of College Composition. These eight students and the instructor then stay together for the support course, immediately following, to address questions, work on essays, and draft "short papers that reinforce what has been discussed in the 101 class or prepare for what will be discussed in the 101 class" (see CCBC, faculty.ccbcmd.edu/~padams/ALP/Site Folder/alpdescription.html).

Results to date suggest that participating students are roughly twice as likely to pass College Composition as they would have been under the former approach, while doing so more rapidly. CCRC will evaluate the program's academic effects as part of the national Achieving the Dream Initiative.

Modularization

Modularization is a different approach to the remedial sequence that challenges the assumption that full, semester-length courses should be the default unit of remediation. Students do not necessarily arrive at community college with skill needs that fit neatly into pre-defined "levels." A student may need additional preparation with respect to some skills and concepts but not others. Modularization means breaking courses or entire sequences into "modules" that students pursue at their own pace, in order to focus their time on skills and concepts for which they need more preparation and exit the remedial sequence more quickly.

The Tennessee Developmental Studies Redesign Initiative, undertaken by the **Tennessee Board of Regents** and the **Education Commission of the States**, provides examples of modularization. **Jackson State Community College** (JSCC), for instance, has reorganized its formerly three-level mathematics sequence—Basic Math, Elementary Algebra, and Intermediate Algebra—into a single suite of nine modules. Which modules JSCC students must master depends both on their preparation and the program of study they intend to pursue. Students fulfill an "individualized learning contract" by mastering "only the concept deficiencies determined by a pre-test and those that are relevant to their career goals." One implication is that students might exit developmental mathematics through different routes, not necessarily by completing an Intermediate Algebra course (see JSCC, www.thencat.org/States/TN/Abstracts/JSCC Algebra_Abstract.htm).

Changes to sequence structure raise policy considerations

The examples above make clear that traditional remedial sequences are not the only way to structure developmental education. But changes to these structures, or in how students access them, require careful consideration of how new approaches fit into existing local and state policies.

For example, students enrolled in the first several cohorts of the **Cabrillo College** Academy for College Excellence (formerly the Digital Bridge Academy), took English 100 (Elements of Writing). This is the degree-applicable course located one level below transfer-level English 1A (College Composition). These students entered the program with a range of assessment recommendations, however, including recommendations below English 100. This meant some students would "'skip' a course in the developmental sequence," bypassing an established prerequisite (Badway, 2005, pg. 27).

Administrative concern arose at the college that placing a student into "a course that is more advanced than that indicated by the assessment/placement process" ran afoul of state regulations (Jenkins, Zeidenberg, et al., pg. 2). As noted early in this report, colleges may not use the assessment process to exclude a student "from any particular course or educational program, except that districts may establish appropriate prerequisites" (§55521a5). A 1997 document developed through consultation to help colleges understand how to act in accordance with these regulations—*Prerequisites, Corequisites, Advisories, and Limitation on Enrollment* (CCCCO, 1997)—makes clear the practical implications:

> "CAN A STAFF OR FACULTY MEMBER 'WAIVE' AN ENROLLMENT REQUIREMENT FOR A STUDENT WHO WISHES TO ENROLL IN A COURSE THAT HAS AN ESTABLISHED PREREQUISITE?
>
> "No. Once a prerequisite has been legally established and adopted for a course, all students wishing to enroll in that course must be required to meet the prerequisite, and this requirement must be applied consistently" (CCCCO, 1997, pg. 4).

Beginning in Spring 2005, the English 100 component of the ACE program was replaced with a reading lab (later a literacy skills course) that was not articulated with the established sequence. One result was that students "lost one semester of English progression" (see Academy for College Excellence, cbacademy.squarespace.com/why-ace/).

However, CCRC's subsequent evaluation of the Academy showed that, other things being equal, students who pursued the initial "accelerated" model did better. They had been significantly more likely than students in the nonaccelerated model and students in a comparison group to pass English 100, pass English 1A within two years, and earn degree-applicable and transferable course credits (Jenkins, Zeidenberg, et al., 2009). These results raise questions about how the structure of students' developmental experiences relate with educational outcomes. The results have also spurred further revision to the English component of the ACE program: in Spring 2010, English 100 is a component of some learning communities, while others include English 255, located two levels below transfer (Cabrillo College, 2010, pp. 41, 54, 56).

Educators must also consider the transfer role of the community colleges when evaluating the structure of remedial sequences. Intermediate Algebra is anchored as the final step in the remedial mathematics sequence, in part, because subsequent transfer-level math courses must have "an explicit intermediate algebra prerequisite" to meet CSU's quantitative reasoning distribution requirement (CSU Office of the Chancellor, Executive Order Number 1033, pg. 7).

Some in the state, including the ACE program and the Carnegie Foundation for the Advancement of Teaching, are considering approaches to developmental mathematics that place stronger focus on statistical reasoning, however. The underlying question is whether the academic goals of all students are best served by Intermediate Algebra—a question also posed by the approach to developmental mathematics undertaken by **Jackson State Community College** in Tennessee, described above. Similar questions arise in K–12 about whether the "a–g" requirements for four-year university eligibility (which include Algebra II) should be required for all students, with vigorous argument on either side.

Going forward: National momentum, state policies, and new initiatives

Community colleges in general, and developmental education specifically, are occupying an increasingly prominent role in the national conversation about postsecondary success. This attention has in part been generated through the efforts of private grant makers—most notably the Bill & Melinda Gates Foundation and the Lumina Foundation, but including others such as Carnegie Corporation of New York, the Ford Foundation, and the W.K. Kellogg Foundation.

In July 2009, President Barack Obama signaled that community colleges had also officially arrived on the federal government's higher education reform agenda by introducing the American Graduation Initiative (AGI). The House of Representatives subsequently included the AGI in HR 3221. The $10 billion proposal articulated several goals for "transforming America's community colleges for the 21st century" (Goldrick-Rab, 2009). Among the goals were stimulating innovative policies and practices to improve the quality of the community college experience and tracking and measuring student and institutional progress through the development of new data systems. The measure was subsumed into health care reform legislation, however, with many aspects eliminated from consideration.

National momentum for change has not stopped, however, thanks in large part to the private foundation efforts. For example, in April 2010, the Gates Foundation announced its commitment to provide up to $110 million to help research and bring to scale innovative developmental education programs that accelerate students' progress (Bill & Melinda Gates Foundation, 2010). In addition, six national organizations have signed on to a "Call to Action" intended to promote changes that will produce 50% more students with high-quality degrees and certificates by 2020. (See the box on the next page.)

State policy changes are one focus for national foundations

Over time, the foundations interested in community college issues have supported various research and advocacy organizations and initiatives. Among these, Jobs for the Future (JFF) stands out for its longevity, having been in operation since 1983; for its contributions in the areas of education reform and workforce development; and for various community college initiatives with which it is identified.

A substantial focus of JFF's current work is policy change at the state level related specifically to developmental education. JFF has worked with other organizations to advance specific recommendations for state policy levers. Many of these are closely aligned with the Obama Administration's proposed initiatives related to community colleges. For example, a discussion convened in October 2009 by Complete College America resulted in some specific state policy recommendations intended to further goals for "revamping developmental education" (Jobs for the Future and Complete College America, 2009, pg. 1). Those goals included increasing completion rates, shortening time to degree/credential, and defining and supporting more effective and efficient pathways to credit-bearing classes and degrees/credentials.

This and a variety of other national initiatives have identified several areas where state policies can play a key role in achieving those goals. Perhaps most visible is the Achieving the Dream initiative, whose 15 participating states have concentrated their policy efforts in specific areas, according to JFF program director Michael Lawrence Collins (Collins, 2009). Those areas include:

- Reducing the need for developmental education.
- Thinking out assessment and placement policies carefully.

- Making sure policies foster program innovations and their evaluation.
- Developing goals for developmental education, measuring performance appropriately, and evaluating improvement.
- Creating incentives that drive institutions to focus on helping their students meet the goals.

Major national community college initiatives

Funding to support most of the efforts listed below has been provided by private foundations. The most active are the Bill & Melinda Gates Foundation and the Lumina Foundation, but support has come from a wide range of funders interested in college access, success, and workforce development.

- **Achieving the Dream: Community Colleges Count** is a national initiative begun in 2003 to help more community college students succeed. It acts on multiple fronts, including efforts at specific community colleges and in research, public engagement, and public policy. Achieving the Dream is funded by the Lumina Foundation and 18 partner foundations; its lead policy partner is Jobs for the Future.
- The **Developmental Education Initiative** is a new three-year Achieving the Dream project focusing on ways community colleges can leverage state policy to make developmental methods more effective. The initiative involves six state partners that have created state policy frameworks and strategies aimed at dramatically increasing the number of students who complete college preparatory work and move on to college.
- The **Committee on Measures of Student Success** is a group of experts appointed by U.S. Secretary of Education Arne Duncan. The group will "develop recommendations for two-year degree-granting institutions of higher education to comply with the law's graduation and completion rate disclosure requirements," as well as "regarding additional or alternate measures of student success that are comparable alternatives" (U.S. Department of Education, 2010).
- **Complete College America** was formally launched in 2010 with the express goal of increasing the nation's college completion rate through state policy change. The group said it will begin its work with an alliance of 17 states.
- The **Call to Action** is a compact aimed at promoting changes that will produce 50% more students with high-quality degrees and certificates by 2020. The six national organizations co-signing the compact are the American Association of Community Colleges (AACC), the Association of Community College Trustees (ACCT), the Center for Community College Student Engagement, League for Innovation in the Community College, the National Institute for Staff and Organizational Development (NISOD), and the Phi Theta Kappa Honor Society.
- The **Voluntary Framework of Accountability** is a joint effort of AACC, ACCT, and the College Board. The goal of this voluntary system, according to AACC, is to measure outcomes and processes specific to community colleges and "provide opportunities for colleges to benchmark their student progress and completion data against peers and to provide stakeholders with critical information on the colleges" (AACC, 2010).

Creating goals for developmental education and measuring improvement appropriately depend on having good data

Among the most basic measures of community college student and institutional performance are those required by the federal government and included in the Integrated Postsecondary Education System (IPEDS), such as the extent to which students attain associate degrees within three years. These metrics have been criticized as inadequately responsive to the real needs of community colleges and their students, however (e.g., Offenstein and Shulock, 2009). These basic measures do not provide the kind of actionable insights into student outcomes in developmental education that are currently being discussed nationally and in California.

"The first step toward improving performance outcomes in developmental education is to get a firm handle on current student and institutional performance," argues Collins (2009, pg. 17). He adds that the states involved in the Achieving the Dream initiative have focused on some key steps involved in doing so. One is to gather data that clarify the need for developmental education and illuminate how this need varies among different groups of students depending on their age, ethnicity, and full-time and part-time status. This is particularly important given the diverse student bodies that community colleges serve.

The Achieving the Dream initiative has undertaken efforts to identify and test additional performance measures of students' progress through community college. These resonate with many of the variables used in the remedial course-taking analysis conducted for this report. They include:

- Pass rates for developmental courses.
- Completion of a remedial course sequence.
- Enrollment in/completion of first college-level math and English courses.
- Continuous enrollment in the community college system (not just at one campus).

In addition, a new national initiative, the Voluntary Framework for Accountability, is working toward developing some recommended measures that campuses could adopt. Headed by AACC, the initiative's goal is to create a set of measures that can be used by all community colleges and are easy for the public to understand. As summarized by *Inside Higher Ed*, the measures being considered include:

- "College readiness, focused on how students arrive at a community college and how they become able to reach the college level."
- "Success in completing college-level courses."
- "'[C]redit accumulation milestones,' such as earning 15 or 30 credits of college-level work."
- "Completion of degrees or certificate programs."
- "'Overall success indicators' focused on whether individuals achieve whatever their purpose was in enrolling" (Jaschik, 2010).

Offenstein, Moore, and Shulock (2010) recently proposed potential "milestone" measures and "on-track indicators" that community college leaders could use to identify particular barriers to student success in their institutions, and provide early warning signs that students are falling off-track. The present study suggests additional indicators that could also be useful, such as whether a student passes his or her first remedial course in a subject, or delays a second, more advanced course by more than one semester.

CB-21: Improving the measurement of developmental education outcomes in California

The Budget Act of 2007 (Assembly Bill 194) required the Chancellor's Office and others to develop basic skills accountability measures, resulting in the state's first *Basic Skills Accountability Report* (CCCCO, 2009), released in Fall 2009. The report provided "student progress metrics" that tracked a first-time freshmen cohort over eight years, with students sorted by the *lowest level* of remedial course a student took. It looked at three outcomes for these students: completion of a degree-applicable but nontransferable course; completion of a transfer-level course; and transfer, completion of a degree/certificate, and/or becoming transfer-prepared.

Some of the results reported were clearly implausible, however, illustrating the challenges involved in developing accurate data. (See Figure 16.) The data purport that students beginning *four or more levels below* the transfer level in mathematics were *more* successful in completing transfer-level math courses and completing degrees or transfer than students who began at higher levels in the developmental sequence. The descriptive statistics offered in this study—see Appendix Five—show clearly that this is not the case: only 8% of first-time students who began at the Arithmetic level in this study's Fall 2002 cohort completed a college-level mathematics course within seven years.

Figure 16: **Outcomes reported for students beginning at the lowest levels of remedial mathematics in the inaugural *Basic Skills Accountability Report* are implausible (First-time freshmen, 2000–01 to 2007–08)**

Level(s) below transfer (credit)	**Number of first-time freshman students** in cohort	Percentage who **completed transfer-level mathematics courses**	Percentage who **transferred, completed a degree/certificate, and/or became transfer-prepared**
1 Level Below	1,474	16.4%	32.8%
2 Levels Below	5,050	15.1%	28.3%
3 Levels Below	41,518	12.3%	27.6%
4+ Levels Below	**32,391**	**21.1%**	**35.6%**

Data: CCCCO, *Basic Skills Accountability Report* (2009), Table D1 EdSource 6/10

This weakness in the data reflects the inconsistency with which colleges coded the course "levels" of their remedial sequences historically using the CB-21 data element. To address this problem, hundreds of disciplinary faculty, the Academic Senate, and the CCCCO undertook a process to "improve, update and correct [the CB-21] coding used to track and report student progress through basic skills" (ASCCC and CCCCO, 2010). The result is a series of rubrics that provides a common framework for coding the "level" of remedial courses, defined in terms of levels *below the transfer level*. The rubrics related to credit courses define four levels below the transfer level in writing (English), reading, and mathematics, with each level defined according to its general learning outcomes, or exit skills.

The implications for accountability reporting could be profound. The new rubrics will enable more meaningful statewide data on student progress through the sequences, even when students change colleges. For example, four levels below transfer in mathematics will reliably signify Arithmetic instruction. The rubrics also provide a foundation for more effectively articulating high school courses and noncredit adult basic education courses with credit instruction. Colleges whose research offices were not already tracking student progress through these sequences will

be better able to identify problems, such as attrition between levels.

What the CB-21 rubrics could mean for colleges' existing remedial sequences is less clear, particularly because these sequences vary in the number of levels they offer; some colleges may need to code more than one step in a sequence at a given CB-21 level. Some express concern that the rubrics could reinforce course sequences and structures that are ineffective. But others who agree that colleges should try new approaches view the rubrics as a tool for starting conversations about how local remedial sequences are organized and whether they provide students with efficient pathways to higher-level coursework.

Assessing the need for developmental education is particularly problematic in California

The data included in the *Basic Skills Accountability Report* (CCCCO, 2009) also reflect the historical disconnect between K–12 and community college data in California. For example, although the report provides statewide and college-level data on basic skills enrollments for students who are 19 years old or younger, it does not provide clear insight into how often California high school graduates enter community college needing developmental education. Many pressing policy questions remain unanswered, such as:

- To what extent does the preparation of California high school students vary based on their ethnicity and/or other characteristics, including English learner status and socioeconomic status?
- To what extent does lack of college readiness reflect poor high school achievement on the part of the student, versus a mismatch between what high schools are teaching and what community colleges expect?

In Florida and a few other states, educators and policymakers have data systems that allow them to follow students through the K–12 system, into postsecondary education, and ultimately into the workforce. That can provide rich information for better understanding how students progress through each step in the educational continuum and how the systems fit together, and for evaluating the extent to which various programs and innovations affect that progress.

Currently, California appears to be a long way from even having a statewide K–16 data system in place, much less being able to use it to evaluate the need for and success of developmental education programs at the broadest level. That said, many state policymakers have at least embraced the goal. Legislation passed early in 2010 as part of California's effort to apply for federal Race to the Top (RTT) grants included an expression of legislative intent. California's lack of success in that grant competition, combined with its financial woes, pose complications, however. California was also recently passed over for Institute of Education Sciences (IES) grant funds, provided through the American Recovery and Reinvestment Act (ARRA), intended to support 20 winning states in developing longitudinal data systems linking early childhood through the workforce.

Local community colleges do have some ability to evaluate their *own* students in relation to local high schools, however, thanks in no small part to the California Partnership for Achieving Student Success (Cal-PASS), a locally driven initiative that has received some state funding. About a decade old, Cal-PASS is a voluntary effort organized around local and regional memoranda of understanding (MOUs) among consortia of K–12 school districts, community college districts, and state universities. It provides participating faculty and teachers with longitudinal data tools for inquiring into barriers faced by local students as they transition between institutions, so that educators might consider new approaches. Because the sharing of data among these institutions is governed by regional MOUs, however, the information generated is primarily used locally and, by its very nature, does not provide a systemwide perspective. (For further discussion, see EdSource, 2008.)

At the statewide level, setting goals for the readiness of students coming out of high school is complicated by a lack of clarity in policy about what students should know and be able to do at the end of high school, and for which postsecondary paths. Again, mathematics provides the clearest example.

- California set Algebra I content as the minimum preferred standard for what is taught in eighth grade, an internationally competitive objective (see EdSource, 2009). By 2008, the state had the highest percentage of eighth graders taking Algebra I in the nation (Moore and Shulock, 2009, pg. 2).
- But Algebra I is also California's *de facto* minimum high school *exit* expectation in mathematics. Algebra I is the highest mathematics *course* the state requires for a high school diploma, and provides the most demanding mathematics *content* on the California High School Exit Exam (CAHSEE).
- At the same time, California's predominant college-readiness benchmark is the minimum course-taking requirements (the "a–g") that students must meet to be eligible for admission to the University of California (UC) or California State University (CSU). This typically means completing Algebra I, Geometry, *and* Algebra II before entering college.
- The community college system shares this expectation with respect to its *transfer* function, with Intermediate Algebra (i.e., Algebra II) being the last step in the remedial mathematics sequence. As noted earlier, CSU requires that transfer-level math courses must have "an explicit intermediate algebra prerequisite" to meet the system's quantitative reasoning distribution requirement (CSU Office of the Chancellor, Executive Order Number 1033, pg. 7).
- That said, relative to the *credentialing* function of the community colleges, Intermediate Algebra is considered college-level for the purpose of earning an associate degree.

The upshot is that the California Community Colleges open their doors to a wide variety of students who have successfully met none, one, some, or all of a variety of expectations. Students do not necessarily understand that their high school preparation could land them in remedial instead of college-level courses, depending on their goals.

Movement toward common assessments continues

In addition to ambiguous exit expectations for what students should know and be able to do when they leave high school, the diversity of assessment practices among the California Community Colleges leaves the system's *entrance* expectations unclear. Pressure continues to increase for colleges to adopt a more uniform approach to the assessment of incoming students.

Common assessments would be consistent with federal goals and could be informed by experiences in other states

The federal legislation drafted as part of the administration's American Graduation Initiative (AGI) encouraged states to develop common standards for assessing students' developmental education needs (Pusser and Levin, 2009, pg. 3). State strategies consistent with these goals would address not only the assessments used, but also placement policies, intake processes, and the integration of placement test data into state data systems.

Participants in the Complete College America discussion of the topic also favored standardizing assessment policies and practices across systems, citing the "benefits of increasing student mobility, developing common metrics of success, and encouraging dialogue among faculty on desired learning outcomes" (Jobs for the Future and Complete College America, 2009, pg. 2).

Another benefit of standardizing assessments, proponents nationally argue, is that it sends a clear

signal to the K–12 system about college-ready expectations. A range of California stakeholders have also raised this point (RP Group, 2004; Shulock and Moore, 2007; Legislative Analyst's Office, 2008). And one of the more troubling findings of the Stanford Bridge Project was the common misperception among high school students that "community colleges don't have academic standards" (Venezia, Kirst, and Antonio, 2003, pg. 31).

Standardization of assessments and policies across multiple colleges is far from straightforward, however. Experiences from Virginia, Connecticut, and North Carolina—all states participating in the Achieving the Dream initiative—reveal the complexities that can accompany such a re-examination. Each state found that implementing a statewide approach to assessment and placement policy leads to far-reaching questions about curriculum and instruction, counseling, budgeting, and the broad goals of community colleges. Collins (2008) discusses the experiences of the three states as they set out to consider common, systemwide cut scores for student placement.

- In **Virginia**, a statewide discussion that initially focused on how to establish common cut scores led to the discovery of wide variation in the placement processes employed by different colleges in the system. The state then acted to first establish comparable placement practices among the colleges because, in the words of the system's vice chancellor for academic services and research, "[W]e had so many differences in the way our colleges managed the procedures of placement that it's very difficult to compare numbers across colleges" (quoted in Collins, 2008, pg. 7).
- The community college system in **Connecticut** also moved toward common cut scores, driven in part by concern about a lack of comparable data across the system and the friction this caused with the state's four-year colleges. The faculty-led process illuminated a need for better alignment between developmental and gatekeeper courses in English and mathematics. According to the system's chief academic officer, the new policy promised big implications for staffing, professional development, and counseling because, according to projections, "some colleges would need to add up to 10 additional sections of developmental education" (quoted in Collins, 2008, pg. 9).
- The example of **North Carolina**, as related by Collins, shows that deliberations about common assessments and how to set cut scores are also closely related to the goals of community colleges in supporting both access to higher education and standards for college-level instruction. As the former chair of the state's placement committee describes, "looking at what the data said . . . if any of the scores could be lower and we could keep the same . . . probability of success with students, then we saw no reason not to lower the score" (quoted in Collins, 2008, pg. 11).

Similar questions, such as about variations in matriculation practice, would likely be raised in California if the system moved toward common assessments. As noted earlier, much smaller proportions of first-time freshmen who enroll for credit receive orientation, counseling, or follow-up services than receive assessment; and not all nonexempt students are assessed. Matriculation service rates reported by colleges vary widely (CCCCO, 2009). And state funds for matriculation services were cut by nearly 52% in the state budget passed in July 2009. These categorical funds were also granted "flexibility" through 2012–13, so that district boards could elect to use them for alternative purposes.

California could learn a great deal from better assessment data

Without question, the ability to collect statewide data on assessment results would enable California's community colleges to make more sophisticated inquiries into important questions about student success in remedial course sequences that cannot currently be addressed.

For example, the statewide data on placement recommendations in California is currently limited to campus surveys conducted for the *Basic Skills Accountability Report* (CCCCO, 2009). By contrast, a recent study of student outcomes in reaching gatekeeper courses in English and mathematics in the **Virginia Community College System** (Roksa, Jenkins, et al., 2009) was able to consider the placement recommendations for individual students. The researchers learned that 39% of Virginia community college students who were referred to a developmental mathematics course did not enroll in one. The corresponding rates in writing and reading were 35% and 41%, respectively. Moreover, the researchers found that—in both English and mathematics—students who were recommended for developmental coursework were similarly likely to take and pass gatekeeper courses *regardless of whether they actually enrolled in the prior developmental courses to which they had been referred*.

These findings raise interesting questions that the Virginia system can explore further regarding matriculation practices, the effectiveness of developmental instruction, and whether alternative strategies may be enabling some students to succeed in gatekeeper coursework even though their assessment results indicate a lower likelihood of doing so (Roksa, Jenkins, et al., 2009). Similar statewide analyses cannot be conducted in California.

Common assessments are increasingly discussed and remain a possibility

In January 2008, the Board of Governors accepted a report from the Consultation Council Task Force on Assessment pertaining to common assessments for the California Community Colleges. The report described resistance to the idea, noting that "local determination of what best supports student success is a deeply ingrained concept" within the system (Consultation Council Task Force on Assessment, 2008, pg. 7). As an alternative, the Task Force's report recommended exploiting existing uniformity in the use of a few commercial assessments to develop new tools for sharing and comparing assessment data.

The California Community College Assessment Association (CCCAA Test-Development Feasibility Taskforce, 2008) has also pursued the idea of new assessments that would be commonly available to colleges—in particular, instruments developed, owned, and managed by the system. This work has been informed, in part, by dissatisfaction with current commercial assessments. The new assessments could reduce expenditures for commercial licenses and the scoring of writing samples, and improve colleges' abilities to measure lower-level skills in English and ESL, according to CCCAA.

A current proposal originating in the Chancellor's Office—the Online Common Assessment Project, or CCCAssess—would provide colleges with incentives for using common assessments, taking advantage of a difficult fiscal climate for colleges. Grant funding from the William and Flora Hewlett Foundation and the Bill & Melinda Gates Foundation supports exploration of the technical feasibility of the concept. Legislation directing the Board of Governors to pursue a feasibility study and pilot project (Assembly Bill 2682) was introduced in February 2010. (The bill passed the Assembly and was referred to the Senate in June 2010.)

The vision is that CCCAssess would provide centralized delivery of common assessments and be a repository or data warehouse for assessment scores, which are currently not collected at the system level. This centralized approach would make it possible for the system to purchase licenses for assessments in mathematics, writing, and reading, with colleges able to administer as many assessments as needed for free.

Under the concept, colleges would retain the right to administer other, locally selected assessments but would bear the cost of doing so, creating a financial incentive for using the common assessments. The proposed system would also enable students to take practice tests. To the extent this incentive proved compelling for colleges, students would encounter the same assessments regardless of the colleges in which they enroll.

Disciplinary subcommittees of the Academic Senate will review potential tests for common use during the next year. The feasibility study will be presented to the BOG in February 2011, with a pilot to follow. The full vision for the data warehouse also calls for it to include information on students' achievement in K–12, such as transcripts and scores on the California Standards Tests, Early Assessment Program (see the box on the next page), and the CAHSEE. These would be available for counselors to use as "multiple measures" during the assessment process.

Policies to support institutional innovation

For the most part, the national conversation does not question *whether* changes in practice related to developmental education are needed. Instead, it focuses on *how* to support institutional innovation and improve student outcomes, particularly the outcomes of students who start three or more levels below the college level.

In the context of President Obama's goals related to college completion, the National Center for Higher Education Management Systems (NCHEMS) published recommendations regarding potential policy changes in California, funded by the Hewlett Foundation (Jones and Ewell, 2009). The authors criticize the approach to developmental education undertaken at most colleges, which they say consists of a remedial course sequence staffed with untrained adjunct faculty to which additional services sometimes get added.

Calling this approach both ineffective and expensive, Jones and Ewell call for "a completely reformed base model, not an ineffective base model with compensatory add-ons" (Jones and Ewell, 2009, pg. 12). Such a model, they argue, would:

- Be based on fine-grained assessments of students' developmental needs;
- Consist of modularized instructional units;
- Be designed for statewide application;
- Be contextualized for students as far as possible;
- Use technology to a greater degree than is currently typical;
- Have a "high touch" component in the form of coaches and mentors.

Jones and Ewell also point to exemplars such as California's Career Advancement Academies, the I-BEST program in Washington State, and the JFF Breaking Through project.

From a national perspective, Collins (2009) cites a similar list of institutional innovations and makes general recommendations regarding state policies that would support those. The list includes:

- Accelerated developmental education featuring "self-paced, computer-based instruction."
- Supplemental instruction to support "students who test close to the placement test cut score to matriculate in college-level courses" successfully.
- Contextualized programs that link developmental instruction "more tightly to students' personal, educational, and workforce-related goals."
- First-year experiences that provide academic and student services in support of college-level course completion (Collins, 2009, pg. 13).

The Early Assessment Program (EAP)

The California Community Colleges are becoming more involved with the state's longstanding Early Assessment Program (EAP), developed initially by California Department of Education, the State Board of Education, and the California State University (CSU). Offered for the first time in spring 2004, the EAP enabled CSU to provide high school students with early feedback—during the summer before their senior year—about their preparedness for college-level classes in English and math. By giving high school students one year to become better prepared if needed, EAP developers hoped to reduce the proportion of incoming CSU students who need remediation in these subjects.

The developers of the EAP found that CSU's placement expectations and the state's K–12 standards for English and mathematics were aligned, but that CSU's placement tests and the state's high school assessments—the California Standards Tests (CSTs)—did not always emphasize the same things. The solution was to give 11th graders the option to take expanded versions of CSTs in English and math. This decision avoided the need to develop yet another set of tests and standards to which students and teachers would need to respond.

- In 2009, 40% of high school juniors scored proficient or advanced on the regular Grade 11 CST in English Language Arts. However, among those juniors who elected to participate in the EAP in English by taking the augmented version of this CST, just 16% were considered "ready for college." These latter students qualified for exemption from placement testing in English upon enrollment at CSU.
- Only about half of high school juniors were eligible to take the EAP in mathematics in 2009, given that only students who have reached at least Algebra II by grade 11 may participate. Among those juniors who were both eligible and participated in the EAP, 13% were considered "ready for college" and thus qualified for exemption from placement testing in mathematics upon enrollment at CSU. Another 44% were "conditionally ready," meaning that their potential exemption from placement testing in mathematics was conditional on completing another, adequately rigorous mathematics course during their senior year.

As of April 8, 2010, 22 community colleges had agreed to accept some or all EAP results as a basis for exemption from placement testing in English and/or mathematics, and another 16 colleges were "under discussion" to begin doing so. And among these colleges, 21 had identified a local EAP coordinator to conduct outreach to local high school students in coordination with CSU. (See the CCCCO website for more information at www.cccco.edu.)

The goal is to send a clearer signal to high school students and educators that the California Community Colleges have the same academic standards for transfer-level courses as CSU, and to create new efficiencies in the matriculation process by exempting qualified students from placement testing. But community college leaders also acknowledge that they must think broadly about high school outreach—and that it should begin before grade 11—given the open-access mission of the colleges.

The roughly half of students who are not far enough along in their study of mathematics in grade 11 to be eligible for the EAP in that subject are potential community college students, for example. (For further discussion, see EdSource, 2008.) Many of these students will place into a remedial mathematics sequence if and when they arrive at community college. Helping these students well before they leave high school, so they can assess into *higher levels* of these sequences—and thus have a shorter path to college-level study with fewer opportunities for attrition—would be of great service to both colleges and students.

Data: California Department of Education, California State University, California Community Colleges Chancellor's Office

Funding policies can remove barriers and support new models

Related to state policy, the focus among participants in the Complete College America discussion (Jobs for the Future and Complete College America, 2009) was largely on ways for states to leverage their funding systems to support these types of innovations in developmental education and remove policies and regulations that penalize innovation or stand in its way. Collins (2009) goes further in highlighting policies in some Achieving the Dream states that support innovation. For example, he argues that states can do so in part by providing flexibility on funding and financial aid policies that use semester-based enrollment reporting.

California already has regulations that give districts guidance for claiming funding for a variety of course configurations, including open entry/exit courses, distance learning, and independent study. Regulatory changes in 2005–06 also specified that "supplemental learning assistance" would be funded whether it was in the form of a lab required of all students in a class or was targeted to just a subset of students in a course. Tutoring, under specified conditions, is also eligible for funding (CCCCO, 2006).

A major catalyst for innovation can also be the availability of additional resources for pilot programs. This kind of funding is important because of the effort that experimentation requires and because some models that provide extra supports for students are more expensive to operate. It is particularly important that the latter types of programs are well evaluated before they are taken to scale.

The push to innovate in the area of developmental education is often framed in the context of two overarching goals:

- Improving students' rates of successful course completion, and
- Compressing the amount of time required for developmental students to become college-ready.

Both of these goals would not only benefit students, but could also potentially reduce state expenditures on developmental education in the long run. Despite that, substantial financial support for innovation in California is unlikely to come from state sources in the near future. This constraint increases the leverage of private foundations and contributes to their ability to shape innovations based on their interests and beliefs. Colleges wanting to experiment with new approaches will likely look to the Gates Foundation's $110 million investment as a potential source of innovation funds, for example.

Often, consistent state-level data and benchmarks are integral to evaluating the success of innovative programs. They are also a key component of many foundation grants. California's challenges in this area mean that the scale-up potential of any new program concept could be compromised. This could make the state's innovators less likely to get private support for their efforts.

Can funding policy encourage success?

The national conversation on community college student success adds one further reform to the mix: providing incentives for results.

Jones and Ewell (2009) distinguish between incentives that provide funds to institutions that achieve a particular degree-production goal and incentives that provide a fixed amount per degree produced. They say that states have used both approaches, but that there is little evidence that pay-for-performance schemes have lived up to their perceived promise. This may be directly related, according to some analyses, to the low levels of funding included in such schemes, which typically affect 1% to 2% of allocations (Jones and Ewell, 2009, pg. 16–18).

One ongoing model is Washington State's Student Achievement Initiative, which provides extra funding to community colleges that improve their performance on specific student success measures. Started in 2008, the program has been partially funded by the Bill & Melinda Gates Foundation, with awards added to colleges' base budgets going forward. Campuses receive points for improvements in four benchmark areas:

- Progression toward college-level skills, including gains in basic skills and passing pre-collegiate courses in writing and mathematics;
- First-year retention;
- Completion of college-level mathematics courses that are required for a technical or academic degree;
- Completions, including degrees, certificates, and apprenticeship. (See Washington SBCTC, http://www.sbctc.edu/college/e_studentachievement.aspx; see also Washington SBCTC, 2007.)

In a critique of California's funding system for community colleges, Shulock and Moore (2007) urge state leaders to at least enter into a conversation about new funding ideas being explored nationally. They note that, "In many cases these new directions recognize the power of financial incentives to change behaviors and involved the targeted use of funds to encourage the desired outcomes" (Shulock and Moore, 2007, pg. 50). But they criticize traditional "performance funding" models as failing to recognize that "improving performance is an ongoing and costly undertaking and should be institutionalized into the basic funding formula so as to provide a stable and significant funding source" (Shulock and Moore, 2007, pg. 53).

Shulock and Moore propose various approaches to a new funding model, all of which begin with redefining the *workload* upon which FTES funding is based:

> "Workload is currently defined as 3rd week enrollment and colleges are funded to serve it. Alternatively, workload could be defined as teaching students for a full term, serving financially disadvantaged students, guiding students through basic skills, or producing certificates and degrees" (Shulock and Moore, 2007, pg. 54).

Such an approach, they contend, would be more consistent with state goals insofar as policymakers intend to *educate* students rather than merely enroll them.

This approach is beginning to influence debates about community college policy in California. Senate Bill 1143 (Liu), introduced in February 2010, initially proposed to redefine FTES as the average of course enrollment at the census date *and at completion*. At this writing, the bill calls for a task force to study and make recommendations regarding alternative funding options for promoting student success. Whether the bill will become law remains unclear.

Budget realities shape the immediate future in California

Although state policy has reinforced the importance of developmental education as a central component of the mission of the California Community Colleges, financial pressures in the face of the economic downturn may be undercutting local campuses' commitment to it.

As already noted, categorical funds for matriculation have been cut substantially and granted flexibility for other uses. Although basic skills categorical funds remained "protected" from other uses in the final version of the 2009–10 state budget, these funds were reduced from the previous $33.1 million to slightly more than $20 million. Further changes could be on the horizon for these funds: at this writing, state legislators are considering budget language that would require the Chancellor to explore performance-based funding options related to basic skills.

Regardless, there is clear concern about the extent to which colleges will place priority on improving basic skills education. Experiences this year underscore the concern. Faced with significant budget cuts to the system, California lawmakers included in the 2009–10 Budget Act a provision that lowered by 3.34% the number of students the community colleges were required to educate. This "workload reduction" was intended to enable the colleges to limit enrollments and reduce their course offerings, commensurate with cuts to their revenues. The Act also expressed "legislative intent that any necessary reductions in course sections, to the greatest extent possible, be achieved in areas other than basic skills, workforce training, and transfer" (CCCCO, 2010b, pg. 1).

The full impact of these budget challenges on developmental education is unclear at this time; but with the state facing another difficult year, workload reduction is likely to continue. The campuses face pressure from many different directions as they decide how to manage their course offerings. Some of that pressure reflects the decisions by the University of California and California State University systems to cut their own enrollments. That has created an increased demand for transfer courses at the community colleges. To the extent that transfer is perceived as the system's "higher purpose," colleges may act to protect those courses at the expense of their developmental offerings.

CCC Chancellor Jack Scott reported to the Legislature in March 2010 (CCCCO, 2010b) that he had encouraged colleges to protect basic skills, workforce training, and transfer courses in part by changing their approach to offering educational enrichment. Most community colleges in California provide a menu of classes that adults in the community can take for their own enrichment, to brush up their skills in a specific area or even, in the case of physical education courses, to socialize and stay fit. In many communities, the availability of these low-cost options expands the reach and political support campuses enjoy, even though they are not a central part of the state's vision for the community colleges. Scott encouraged the districts to "either stop offering non-core courses or to restructure such courses as community education courses in which the student pays the full cost of instruction" (CCCCO, 2010b, pg. 2). However, a survey that included 49 community college districts indicated that about 73% had made cuts proportionately across all disciplines rather than targeting changes in their community education courses (CCCCO, 2010a).

At a June press briefing, Scott reported that colleges had, in total, cut course sections by 6.3% but only reduced the overall number of students being educated by 0.2% in Fall 2009, compared with Fall 2008. First-time student enrollments were hardest hit, decreasing by 12% (CCCCO, 2010c, pg. 1). Previously, Scott had explained that campuses had increased class sizes and tapped reserves, such that the system was "currently educating 89,000 FTES (or 201,000 headcount students) beyond the levels funded in the state budget" (CCCCO, 2010b, pg. 3).

The conclusions and policy implications of this study

Current enrollment pressures, combined with financial constraints, have created something of a perfect storm for the California Community Colleges. That storm is testing their commitment to developmental education and their ability to strengthen the programs and services they provide to students who enter the colleges needing to improve their basic skills.

But the community colleges cannot afford to ignore the rising call, both in California and nationally, for greater success rates for their students. As long as open access remains a core operating principle for these public institutions, improving developmental education and increasing student success are goals that go hand in hand.

This study provides some insights into how students in California's community colleges have proceeded through remedial course sequences in writing and mathematics, which students take these courses, and the extent to which their starting levels and course-taking behaviors appear to be related to achievement of long-term academic goals. These findings have implications for college officials and state leaders as they consider ways they can continue to pursue both the access and success goals of the system.

Reducing the need for developmental education is a long-term goal

Data limitations make it impossible to say precisely how many of California's high school graduates enroll at community colleges needing to improve their basic skills. Nevertheless, it is clear that the numbers are quite high, creating a severe strain on the colleges and on the state's ability to maintain its support of their open-access mission.

California's state leaders ought to look seriously at every strategy for tackling the complex and long-term challenge of improving students' preparation for community college while they are still in high school. Current efforts to clarify academic expectations across the systems (such as the Early Assessment Program) and promote the use of common assessments are important first steps. It will be crucial to gather information about these changes, evaluate their effectiveness, and continue to improve their implementation in both the K–12 and community college systems.

Delays in remedial course-taking are entwined with other issues

In California, where community colleges have a high degree of local autonomy, some have urged that the state needs to set a uniform policy that immediate remediation (when needed) be mandatory across the system. The quantitative findings from this study are neither strong nor clear enough to support such a policy. Combined with the qualitative research, the findings do illuminate some reasons students delay remedial courses and indicate that those delays take a toll on students and the system, raising implications for local and state policy.

Based on the analysis, delaying a first remedial course appears to be more costly for students in writing than in mathematics. The regression analysis indicated that students who delayed their first writing course for only a year were less likely to complete the developmental sequence or college composition than those who did not delay. **Given limited time and resources, colleges might do well to focus first on encouraging students to enroll early in remedial courses in writing.** However, it is likely that this statewide pattern varies considerably among campuses. Deeper and more detailed research into local patterns would be an important precursor to the implementation of such a strategy on a given campus. Evaluating the impacts of any new strategies could help the system as a whole understand this finding and the conditions under which early remediation in writing is associated with better student outcomes.

In both mathematics and writing, students who delayed taking a second, more advanced course by more than one semester were less likely to attain college-level skill, even after controlling for

whether they passed their first course. **Campuses might examine their course schedules to determine ways they could encourage students to enroll in a given remedial sequence continuously, without interruption.** Are there simple changes that could encourage the start of remedial coursework in the fall? Or what programs or policies could provide better bridges from one academic year to the next during the summer months?

Most students in the cohort studied who enrolled in a remedial sequence began doing so during their first year. And overall, students who failed or withdrew from their first math or writing course were less likely to attempt a second, more advanced course in those subjects. **Supporting students' success during their first year, then, could be an important lever for keeping students on a path to completing remedial sequences.** Such support could involve more effective matriculation services on campuses, backed by appropriate state policies that encourage and enhance those local efforts.

Students who enter community college at the lowest levels face daunting odds

Black/African American and Hispanic students in the cohort studied were overrepresented at the lowest levels of the mathematics and writing sequences. The same was true for Asian students in writing. This, in turn, had consequences for these students' likelihood of completing a sequence successfully. In addition, when compared with white students in this study's regression analyses, African American students were more likely to delay their first remedial writing course, less likely to pass their first remedial math course, and less likely to complete a college-level course in either subject—even after controlling for socioeconomic status and other variables.

This raises important questions about student readiness coming from high school. And it raises questions about whether existing developmental approaches address incoming differences among student groups, what might be done differently, and where. For example, two-thirds of all African American community college students in California attend in just five counties: Alameda, Los Angeles, Riverside, Sacramento, and San Diego. This being the case, **a state-led focus on colleges that educate the majority of African American students could have great benefit.**

Innovations in developmental education need to be implemented and evaluated

The analyses also indicate that students' abilities to achieve their long-term goals are clearly associated with their starting levels. When compared with students who began at the highest level of a remedial sequence in this study's regression analyses, students who entered a remedial sequence at lower levels were more likely to pass their first remedial math course, more likely to attempt a more advanced course in math and/or writing, and less likely to delay that second course. And yet these students remain much less likely to complete the remedial sequence or a college-level course in either subject.

Many researchers, in California and nationally, believe that innovations in the structure of remedial courses, instructional approaches, and/or support services are essential for greater student success. **What works where, for which students, and under what conditions warrants extensive and careful investigation.**

On the positive side of the ledger, California's decentralized governance system provides a level of local flexibility that can encourage and support such experimentation. But for local educators to learn more effectively from these efforts—and for the system to move forward deliberately—common frameworks for measuring and evaluating outcomes are also essential. **The system's movement toward more standardized coding of course levels below transfer and other common metrics needs to be done thoughtfully, but it should be encouraged and supported.**

The efficacy of the state's investment in developmental education warrants more attention

Finding resources to finance the development of innovative new models is currently a huge challenge in California. Perhaps more importantly, **it is unclear that the colleges have sufficient resources or motivation to bring successful innovations to scale and fully integrate them into existing curricula and services,** particularly when doing so challenges a powerful status quo and will not clearly be accompanied by increased state support. The irony, of course, is that moving students more rapidly through remedial coursework could ultimately save the state money by increasing the "productivity" of its educational investment and reducing the amount spent on programs that do not lead to student success.

When students attend college but never leave the developmental sequence, it is costly both for them and for the state. Helping students get through developmental sequences in less time would help address this issue. **Developing stronger alternative pathways, and making sure students are aware of those options, could be a good investment for the state and for those students who are currently at the greatest risk of leaving community college empty-handed.** In this study, for example, less than 5% of first-time students overall who enrolled in developmental courses said that a vocational degree or certificate was their goal and roughly the same proportion attained that goal. **The state might be better served if more students were encouraged to participate in high quality career technical programs rather than the emphasis being placed so heavily on transfer courses.** For guidance in doing this more effectively, California might look to other states where the community college systems have long put more emphasis on workforce development.

Growing concerns about student success rates in community colleges have prompted calls for better measures of student progress and for holding colleges more accountable for that progress. In 2010 in California, that momentum crystallized into several proposals to change state policy related to such things as transfer requirements and state funding formulas. These policy initiatives make it clear that the pressure on the community colleges will increase related to delivering developmental education more effectively and in a way that results in better student outcomes.

Technical Appendices

Course-taking patterns, policies, and practices in developmental education in the California Community Colleges

A report to the California Community Colleges Chancellor's Office

June 2010

EdSource

Mary Perry, deputy director, study project director
Matthew Rosin, Ph.D., senior research associate
Kathryn Morgan Woodward, research associate

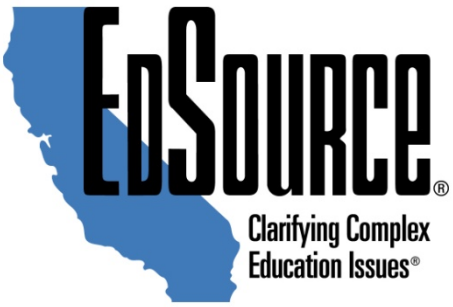
Trish Williams, executive director

University of Michigan
School of Education

Peter Riley Bahr, Ph.D., assistant professor

Suggested citation:

Perry, M.; Bahr, P.R.; Rosin, M.; & Woodward, K.M. (2010). *Course-taking patterns, policies, and practices in developmental education in the California Community Colleges*. Mountain View, CA: EdSource.



EdSource is an independent, impartial, not-for-profit organization whose sole mission is to clarify complex education issues and to promote thoughtful decisions about improving public education. Founded in California in 1977, EdSource is a respected source of information for K–14 education policy, data, and research.

520 San Antonio Rd, Suite 200, Mountain View, CA 94040-1217 | 650/917-9481

Fax: 650/917-9482 | edsource@edsource.org

www.edsource.org | www.ed-data.org

Technical Appendices

Table of contents

Appendix One: Stakeholders Consulted

The research team consulted with a range of experts and stakeholders—inside and outside the California Community Colleges—during the course of this study. These activities included early consultations, a February 2010 advisory meeting, and interviews on topics related to policy and practice.

The research team thanks the following individuals for sharing their time and expertise during this process.

- Rose Asera (The Carnegie Foundation for the Advancement of Teaching)
- Estela Mara Bensimon (University of Southern California)
- Dona Boatright (former Vice Chancellor for Educational Services, California Community Colleges Chancellor's Office)
- George C. Bunch (University of California, Santa Cruz)
- Pamela Burdman (WestEd)
- Linda Collins (Career Ladders)
- Tom deWit (Chabot College)
- Bonnie Edwards (Chancellor's Office)
- Janet Fulks (Bakersfield College, Academic Senate for California Community Colleges)
- Robert Gabriner (San Francisco State University, RP Group)
- W. Norton Grubb (University of California, Berkeley)
- Benita D. Haley (Board of Governors)
- Kenneth Hall (University of Southern California)
- Deborah Harrington (Los Angeles Community College District)
- Gerald C. Hayward (former Chancellor of the California Community Colleges)
- Katie Hern (Chabot College)
- Laura Hope (Chaffey College)
- Barbara Illowsky (De Anza College)
- Robert Johnstone (Skyline College, RP Group)
- Michael W. Kirst (Stanford University)
- Mark Wade Lieu (Ohlone College)
- Morgan Lynn (Chancellor's Office)
- Richard Mahon (Riverside Community College, Academic Senate for California Community Colleges)
- Sean McFarland (Chabot College)
- Kenneth Meehan (Fullerton College, RP Group)
- Linda Michalowski (Chancellor's Office)
- Colleen Moore (California State University, Sacramento)

- Diego Navarro (Cabrillo College)
- Jeremy Offenstein (California State University, Sacramento)
- Sonia Ortiz-Mercado (Chancellor's Office)
- Jane Patton (Mission College, Academic Senate for California Community Colleges)
- Patrick Perry (Chancellor's Office)
- Kent Phillippe (American Association of Community Colleges)
- DeRionne Pollard (Las Positas College)
- Thomas P. Ray (Merced College)
- Barry Russell (Chancellor's Office)
- Nancy Shulock (California State University, Sacramento)
- Erik Skinner (Chancellor's Office)
- Regina Stanback-Stroud (Skyline College)
- Paul Steenhausen (Legislative Analyst's Office)
- Andrea Venezia (WestEd)

Appendix Two: Definitions of English Course Categories

Here we provide a list of the categories (and associated category definitions) into which we coded each English course in which any student of the Fall 2002 first-time cohort enrolled at any time between college entry and Spring 2009. The particular category of a given English course was determined on the basis of information detailed in the COMIS database, descriptions of courses in the course catalogs, and prerequisites specified in the course catalogs. Our basic procedure for coding English courses for a given college was as follows:

1. Determine the **first college-level writing** course, which typically is college composition, as defined under *W0* below.
2. Determine the **first college-level reading** course (if any), defined under *R0* below.
3. Work backwards to determine which courses feed students into the *W0* course and, separately, the *R0* course, and in what order. For example, the *W1* course (defined below) is the first course that feeds into *W0*, *W2* feeds *W1*, and so on. The courses that feed successively the *W0* course and the *R0* are course are defined here as **remedial** courses.
4. Categorize **remaining English courses** on the basis of their relationship, or lack thereof, to the core remedial/college writing and reading sequences at each college. Determination of the nature of these relationships relied heavily, although not exclusively, upon prerequisites, recommended preparation, or advisories specified (or not specified) in the course catalogs.

The resulting course categories are as follows:

W0 **First College-Level Writing**

- The *First College-Level Writing* course is the course that fulfills the general education IGETC 1A requirement (defined as English Composition).
- Common titles of the *First College-Level Writing* course include College Composition, Reading and Composition, Freshman Composition, and College Exposition.
- In all, or nearly all, cases, the *First College-Level Writing* course is the culmination of one or more courses categorized as *Remedial Writing* (and sometimes one or more courses categorized as *Remedial Reading*).
- Sometimes an "honors" version of the *First College-Level Writing* course is offered. Both the "regular" version and the "honors" version receive the same *W0* designation.

W1–W6 **Remedial Writing [*numeric level determined empirically*]**

- *Remedial Writing* courses offer content intended to improve writing skills (including grammar, sentence structure, paragraph construction, essay writing, etc.) for students who are skill-deficient in writing.
- *Remedial Writing* courses may include individualized instructional modules if such modules are the course itself, rather than supplemental to the main

course. Purely supplemental courses should be placed in the category of *Other English Courses*.

- *Remedial Writing* courses generally are sequential (i.e., a lower-level *Remedial Writing* course is a prerequisite for a higher-level *Remedial Writing* course), and the specific numeric level of the course (e.g., *W1*, *W2*, *W3*, *W4*) is determined by the "distance" of the course from the *First College-Level Writing* course (*W0*). "Distance" refers to the number of courses that must be completed to advance to *W0*.
- *Remedial Writing* courses are not transferable for credit to either a California State University (CSU) or University of California (UC).
- *Remedial Writing* courses are not targeted specifically at students who are seeking to prepare for the GED, students who have disabilities, or English-as-a-second-language learners.
- *Remedial Writing* courses present new material and "stand on their own." In other words, *Remedial Writing* courses are not supplemental to another course.
- Colleges may offer a 3- or 4-unit *Remedial Writing* course as well as a series of 1-unit *Remedial Writing* courses that, if completed successfully, "add up" to the single 3- or 4-unit *Remedial Writing* course. In such cases, all of these courses receive the same level designation, which is determined by how far down the remedial ladder is the 3- or 4-unit *Remedial Writing* course.

W+ **Advanced College-Level English**

- *Advanced College-Level English* courses include all courses that meet both of the following criteria: (1) transferable to CSU and/or UC and (2) have a recommended, required, or advised prerequisite of the *First College-Level Writing* course, or have a prerequisite of one or more courses that, themselves, require the *First College-Level Writing* course as a prerequisite.
- *Advanced College-Level English* courses do not include courses that are specifically (and generally exclusively) designed for English-as-a-second-language learners, regardless of whether or not they are accepted for transfer credit.

T0 **Level 0 Transfer English**

- *Level 0 Transfer English* courses include all courses that meet both of the following criteria: (1) transferable to CSU and/or UC and (2) have a recommended, required, or advised prerequisite of the course designated as level *W1* (but not *W0*) and/or the course designated as level *R1* (but not *R0*).
- *Level 0 Transfer English* courses do not include courses that are specifically (and generally exclusively) designed for English-as-a-second-language learners, regardless of whether or not they are accepted for transfer credit.
- Note: A subjective evaluation was conducted of all *T1* courses (see next category) that did not recommend, require, or advise any prerequisites. Such courses were compared to the course offerings of one or more UC schools. Those courses that matched course offerings in one or more UC schools in terms of title and perceived rigor were categorized as *T0*.

T1 **Level 1 Transfer English**

- *Level 1 Transfer English* courses include all courses that are transferable to CSU and/or UC, but that have a recommended, required, or advised prerequisite of the course designated as level *W2*, an English course that is lower in the skill hierarchy than the course designated as level *W2*, or no recommended, required, or advised prerequisite.
- Note: A subjective evaluation was conducted of all *T1* courses that did not recommend, require, or advise any prerequisites. Such courses were compared to the course offerings of one or more UC schools. Those courses that matched course offerings in one or more UC schools in terms of title and perceived rigor were categorized as *T0* (see previous category)

R0 **College-Level Reading**

- *College-Level Reading* courses offer content intended to improve reading skills specifically (not writing skills) and are "stand alone" courses.
- Common titles of the *College-Level Reading* course include "College Reading," "Principles of College Reading," and "Critical Reading."
- In all, or nearly all, cases, *College-Level Reading* courses are the culmination of one or more courses categorized as *Remedial Reading*. In other words, *College-Level Reading* courses are part of an integrated sequence of reading courses, the culmination of which is the *College-Level Reading* course.
- Unlike *Remedial Reading* courses, *College-Level Reading* courses are transferable for elective credit to a CSU and/or a UC. However, *College-Level Reading* courses do not fulfill a general education breadth requirement (i.e., an IGETC or other general education module).
- Any *College-Level Reading* course that is worth less than 2 units of credit should be scrutinized closely to determine if, in fact, it is a "stand alone" course. If it is not a "stand alone" course, it belongs in a category other than *R0*.

R1–R6 **Remedial Reading [*numeric level determined empirically*]**

- *Remedial Reading* courses offer content intended to improve reading skills (including vocabulary, spelling, phonics, reading comprehension, etc.) for students who are skill-deficient in reading.
- *Remedial Reading* courses may include individualized instructional modules if such modules are the course itself, rather than supplemental to the main course. Purely supplemental courses should be placed in the category of *Other English Courses*.
- *Remedial Reading* courses generally are sequential (i.e., a lower-level *Remedial Reading* course is a prerequisite for a higher-level *Remedial Reading* course), and the specific numeric level of the course (e.g., *R1*, *R2*, *R3*, *R4*) is determined by the "distance" of the course from the *College-Level Reading* course (*R0*) or, in the absence of a designated *College-Level Reading* course, the *First College-Level Writing* course (*W0*). "Distance" refers to the number of courses that must be completed to advance to *R0* (or *W0*).

- *Remedial Reading* courses are not transferable for credit to either a CSU or UC.
- *Remedial Reading* courses are not targeted specifically at students who are seeking to prepare for the GED, students who have disabilities, nor English-as-a-second-language learners.
- *Remedial Reading* courses present new material and "stand on their own." In other words, *Remedial Reading* courses are not supplemental to another course.

RS **Speed Reading**

- *Speed Reading* courses are a special case. In most instances, *Speed Reading* courses are transferable for elective credit to a CSU and/or UC.
- However, *Speed Reading* courses generally are not integrated into the remedial reading sequence (i.e., they do not serve as prerequisites for higher-level courses and may not, themselves, have prerequisites).
- *Speed Reading* courses generally are of low unit value (e.g., 1 unit of credit).

WR1–WR6 **Integrated Remedial Writing/Reading [*exact level determined empirically*]**

- *Integrated Remedial Writing/Reading* courses offer content intended to improve both reading and writing skills simultaneously for students who are skill-deficient in reading and writing.
- *Integrated Remedial Writing/Reading* courses may include individualized instructional modules if such modules are the course itself, rather than supplemental to the main course. Purely supplemental courses should be placed in the category of *Other English Courses*.
- *Integrated Remedial Writing/Reading* courses generally are sequential (i.e., a lower-level course is a prerequisite for a higher-level course), and the specific numeric level of the course (e.g., *WR1*, *WR2*, *WR3*, *WR4*) is determined by the distance of the course from the *First College-Level Writing* course (*W0*). "Distance" refers to the number of courses that must be completed to advance to *W0*.
- *Integrated Remedial Writing/Reading* courses are not transferable for credit to either a CSU or UC.
- *Integrated Remedial Writing/Reading* courses are not targeted specifically at students who are seeking to prepare for the GED, students who have disabilities, nor English-as-a-second-language learners.
- *Integrated Remedial Writing/Reading* courses present new material and "stand on their own." In other words, the courses are not supplemental to another course.
- Colleges may offer a 3- or 4-unit *Integrated Remedial Writing/Reading* course as well as a series of 1-unit *Integrated Remedial Writing/Reading* courses that, if completed successfully, "add up" to the single 3- or 4-unit *Integrated Remedial Writing/Reading* course. In such cases, all of these courses receive the same level designation, which is determined by how far down the remedial ladder is the 3- or 4-unit *Integrated Remedial Writing/Reading* course.

V **Vocational Reading or Writing**

- *Vocational Reading or Writing* courses include reading and writing courses that are designed specifically for a particular vocational program or set of vocational programs (e.g., report writing for law enforcement).
- One of the defining features of *Vocational Reading or Writing* courses is that they are not integrated into the remedial writing or remedial reading sequences. In other words, completion of a particular *Vocational Reading or Writing* does not qualify a student to move up to a more advanced reading or writing course in the mainstream reading/writing curriculum.
- Another defining feature of *Vocational Reading or Writing* courses is that the subject matter of the courses revolves centrally around reading and/or writing. In other words, it is not sufficient for the title to include the word "reading" or the word "writing". Instead, the course content as described in the catalog should indicate a focus on developing reading and/or writing skills.

ESL **English-as-a-Second-Language (ESL)**

- *ESL* courses are specifically (and generally exclusively) designed for English-as-a-second-language learners.
- Courses that are specifically (and generally exclusively) designed for English-as-a-second-language learners are categorized as *ESL* regardless of whether the units earned in the course are transferable to a CSU or UC.
- *ESL* courses may include speech/pronunciation courses, in addition to reading and writing courses. However, again, the course is specifically designed for English-as-a-second-language learners.

SV1-SV6 **Sequential Vocational Reading or Writing [a special case]**

- *Vocational Reading or Writing* courses include reading and writing courses that are designed specifically for a particular vocational program.
- In contrast to the category *Vocational Reading and Writing*, these courses are linked to the remedial sequence through their prerequisites, recommended preparation, or advisories.
- The majority of these courses are business courses, including titles such as "Business English," "English for the Professional," and "Business Writing and Presentation Methods."

W1S-W6S **Remedial Spelling [a special case]**

- *Remedial Spelling* Courses are targeted specifically at teaching spelling.
- These courses are not included in the primary remedial sequence of prerequisites leading to *W0*.
- The numeric designation of a *Remedial Spelling* course in relation to *Remedial Writing* takes into consideration
    - Prerequisites or strong recommendations for the course.
    - Course content, especially in the context of other spelling content in remedial writing classes.

R1V-R5V **Remedial Vocabulary [a special case]**

- *Remedial Vocabulary* Courses are targeted specifically at teaching vocabulary.
- These courses are not included in the primary remedial sequence of prerequisites leading to *R0*.
- The numeric designation of a *Remedial Vocabulary* course in relation to *Remedial Reading* takes into consideration:
    - Prerequisites or strong recommendations for the course.
    - Course content, especially in the context of other vocabulary content in remedial reading classes.

O **Other English Courses**

- The category of *Other English Courses* includes any reading or writing that does not fit into one of the previous categories.
- *Other English Courses* includes courses targeted specifically (and generally exclusively) at students who have disabilities, courses targeted specifically (and generally exclusively) at students who are seeking to prepare for the GED, and courses designed to train English tutors.
- *Other English Courses* includes "labs" and other forms of supporting instruction when the course is purely supplemental to one or more other courses from the previous categories.
- *Other English Courses* includes Early Child Education (ECE) and Child Development courses when such courses are focused on teaching educators how to deliver reading and writing instruction.
- *Other English Courses* includes Directed Study courses, Independent Study courses, Linguistics courses, and Special Topics courses unless there is a compelling reason to place such courses into another category.

Appendix Three: The Difficulty of Tracking Student Progress through Remedial Reading Sequences

This study was unable to attempt to track student progress through remedial reading sequences. This is a consequence of:

- How our analyses of student progress through the *writing* sequence were conducted, and
- The wide variation among colleges in the use of integrated writing/reading courses.

For the sake of our analyses, any given course could only be designated as part of one sequence—in this case, writing or reading. Our operating assumption was that integrated writing/reading courses should be treated, first and foremost, as part of the *writing* sequence. This assumption was validated by institutional researchers present at a February 2009 technical advisory meeting. The 2009 *Basic Skills Accountability Report* also provides a strong practical warrant for this assumption: far more students are served by a far greater number of basic skills writing sections, compared with students and sections in reading.

As a consequence, integrated writing/reading courses were coded as part of each college's writing sequence, and *not* as part of its reading sequence. This raises complications for analyzing student progress through reading sequences, however, given that half of colleges in the study employed some form of integrated writing/reading course. As described earlier, a few colleges did not offer a separate reading sequence at all. In other colleges, integrated writing/reading courses "interrupted" the reading sequence at one or more particular levels, creating a "gap."

Consider an example. **Los Angeles Harbor College** offered integrated courses at one, two, and three levels below Freshman Composition. But some students also took a non-integrated reading course *four* levels below Freshman Composition, which served as a prerequisite for the lowest integrated course. Having coded integrated writing/reading courses as *writing* courses, however, we would not be able to track student progress in a reading sequence at Los Angeles Harbor College beyond a single lower-level course. Any data resulting from such an analysis would misrepresent students' actual course-taking patterns.

Unfortunately, this problem is difficult to remedy. One seeming solution is to simply code integrated writing/reading courses as *both* writing and reading courses, for the purpose of two different analyses. But this would cause further problems. As noted above, the *Basic Skills Accountability Report* shows that many more students are served by many more basic skills writing than reading sections. Counting all integrated courses as part of the reading sequence would contaminate the reading cohort with large numbers of students *who are not actually reading students*. This would misrepresent both student progress and participation in the reading sequence. This is a particular problem to the extent that all colleges in the Los Angeles Community College District, which serves especially large numbers of students, offered integrated courses of some form.

The research team also considered the possibility of performing an analysis of student progress in remedial reading that would be limited only to colleges that offered a complete reading sequence. But this also is problematic. Our analyses track *student* progress, and approximately one-third of students in the Fall 2002 cohort who took a remedial course changed colleges at some point during the seven-year time period analyzed. Students' subsequent colleges may have adopted different structures for developmental reading.

Appendix Four: A Sampling of Actual Student Course-taking

There was ***tremendous variation*** in how students in this study moved through—or did not move through—the remedial writing and mathematics sequences. Table 1 tracks the cohort of students starting three levels below college mathematics (i.e. pre-algebra) in Fall 2002 and the many different course-taking paths they actually took during their first two years of community college attendance. The table demonstrates the impossibility of summarizing the most common remedial course-taking *trajectories* that students undertook on their way to college-level study.

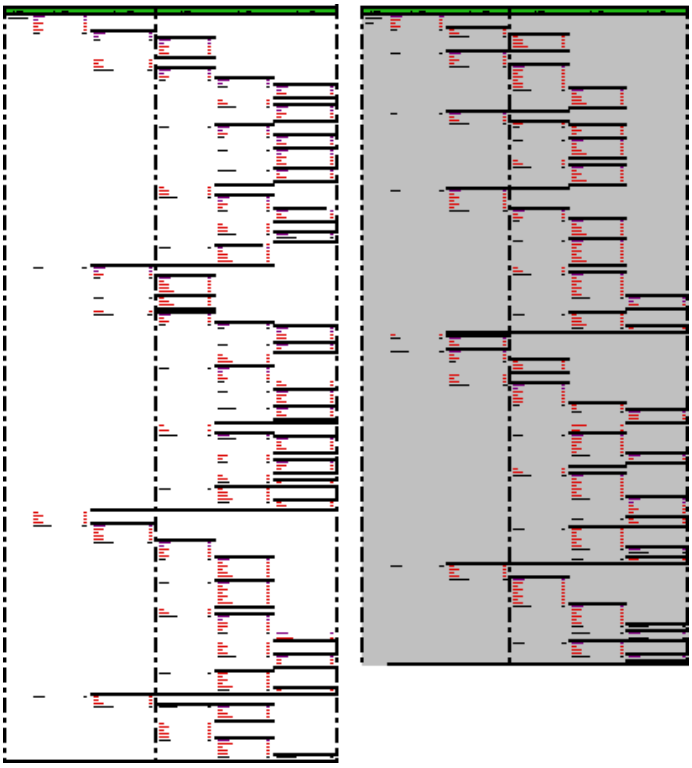
To summarize this behavior in a form that can be understood and analyzed, we use the economical set of remedial course-taking *variables* outlined in the "Data sources and variables considered" section of the main report.

Table 1: Math Trajectories of Students Starting 3 Levels below College Mathematics (i.e. Pre-algebra) in Fall 2002, over 2 Years

Total Cohort = 5,322 students
54% of these students **passed** their initial math course (3) on the first attempt
We stop following trajectories of cohorts smaller than 1% of students who initially passed
46% of these students **did not pass** their initial math course (3) on the first attempt
We stop following trajectories of cohorts smaller than 1% of students who initially did not pass
(Did not pass = failed or withdrew)

Coding of the Sequence Levels:
0=College Math
1=Intermediate Algebra / Geometry
2=Beginning Algebra
3=Pre-algebra
4=Arithmetic

Overview of Table: See Following Pages for Detail



Pass Table (Part 1 of 4)

Fall 2002	Spring 2003		Summer 2003		Fall 2003		Spring 2004		Summer 2004	
passed 3 on first attempt	no longer enrolled	6%								
	passed 0	<1%								
	did not pass 0	<1%								
	passed 1	<1%								
	did not pass 1	<1%								
	passed 2	**32%**	no longer enrolled	2%						
			passed 0	<1%						
			passed 1	**2%**	no longer enrolled	<1%				
					passed 0	1%				
					did not pass 0	<1%				
					passed 1	<1%				
					did not pass 1	<1%				
					enrolled but no math	<1%				
			did not pass 1	<1%						
			passed 2	<1%						
			did not pass 2	<1%						
			not enrolled or no math	**27%**	no longer enrolled	<1%				
					passed 0	<1%				
					did not pass 0	<1%				
					passed 1	**8%**	no longer enrolled	<1%		
							passed 0	3%		
							did not pass 0	**2%**	no longer enrolled	<1%
									passed 0	<1%
									did not pass 0	<1%
									not enrolled or no math	<1%
							passed 1	<1%		
							did not pass 1	<1%		
							enrolled but no math	**3%**	no longer enrolled	<1%
									passed 0	<1%
									did not pass 0	<1%
									passed 1	<1%
									not enrolled or no math	**3%**
							not enrolled	<1%		
					did not pass 1	**7%**	no longer enrolled	<1%		
							passed 0	<1%		
							did not pass 0	<1%		
							passed 1	**2%**	no longer enrolled	<1%
									passed 0	<1%
									did not pass 0	<1%
									not enrolled or no math	**1%**
							did not pass 1	**2%**	no longer enrolled	<1%
									passed 0	<1%
									did not pass 0	<1%
									passed 1	<1%
									did not pass 1	<1%
									not enrolled or no math	**2%**
							enrolled but no math	**2%**	no longer enrolled	<1%
									nb	<1%
									did not pass 1	<1%
									not enrolled or no math	**2%**
							not enrolled	<1%		
					passed 2	<1%				
					did not pass 2	<1%				
					did not pass 3	<1%				
					enrolled but no math	**8%**	no longer enrolled	<1%		
							passed 0	<1%		
							did not pass 0	<1%		
							passed 1	<1%		
							did not pass 1	**1%**	no longer enrolled	<1%
									passed 1	<1%
									did not pass 1	<1%
									not enrolled or no math	<1%
							passed 2	<1%		
							did not pass 2	<1%		
							did not pass 3	<1%		
							enrolled but no math	**4%**	no longer enrolled	<1%
									not enrolled or no math	**4%**
									passed 1	<1%
							not enrolled	<1%		

Pass Table (Part 2 of 4)

Fall 2002	Spring 2003	Summer 2003	Fall 2003	Spring 2004	Summer 2004
			not enrolled **2%**	passed 0 <1%	
				passed 1 <1%	
				did not pass 1 <1%	
				did not pass 2 <1%	
				enrolled but no math <1%	
				not enrolled <1%	
	did not pass 2 **33%**	no longer enrolled 4%			
		passed 0 <1%			
		did not pass 1 <1%			
		passed 2 **2%**	no longer enrolled <1%		
			passed 1 <1%		
			did not pass 1 <1%		
			did not pass 2 <1%		
			enrolled but no math <1%		
			not enrolled <1%		
		did not pass 2 **1%**	passed 2 <1%		
			did not pass 2 <1%		
			enrolled but no math <1%		
			not enrolled <1%		
		did not pass 4 <1%			
		not enrolled or no math **26%**	no longer enrolled <1%		
			passed 1 <1%		
			did not pass 1 <1%		
			passed 2 **5%**	no longer enrolled <1%	
				passed 1 **2%**	no longer enrolled <1%
					passed 0 <1%
					did not pass 0 <1%
					did not pass 1 <1%
					not enrolled or no math **2%**
				did not pass 1 **2%**	no longer enrolled <1%
					passed 1 <1%
					not enrolled or no math **2%**
				passed 2 <1%	
				did not pass 2 <1%	
				enrolled but no math <1%	
				not enrolled <1%	
			did not pass 2 **8%**	no longer enrolled <1%	
				passed 0 <1%	
				passed 1 <1%	
				did not pass 1 <1%	
				passed 2 **1%**	passed 1 <1%
					did not pass 1 <1%
					not enrolled or no math <1%
				did not pass 2 **1%**	no longer enrolled <1%
					did not pass 1 <1%
					passed 2 <1%
					did not pass 2 <1%
					not enrolled or no math **1%**
				enrolled but no math **3%**	no longer enrolled <1%
					passed 2 <1%
					did not pass 2 <1%
					not enrolled or no math **3%**
				not enrolled **1%**	**not enrolled or no math** **1%**
			passed 3 <1%		
			did not pass 3 <1%		
			enrolled but no math **8%**	no longer enrolled <1%	
				enrolled but no math **3%**	no longer enrolled <1%
					passed 1 <1%
					passed 2 <1%
					did not pass 2 <1%
					not enrolled or no math **2%**
				did not pass 0 <1%	
				passed 2 <1%	
				did not pass 2 **2%**	no longer enrolled <1%
					did not pass 0 <1%
					passed 2 <1%
					not enrolled or no math **1%**
				passed 3 <1%	
				did not pass 3 <1%	
				not enrolled **1%**	passed 3 <1%
					not enrolled or no math **1%**

Pass Table (Part 3 of 4)

Fall 2002	Spring 2003		Summer 2003		Fall 2003		Spring 2004		Summer 2004	
							did not pass 3	<1%		
							not enrolled	**1%**	passed 3	<1%
									not enrolled or no math	**1%**
					not enrolled	**4%**	passed 2	<1%		
							did not pass 2	<1%		
							did not pass 3	<1%		
							enrolled but no math	<1%		
							not enrolled	**3%**	passed 2	<1%
									did not pass 2	<1%
									not enrolled or no math	**3%**
	passed 3	<1%								
	did not pass 3	<1%								
	passed 4	<1%								
	did not pass 4	<1%								
	enrolled but no math	20%	no longer enrolled	3%						
			did not pass 1	<1%						
			passed 2	<1%						
			did not pass 2	<1%						
			did not pass 3	<1%						
			not enrolled or no math	**17%**	no longer enrolled	<1%				
					passed 0	<1%				
					did not pass 0	<1%				
					passed 1	<1%				
					did not pass 1	<1%				
					passed 2	**2%**	no longer enrolled	<1%		
							passed 1	<1%		
							did not pass 1	<1%		
							passed 2	<1%		
							did not pass 2	<1%		
							enrolled but no math	<1%		
							not enrolled	<1%		
					did not pass 2	**3%**	no longer enrolled	<1%		
							passed 1	<1%		
							did not pass 1	<1%		
							passed 2	<1%		
							did not pass 2	<1%		
							passed 3	<1%		
							enrolled but no math	<1%		
							not enrolled	<1%		
					passed 3	<1%				
					did not pass 3	<1%				
					enrolled but no math	**8%**	no longer enrolled	<1%		
							passed 0	<1%		
							did not pass 0	<1%		
							did not pass 1	<1%		
							passed 2	<1%		
							did not pass 2	**1%**	no longer enrolled	<1%
									not enrolled or no math	<1%
							passed 3	<1%		
							did not pass 3	<1%		
							passed 4	<1%		
							did not pass 4	<1%		
							enrolled but no math	**4%**	no longer enrolled	<1%
									passed 2	<1%
									passed 3	<1%
									not enrolled or no math	**3%**
							not enrolled	<1%		
					not enrolled	**3%**	did not pass 1	<1%		
							passed 2	<1%		
							did not pass 2	<1%		
							passed 3	<1%		
							enrolled but no math	<1%		
							not enrolled	**2%**	passed 2	<1%
									not enrolled or no math	**2%**

Pass Table (Part 4 of 4)

Fall 2002	Spring 2003		Summer 2003		Fall 2003		Spring 2004		Summer 2004	
	not enrolled	**6%**	passed 1	<1%						
			passed 2	<1%						
			did not pass 2	<1%						
			not enrolled or no math	**5%**	**enrolled but no math**	**1%**	no longer enrolled	<1%		
							passed 2	<1%		
							did not pass 2	<1%		
							enrolled but no math	<1%		
							not enrolled	<1%		
					passed 1	<1%				
					did not pass 1	<1%				
					passed 2	<1%				
					did not pass 2	<1%				
					did not pass 3	<1%				
					not enrolled	**3%**	no longer enrolled	<1%		
							enrolled but no math	<1%		
							passed 2	<1%		
							did not pass 2	<1%		
							did not pass 4	<1%		
							not enrolled	**2%**	**not enrolled or no math**	**2%**
									passed 2	<1%

Did Not Pass Table (Part 1 of 3)

Fall 2002	Spring 2003		Summer 2003		Fall 2003		Spring 2004		Summer 2004
did not pass 3 on first attempt	no longer enrolled	18%							
	did not pass 0	<1%							
	passed 1	<1%							
	did not pass 1	<1%							
	passed 2	1%	passed 1	<1%					
			did not pass 1	<1%					
			not enrolled or no math	**1%**	passed 1	<1%			
					did not pass 1	<1%			
					did not pass 2	<1%			
					enrolled but no math	<1%			
					not enrolled	<1%			
	did not pass 2	4%	no longer enrolled	<1%					
			passed 2	<1%					
			did not pass 2	<1%					
			passed 3	<1%					
			not enrolled or no math	**3%**	no longer enrolled	<1%			
					did not pass 1	<1%			
					passed 2	<1%			
					did not pass 2	<1%			
					passed 3	<1%			
					did not pass 3	<1%			
					did not pass 4	<1%			
					enrolled but no math	**1%**	no longer enrolled	<1%	
							passed 2	<1%	
							did not pass 2	<1%	
							did not pass 3	<1%	
							enrolled but no math	<1%	
							not enrolled	<1%	
					not enrolled	<1%			
	passed 3	7%	no longer enrolled	<1%					
			passed 2	<1%					
			did not pass 2	<1%					
			not enrolled or no math	**6%**	did not pass 1	<1%			
					passed 2	**1%**	passed 1	<1%	
							did not pass 1	<1%	
							passed 2	<1%	
							enrolled but no math	<1%	
					did not pass 2	**2%**	no longer enrolled	<1%	
							passed 1	<1%	
							passed 2	<1%	
							did not pass 2	<1%	
							enrolled but no math	<1%	
							not enrolled	<1%	
					passed 3	<1%			
					did not pass 3	<1%			
					enrolled but no math	**2%**	no longer enrolled	<1%	
							passed 2	<1%	
							did not pass 2	<1%	
							passed 3	<1%	
							enrolled but no math	<1%	
							not enrolled	<1%	
					not enrolled	<1%			
	did not pass 3	15%	no longer enrolled	2%					
			passed 2	<1%					
			did not pass 2	<1%					
			passed 3	<1%					
			did not pass 3	<1%					
			passed 4	<1%					
			not enrolled or no math	**12%**	no longer enrolled	<1%			
					passed 2	<1%			
					did not pass 2	<1%			
					passed 3	**1%**	no longer enrolled	<1%	
							passed 2	<1%	
							did not pass 2	<1%	
							did not pass 3	<1%	
							enrolled but no math	<1%	
							not enrolled	<1%	

Did Not Pass Table (Part 2 of 3)

Fall 2002	Spring 2003		Summer 2003		Fall 2003		Spring 2004		Summer 2004	
					did not pass 3	**2%**	no longer enrolled	<1%		
							did not pass 2	<1%		
							passed 3	<1%		
							did not pass 3	<1%		
							passed 4	<1%		
							did not pass 4	<1%		
							enrolled but no math	<1%		
							not enrolled	<1%		
					passed 4	<1%				
					did not pass 4	<1%				
					enrolled but no math	**5%**	no longer enrolled	<1%		
							passed 2	<1%		
							did not pass 2	<1%		
							passed 3	<1%		
							did not pass 3	<1%		
							passed 4	<1%		
							did not pass 4	<1%		
							enrolled but no math	**2%**	no longer enrolled	<1%
									passed 0	<1%
									did not pass 3	<1%
									not enrolled or no math	**2%**
							not enrolled	<1%		
					not enrolled	**3%**	passed 3	<1%		
							did not pass 3	<1%		
							did not pass 4	<1%		
							enrolled but no math	<1%		
							not enrolled	**2%**	passed 3	<1%
									not enrolled or no math	**2%**
	passed 4	<1%								
	did not pass 4	**1%**	no longer enrolled	<1%						
			passed 4	<1%						
			did not pass 4	<1%						
			not enrolled or no math	<1%						
	enrolled but no math	**34%**	no longer enrolled	<1%						
			passed 2	<1%						
			did not pass 2	<1%						
			passed 3	**1%**	passed 2	<1%				
					did not pass 2	<1%				
					did not pass 3	<1%				
					enrolled but no math	<1%				
			did not pass 3	<1%						
			passed 4	<1%						
			did not pass 4	<1%						
			not enrolled or no math	**26%**	no longer enrolled	<1%				
					passed 0	<1%				
					did not pass 0	<1%				
					passed 1	<1%				
					did not pass 1	<1%				
					did not pass 2	<1%				
					passed 3	**2%**	passed 1	<1%		
							passed 2	<1%		
							did not pass 2	**1%**	no longer enrolled	<1%
									did not pass 1	<1%
									did not pass 2	<1%
									not enrolled or no math	<1%
							enrolled but no math	0%		
							not enrolled	0%		
					did not pass 3	**3%**	no longer enrolled	<1%		
							did not pass 0	<1%		
							did not pass 2	<1%		
							passed 3	<1%		
							did not pass 3	<1%		
							passed 4	<1%		
							enrolled but no math	**2%**	no longer enrolled	<1%
									passed 3	<1%
									not enrolled or no math	**1%**
							not enrolled	<1%		
					passed 4	<1%				
					did not pass 4	<1%				

Did Not Pass Table (Part 3 of 3)

Fall 2002	Spring 2003		Summer 2003		Fall 2003		Spring 2004		Summer 2004	
					enrolled but no math	**13%**	no longer enrolled	2%		
							passed 2	<1%		
							did not pass 2	<1%		
							passed 3	<1%		
							did not pass 3	<1%		
							passed 4	<1%		
							did not pass 4	<1%		
							enrolled but no math	**6%**	no longer enrolled	<1%
									passed 0	<1%
									passed 2	<1%
									did not pass 3	<1%
									passed 4	<1%
									not enrolled or no math	**5%**
							not enrolled	**2%**	passed 2	<1%
									did not pass 3	<1%
									not enrolled or no math	**2%**
					not enrolled	**7%**	did not pass 1	<1%		
							passed 2	<1%		
							passed 3	<1%		
							did not pass 3	<1%		
							passed 4	<1%		
							did not pass 4	<1%		
							enrolled but no math	**2%**	no longer enrolled	<1%
									not enrolled or no math	**1%**
									passed 3	<1%
							not enrolled	**4%**	did not pass 3	<1%
									not enrolled or no math	**4%**
	not enrolled	**17%**	passed 2	<1%						
			did not pass 2	<1%						
			passed 3	<1%						
			did not pass 4	<1%						
			not enrolled or no math	**17%**	no longer enrolled	<1%				
					did not pass 1	<1%				
					passed 2	<1%				
					did not pass 2	<1%				
					passed 3	<1%				
					did not pass 3	<1%				
					passed 4	<1%				
					did not pass 4	<1%				
					enrolled but no math	**4%**	no longer enrolled	<1%		
							did not pass 1	<1%		
							passed 3	<1%		
							did not pass 3	<1%		
							passed 4	<1%		
							did not pass 4	<1%		
							not enrolled	**1%**	**not enrolled or no math**	**1%**
									passed 2	<1%
							enrolled but no math	**1%**	no longer enrolled	<1%
									not enrolled or no math	**1%**
					not enrolled	**11%**	no longer enrolled	<1%		
							passed 3	<1%		
							did not pass 3	<1%		
							did not pass 4	<1%		
							enrolled but no math	**2%**	no longer enrolled	<1%
									not enrolled or no math	**2%**
							not enrolled	**8%**	**not enrolled or no math**	**8%**

Appendix Five: Descriptive Statistics on the Fall 2002 Cohort

Note: For discussion and summary of data and variables shown in this section, see the **Data Sources and Variables Considered** in the main report.

Table 1: Students Who Enrolled in a Remedial Sequence vs. All First-time Students: Student Demographic Characteristics

Fall 2002 First-Time Students		All First-Time Students		Remedial Math Segment		Remedial Writing Segment		Remedial Reading Segment	
All Students		122,427	**100%**	49,997	**100%**	38,672	**100%**	13,052	**100%**
Age at College Entry	<20	67,148	55%	39,401	79%	30,704	79%	10,139	78%
	20-25	18,654	15%	6,110	12%	4,578	12%	1,647	13%
	>25	35,888	29%	4,468	9%	3,376	9%	1,257	10%
	missing	737	1%	18	0%	14	0%	9	0%
Race/Ethnicity	White	47,838	39%	19,629	39%	13,090	34%	3,374	26%
	Black	9,054	7%	3,996	8%	3,176	8%	1,279	10%
	Hispanic	40,079	33%	17,301	35%	14,537	38%	5,770	44%
	Asian	10,924	9%	3,865	8%	3,830	10%	1,319	10%
	Other	6,453	5%	3,209	6%	2,541	7%	851	7%
	missing	8,079	7%	1,997	4%	1,498	4%	459	4%
Sex	male	58,652	48%	22,318	45%	17,770	46%	5,636	43%
	female	62,494	51%	27,536	55%	20,800	54%	7,376	57%
	missing	1,281	1%	143	0%	102	0%	40	0%
Citizenship	U.S. citizen	96,202	79%	42,762	86%	32,086	83%	10,452	80%
	not U.S. citizen	21,274	17%	6,275	13%	5,748	15%	2,426	19%
	missing	4,951	4%	960	2%	838	2%	174	1%
Fee Waiver in 2002/2003	received	33,617	27%	19,422	39%	15,973	41%	6,368	49%
	did not receive	88,810	73%	30,575	61%	22,699	59%	6,684	51%
% BA or Greater in Zip Code	< 12.50%	29,940	24%	12,522	25%	10,433	27%	4,183	32%
	12.50% - 24.99%	42,869	35%	18,284	37%	14,137	37%	4,586	35%
	25.00% - 37.49%	24,041	20%	9,891	20%	7,150	18%	2,317	18%
	> 37.49%	19,817	16%	7,807	16%	5,805	15%	1,603	12%
	missing	5,760	5%	1,493	3%	1,147	3%	363	3%

Table 2: Students Who Enrolled in a Remedial Sequence vs. All First-time Students: Student Goals, Global Enrollment Patterns, and Academic Outcome

Fall 2002 First-Time Students		All First-Time Students		Remedial Math Segment		Remedial Writing Segment		Remedial Reading Segment	
Academic Goal (at initial enrollment)	transfer & associate's degree	34,796	28%	21,123	42%	15,754	41%	5,181	40%
	transfer only	9,161	7%	5,090	10%	3,895	10%	1,113	9%
	academic associate's degree	5,238	4%	2,733	5%	2,188	6%	775	6%
	vocational associate's degree	2,088	2%	921	2%	835	2%	337	3%
	certificate	3,130	3%	827	2%	632	2%	233	2%
	other job-related	16,876	14%	4,032	8%	3,321	9%	1,375	11%
	abstract	10,672	9%	2,724	5%	2,062	5%	671	5%
	remediation	6,799	6%	1,436	3%	1,233	3%	514	4%
	undecided	22,557	18%	9,783	20%	7,647	20%	2,464	19%
	not reported	11,110	9%	1,328	3%	1,105	3%	389	3%
Average Unit Course Load (1st Year; Fall & Spring semesters only)	0.000-5.999	49,019	40%	6,583	13%	5,162	13%	1,724	13%
	6.000-8.999	18,041	15%	8,426	17%	6,667	17%	2,356	18%
	9.000-11.999	19,117	16%	12,050	24%	9,424	24%	3,301	25%
	12.000 or greater	36,250	30%	22,938	46%	17,419	45%	5,671	43%
Course Success Ratio (1st Year)	0.000-0.249	20,514	17%	7,333	15%	5,650	15%	1,999	15%
	0.250-0.499	12,222	10%	7,318	15%	5,811	15%	2,121	16%
	0.500-0.749	21,537	18%	12,525	25%	9,927	26%	3,488	27%
	0.750-1.000	67,073	55%	22,647	45%	17,130	44%	5,401	41%
	no valid grades reported	1,081	1%	174	0%	154	0%	43	0%
Duration of CC Attendance (excluding winter intersessions)	1 semester	31,102	25%	2,837	6%	2,327	6%	741	6%
	2-3 semesters	28,357	23%	8,295	17%	6,611	17%	2,263	17%
	4-6 semesters	24,989	20%	12,380	25%	9,592	25%	3,171	24%
	7-9 semesters	18,186	15%	11,606	23%	8,567	22%	2,691	21%
	10-12 semesters	11,371	9%	8,286	17%	6,320	16%	2,112	16%
	> 12 semesters	8,422	7%	6,593	13%	5,255	14%	2,074	16%
Transfer Prepared	total transferrable units earned < 60	102,405	84%	36,582	73%	28,738	74%	10,135	78%
	total transferrable units earned ≥ 60	20,022	16%	13,415	27%	9,934	26%	2,917	22%
Academic Outcome	transfer with credential	7,403	6%	4,947	10%	3,523	9%	1,006	8%
	transfer without credential	15,264	12%	7,379	15%	5,504	14%	1,367	10%
	academic associate's degree	2,536	2%	2,010	4%	1,435	4%	430	3%
	vocational associate's degree	1,412	1%	1,136	2%	873	2%	327	3%
	certificate	2,325	2%	1,130	2%	927	2%	293	2%
	no credential & no transfer	93,487	76%	33,395	67%	26,410	68%	9,629	74%

Table 3: Students Who Enrolled in a Remedial Mathematics Sequence, by Starting Level: Demographic Characteristics

Fall 2002 First-Time Students		Remedial Math Segment		First Math Course = Interm Algebra or Geometry		First Math Course = Beginning Algebra		First Math Course = Pre-Algebra		First Math Course = Arithmetic	
All Students		49,997	**100%**	11,466	**100%**	16,843	**100%**	10,325	**100%**	11,363	**100%**
**Proportion in sequence starting at each level:*			*100%*		*23%*		*34%*		*21%*		*23%*
Age at College Entry	<20	39,401	79%	10,518	92%	13,886	82%	7,701	75%	7,296	64%
	20-25	6,110	12%	701	6%	1,883	11%	1,511	15%	2,015	18%
	>25	4,468	9%	244	2%	1,068	6%	1,110	11%	2,046	18%
	missing	18	0%	3	0%	6	0%	3	0%	6	0%
Race/Ethnicity	White	19,629	39%	5,497	48%	7,351	44%	3,794	37%	2,987	26%
	Black	3,996	8%	513	4%	1,042	6%	873	8%	1,568	14%
	Hispanic	17,301	35%	2,816	25%	5,275	31%	4,032	39%	5,178	46%
	Asian	3,865	8%	1,285	11%	1,327	8%	661	6%	592	5%
	Other	3,209	6%	854	7%	1,159	7%	587	6%	609	5%
	missing	1,997	4%	501	4%	689	4%	378	4%	429	4%
Sex	male	22,318	45%	5,773	50%	7,905	47%	4,334	42%	4,306	38%
	female	27,536	55%	5,671	49%	8,881	53%	5,975	58%	7,009	62%
	missing	143	0%	22	0%	57	0%	16	0%	48	0%
Citizenship	U.S. citizen	42,762	86%	9,919	87%	14,622	87%	8,716	84%	9,505	84%
	not U.S. citizen	6,275	13%	1,405	12%	1,893	11%	1,354	13%	1,623	14%
	missing	960	2%	142	1%	328	2%	255	2%	235	2%
Fee Waiver in 2002/2003	received	19,422	39%	3,380	29%	5,974	35%	4,227	41%	5,841	51%
	did not receive	30,575	61%	8,086	71%	10,869	65%	6,098	59%	5,522	49%
% BA or Greater in Zip Code	< 12.50%	12,522	25%	2,065	18%	3,588	21%	2,643	26%	4,226	37%
	12.50% - 24.99%	18,284	37%	4,071	36%	6,125	36%	3,943	38%	4,145	36%
	25.00% - 37.49%	9,891	20%	2,674	23%	3,676	22%	1,931	19%	1,610	14%
	> 37.49%	7,807	16%	2,366	21%	2,879	17%	1,516	15%	1,046	9%
	missing	1,493	3%	290	3%	575	3%	292	3%	336	3%

*Percentages do not sum to 100% due to rounding

Table 4: Students Who Enrolled in a Remedial Mathematics Sequence, by Starting Level: Student Goals, Global Enrollment Patterns, and Academic Outcome

Fall 2002 First-Time Students		Remedial Math Segment		First Math Course = Interm Algebra or Geometry		First Math Course = Beginning Algebra		First Math Course = Pre-Algebra		First Math Course = Arithmetic	
Academic Goal (at initial enrollment)	transfer & associate's degree	21,123	42%	5,667	49%	7,717	46%	4,194	41%	3,545	31%
	transfer only	5,090	10%	1,702	15%	1,749	10%	929	9%	710	6%
	academic associate's degree	2,733	5%	394	3%	901	5%	704	7%	734	6%
	vocational associate's degree	921	2%	87	1%	282	2%	229	2%	323	3%
	certificate	827	2%	100	1%	245	1%	191	2%	291	3%
	other job-related	4,032	8%	529	5%	1,052	6%	881	9%	1,570	14%
	abstract	2,724	5%	467	4%	902	5%	620	6%	735	6%
	remediation	1,436	3%	181	2%	286	2%	298	3%	671	6%
	undecided	9,783	20%	2,046	18%	3,255	19%	2,116	20%	2,366	21%
	not reported	1,328	3%	293	3%	454	3%	163	2%	418	4%
Average Unit Course Load (1st Year; Fall & Spring semesters only)	0.000-5.999	6,583	13%	719	6%	1,731	10%	1,636	16%	2,497	22%
	6.000-8.999	8,426	17%	1,245	11%	2,637	16%	1,979	19%	2,565	23%
	9.000-11.999	12,050	24%	2,499	22%	4,127	25%	2,650	26%	2,774	24%
	12.000 or greater	22,938	46%	7,003	61%	8,348	50%	4,060	39%	3,527	31%
Course Success Ratio (1st Year)	0.000-0.249	7,333	15%	1,180	10%	2,449	15%	1,666	16%	2,038	18%
	0.250-0.499	7,318	15%	1,441	13%	2,504	15%	1,583	15%	1,790	16%
	0.500-0.749	12,525	25%	2,738	24%	4,262	25%	2,664	26%	2,861	25%
	0.750-1.000	22,647	45%	6,088	53%	7,577	45%	4,375	42%	4,607	41%
	no valid grades reported	174	0%	19	0%	51	0%	37	0%	67	1%
Duration of CC Attendance (excluding winter intersessions)	1 semester	2,837	6%	341	3%	852	5%	621	6%	1,023	9%
	2-3 semesters	8,295	17%	1,300	11%	2,657	16%	1,867	18%	2,471	22%
	4-6 semesters	12,380	25%	2,831	25%	4,090	24%	2,579	25%	2,880	25%
	7-9 semesters	11,606	23%	3,379	29%	4,055	24%	2,141	21%	2,031	18%
	10-12 semesters	8,286	17%	2,153	19%	3,026	18%	1,633	16%	1,474	13%
	> 12 semesters	6,593	13%	1,462	13%	2,163	13%	1,484	14%	1,484	13%
Transfer Prepared	total transferrable units earned < 60	36,582	73%	6,475	56%	11,995	71%	8,266	80%	9,846	87%
	total transferrable units earned ≥ 60	13,415	27%	4,991	44%	4,848	29%	2,059	20%	1,517	13%
Academic Outcome	transfer with credential	4,947	10%	1,925	17%	1,818	11%	745	7%	459	4%
	transfer without credential	7,379	15%	2,904	25%	2,717	16%	1,085	11%	673	6%
	academic associate's degree	2,010	4%	583	5%	772	5%	362	4%	293	3%
	vocational associate's degree	1,136	2%	261	2%	457	3%	205	2%	213	2%
	certificate	1,130	2%	147	1%	362	2%	257	2%	364	3%
	no credential & no transfer	33,395	67%	5,646	49%	10,717	64%	7,671	74%	9,361	82%

Table 5: Students Who Enrolled in a Remedial Mathematics Sequence, by Starting Level: Student Course-Taking Patterns

Fall 2002 First-Time Students		Remedial Math Segment		First Math Course = Interm Algebra or Geometry		First Math Course = Beginning Algebra		First Math Course = Pre-Algebra		First Math Course = Arithmetic	
Units Attempted in First Math	< 3 units	3,624	7%	96	1%	500	3%	355	3%	2,673	24%
	3+ units	46,373	93%	11,370	99%	16,343	97%	9,970	97%	8,690	76%
Term of First Remedial Math Course	Fall 2002	27,453	55%	6,776	59%	9,567	57%	5,322	52%	5,788	51%
	Spring 2003	9,481	19%	2,168	19%	3,051	18%	2,053	20%	2,209	19%
	Summer 2003	707	1%	159	1%	237	1%	157	2%	154	1%
	Fall 2003	3,505	7%	797	7%	1,184	7%	761	7%	763	7%
	Spring 2004	2,368	5%	502	4%	777	5%	501	5%	588	5%
	after Spring 2004	6,483	13%	1,064	9%	2,027	12%	1,531	15%	1,861	16%
Grade in First Remedial Math Course	A	6,881	14%	1,634	14%	2,394	14%	1,544	15%	1,309	12%
	B	7,817	16%	2,016	18%	2,668	16%	1,775	17%	1,358	12%
	C	8,011	16%	2,134	19%	2,960	18%	1,649	16%	1,268	11%
	D	3,671	7%	967	8%	1,426	8%	719	7%	559	5%
	F	6,366	13%	1,488	13%	2,348	14%	1,267	12%	1,263	11%
	Credit	2,570	5%	105	1%	263	2%	505	5%	1,697	15%
	No Credit	1,670	3%	91	1%	210	1%	404	4%	965	8%
	Withdrawal	11,204	22%	2,704	24%	4,035	24%	2,144	21%	2,321	20%
	Ungraded	524	1%	62	1%	121	1%	91	1%	250	2%
	missing/undetermined	1,283	3%	265	2%	418	2%	227	2%	373	3%
	passed	25,803	52%	5,951	52%	8,406	50%	5,564	54%	5,882	52%
	did not pass	24,194	48%	5,515	48%	8,437	50%	4,761	46%	5,481	48%
Attempted Second Math Course	attempted	27,639	55%	7,064	62%	9,138	54%	5,985	58%	5,452	48%
	did not attempt	22,358	45%	4,402	38%	7,705	46%	4,340	42%	5,911	52%
Delay of Second Math Course	no delay	12,433	25%	2,767	24%	4,124	24%	3,010	29%	2,532	22%
	1 semester	3,923	8%	883	8%	1,216	7%	997	10%	827	7%
	2 semesters	3,878	8%	1,121	10%	1,258	7%	745	7%	754	7%
	3 semesters	1,757	4%	570	5%	594	4%	297	3%	296	3%
	>3 semesters	5,648	11%	1,723	15%	1,946	12%	936	9%	1,043	9%
	no second math course	22,358	45%	4,402	38%	7,705	46%	4,340	42%	5,911	52%
Highest Math Course Completed	college-level math	13,096	26%	5,806	51%	4,670	28%	1,661	16%	959	8%
	interm algebra/geometry	6,160	12%	2,534	22%	2,258	13%	833	8%	535	5%
	beginning algebra	7,592	15%	189	2%	4,466	27%	1,655	16%	1,282	11%
	pre-algebra	3,969	8%	36	0%	143	1%	2,767	27%	1,023	9%
	basic arithmetic	3,590	7%	21	0%	67	0%	96	1%	3,406	30%
	voc math or did not pass any math	15,590	31%	2,880	25%	5,239	31%	3,313	32%	4,158	37%

Table 6: Remedial Mathematics Sequence Course-Taking Pattern Means, from Regression: Student Demographic Characteristics

Fall 2002 First-Time Students		Mean Level of First Math	% Attempted at least 3 Units in First Math	Mean Delay of First Math	% Passed First Math on First Try (includes ungraded as passing)	% Attempted Second (More Advanced) Math Course	Mean Delay of Second (More Advanced) Math Course	% Completed Interm Algebra, Geometry, or Higher Math Course	% Completed College Algebra or Higher Math Course
All Students		2.43	93%	1.91	52%	55%	2.23	39%	26%
Age at College Entry	<20	2.30	94%	1.69	50%	58%	2.32	42%	29%
	20-25	2.79	91%	2.49	55%	47%	1.99	27%	16%
	>25	3.11	86%	2.99	64%	45%	1.62	22%	12%
	missing	2.67	89%	0.89	44%	33%	1.50	11%	0%
Race/Ethnicity	White	2.22	95%	1.89	54%	57%	2.23	43%	30%
	Black	2.87	86%	2.25	39%	41%	2.54	21%	12%
	Hispanic	2.67	92%	1.89	50%	54%	2.27	33%	22%
	Asian	2.14	94%	1.98	57%	63%	2.07	52%	37%
	Other	2.30	92%	1.70	53%	57%	2.03	42%	27%
	missing	2.37	93%	1.71	53%	55%	2.14	40%	28%
Sex	male	2.32	93%	1.89	47%	51%	2.25	37%	25%
	female	2.52	92%	1.92	55%	59%	2.22	40%	27%
	missing	2.63	90%	0.90	46%	38%	1.59	25%	19%
Citizenship	U.S. citizen	2.42	93%	1.87	51%	55%	2.28	38%	26%
	not U.S. citizen	2.51	92%	2.27	60%	59%	1.98	42%	28%
	missing	2.61	94%	1.22	47%	40%	1.80	27%	17%
Fee Waiver in 2002/2003	received	2.65	91%	1.69	51%	55%	2.18	34%	23%
	did not receive	2.30	94%	2.05	52%	56%	2.27	41%	28%
% BA or Greater in Zip Code	< 12.50%	2.72	92%	1.96	49%	51%	2.31	31%	20%
	12.50% - 24.99%	2.45	92%	1.95	52%	54%	2.21	37%	25%
	25.00% - 37.49%	2.25	95%	1.81	52%	58%	2.28	43%	30%
	> 37.49%	2.16	93%	1.83	53%	62%	2.16	49%	36%
	missing	2.45	92%	1.94	52%	51%	1.98	35%	23%

Table 7: Remedial Mathematics Sequence Course-Taking Pattern Means, from Regression: Student Goals, Global Enrollment Patterns, and Academic Outcome

Fall 2002 First-Time Students		Mean Level of First Math	% Attempted at least 3 Units in First Math	Mean Delay of First Math	% Passed First Math on First Try (includes ungraded as passing)	% Attempted Second (More Advanced) Math Course	Mean Delay of Second (More Advanced) Math Course	% Completed Interm Algebra, Geometry, or Higher Math Course	% Completed College Algebra or Higher Math Course
Academic Goal (at initial enrollment)	transfer & associate's degree	2.27	94%	1.58	51%	60%	2.23	44%	31%
	transfer only	2.13	96%	1.62	54%	63%	2.13	50%	36%
	academic associate's degree	2.65	93%	2.09	50%	47%	2.18	28%	16%
	vocational associate's degree	2.86	91%	2.21	51%	44%	2.14	21%	11%
	certificate	2.81	90%	2.87	48%	43%	2.00	23%	15%
	other job-related	2.87	92%	2.75	52%	46%	2.41	25%	15%
	abstract	2.60	93%	2.50	51%	49%	2.30	32%	20%
	remediation	3.02	79%	3.06	54%	41%	2.40	24%	15%
	undecided	2.49	91%	1.98	51%	54%	2.27	37%	25%
	not reported	2.53	88%	1.38	50%	45%	1.94	30%	20%
Average Unit Course Load (1st Year; Fall & Spring semesters only)	0.000-5.999	2.90	85%	4.66	51%	38%	2.31	20%	11%
	6.000-8.999	2.70	92%	2.39	46%	43%	2.73	26%	14%
	9.000-11.999	2.47	93%	1.69	47%	52%	2.63	33%	21%
	12.000 or greater	2.18	95%	1.05	56%	66%	1.94	51%	38%
Course Success Ratio (1st Year)	0.000-0.249	2.62	91%	2.39	14%	24%	4.33	12%	6%
	0.250-0.499	2.51	92%	1.52	26%	37%	3.46	19%	10%
	0.500-0.749	2.45	93%	1.62	45%	54%	2.57	33%	20%
	0.750-1.000	2.33	93%	2.01	76%	72%	1.66	57%	41%
	no valid grades reported	2.87	87%	4.56	29%	27%	2.60	17%	7%
Duration of CC Attendance (excluding winter intersessions)	1 semester	2.82	89%	0.01	26%	0%	----------	3%	0%
	2-3 semesters	2.66	91%	1.30	37%	19%	0.86	8%	1%
	4-6 semesters	2.44	93%	1.95	48%	45%	1.62	25%	14%
	7-9 semesters	2.24	94%	2.12	61%	71%	2.03	52%	38%
	10-12 semesters	2.29	94%	2.32	60%	80%	2.61	61%	46%
	> 12 semesters	2.45	93%	2.50	60%	87%	3.06	66%	47%
Academic Outcome	transfer with credential	1.95	91%	1.29	74%	97%	1.80	96%	91%
	transfer without credential	1.94	92%	1.43	62%	75%	1.88	68%	57%
	academic associate's degree	2.18	96%	1.73	75%	89%	2.52	79%	58%
	vocational associate's degree	2.33	95%	2.40	78%	71%	2.41	54%	26%
	certificate	2.74	96%	3.38	56%	50%	2.92	23%	8%
	no credential & no transfer	2.62	96%	2.05	44%	42%	2.45	21%	9%

Table 8: Remedial Mathematics Sequence Course-Taking Pattern Means, from Regression: Student Course-Taking Patterns

Fall 2002 First-Time Students		Mean Level of First Math	% Attempted at least 3 Units in First Math	Mean Delay of First Math	% Passed First Math on First Try (includes ungraded as passing)	% Attempted Second (More Advanced) Math Course	Mean Delay of Second (More Advanced) Math Course	% Completed Interm Algebra, Geometry, or Higher Math Course	% Completed College Algebra or Higher Math Course
First Nonvoc Math Course Attempted	college-level math		----------	---------	----------	----------	----------	----------	----------
	interm algebra/geometry		99%	1.48	52%	62%	2.57	73%	51%
	beginning algebra		97%	1.78	50%	54%	2.32	41%	28%
	pre-algebra		97%	2.15	54%	58%	1.82	24%	16%
	basic arithmetic		76%	2.31	52%	48%	2.11	13%	8%
	vocational math only or no math		----------	---------	----------	----------	----------	----------	----------
Units Attempted in First Math	< 3 units			1.84	55%	43%	2.94	18%	12%
	3+ units			1.91	51%	56%	2.19	40%	27%
Term of First Remedial Math Course	Fall 2002				52%	57%	2.14	41%	28%
	Spring 2003				50%	54%	2.96	38%	27%
	Summer 2003				62%	67%	1.89	47%	33%
	Fall 2003				50%	56%	2.01	40%	26%
	Spring 2004				50%	52%	2.68	35%	23%
	after Spring 2004				55%	47%	1.51	30%	18%
Grade in First Remedial Math Course	A					82%	1.02	65%	48%
	B					80%	1.21	59%	41%
	C					77%	1.39	54%	35%
	D					49%	3.78	32%	22%
	F					29%	5.07	18%	12%
	Credit					71%	1.44	34%	22%
	No Credit					33%	3.65	12%	8%
	Withdrawal					28%	5.46	18%	12%
	Ungraded					23%	5.49	19%	7%
	missing/undetermined					29%	4.28	19%	14%
	passed					78%	1.26	56%	38%
	did not pass					32%	4.79	20%	13%
Attempted Second Math Course	attempted							64%	47%
	did not attempt							6%	0%
Delay of Second Math Course	no delay							66%	49%
	1 semester							65%	49%
	2 semesters							64%	47%
	3 semesters							63%	47%
	>3 semesters							62%	43%
	no second math course							6%	0%
Highest Math Course Completed	college-level math	1.83	97%	1.34	75%	100%	1.99		
	interm algebra/geometry	1.90	96%	1.96	74%	77%	2.46		
	beginning algebra	2.53	93%	2.09	73%	64%	2.38		
	pre-algebra	3.20	93%	2.34	75%	65%	2.19		
	basic arithmetic	3.92	72%	2.48	80%	37%	2.48		
	voc math or did not pass	2.56	92%	2.02	0%	7%	3.26		

Table 9: Students Who Enrolled in a Remedial Writing Sequence, by Starting Level: Demographic Characteristics

Fall 2002 First-Time Students		Remedial Writing Segment		First Writing Course = Level 1 Writing		First Writing Course = Level 2 Writing		First Writing Course = Level 3 Writing		First Writing Course = Level 4/5 Writing	
All Students		38,672	**100%**	20,190	**100%**	12,932	**100%**	4,355	**100%**	1,195	**100%**
**Proportion in sequence starting at each level:*			*100%*		*52%*		*33%*		*11%*		*3%*
Age at College Entry	<20	30,704	79%	16,749	83%	10,124	78%	3,098	71%	733	61%
	20-25	4,578	12%	2,078	10%	1,646	13%	641	15%	213	18%
	>25	3,376	9%	1,357	7%	1,156	9%	615	14%	248	21%
	missing	14	0%	6	0%	6	0%	1	0%	1	0%
Race/Ethnicity	White	13,090	34%	8,322	41%	3,711	29%	901	21%	156	13%
	Black	3,176	8%	1,262	6%	1,121	9%	580	13%	213	18%
	Hispanic	14,537	38%	6,601	33%	5,422	42%	1,966	45%	548	46%
	Asian	3,830	10%	1,769	9%	1,335	10%	556	13%	170	14%
	Other	2,541	7%	1,369	7%	866	7%	223	5%	83	7%
	missing	1,498	4%	867	4%	477	4%	129	3%	25	2%
Sex	male	17,770	46%	9,333	46%	5,936	46%	1,982	46%	519	43%
	female	20,800	54%	10,798	53%	6,967	54%	2,366	54%	669	56%
	missing	102	0%	59	0%	29	0%	7	0%	7	1%
Citizenship	U.S. citizen	32,086	83%	17,472	87%	10,305	80%	3,480	80%	360	30%
	not U.S. citizen	5,748	15%	2,219	11%	2,330	18%	839	19%	829	69%
	missing	838	2%	499	2%	297	2%	36	1%	6	1%
Fee Waiver in 2002/2003	received	15,973	41%	7,194	36%	5,747	44%	2,374	55%	658	55%
	did not receive	22,699	59%	12,996	64%	7,185	56%	1,981	45%	537	45%
% BA or Greater in Zip Code	< 12.50%	10,433	27%	4,610	23%	3,745	29%	1,626	37%	452	38%
	12.50% - 24.99%	14,137	37%	7,645	38%	4,557	35%	1,578	36%	357	30%
	25.00% - 37.49%	7,150	18%	3,905	19%	2,432	19%	655	15%	158	13%
	> 37.49%	5,805	15%	3,433	17%	1,805	14%	377	9%	190	16%
	missing	1,147	3%	597	3%	393	3%	119	3%	38	3%

*Percentages do not sum to 100% due to rounding

Table 10: Students Who Enrolled in a Remedial Writing Sequence, by Starting Level: Student Goals, Global Enrollment Patterns, and Academic Outcome

Fall 2002 First-Time Students		Remedial Writing Segment		First Writing Course = Level 1 Writing		First Writing Course = Level 2 Writing		First Writing Course = Level 3 Writing		First Writing Course = Level 4/5 Writing	
Academic Goal (at initial enrollment)	transfer & associate's degree	15,754	41%	8,781	43%	5,157	40%	1,486	34%	330	28%
	transfer only	3,895	10%	2,270	11%	1,289	10%	288	7%	48	4%
	academic associate's degree	2,188	6%	1,023	5%	848	7%	278	6%	39	3%
	vocational associate's degree	835	2%	367	2%	299	2%	116	3%	53	4%
	certificate	632	2%	295	1%	237	2%	80	2%	20	2%
	other job-related	3,321	9%	1,408	7%	1,261	10%	546	13%	106	9%
	abstract	2,062	5%	977	5%	697	5%	303	7%	85	7%
	remediation	1,233	3%	393	2%	414	3%	248	6%	178	15%
	undecided	7,647	20%	3,982	20%	2,442	19%	899	21%	324	27%
	not reported	1,105	3%	694	3%	288	2%	111	3%	12	1%
Average Unit Course Load (1st Year; Fall & Spring semesters only)	0.000-5.999	5,162	13%	2,271	11%	1,810	14%	794	18%	287	24%
	6.000-8.999	6,667	17%	3,132	16%	2,401	19%	920	21%	214	18%
	9.000-11.999	9,424	24%	4,833	24%	3,207	25%	1,085	25%	299	25%
	12.000 or greater	17,419	45%	9,954	49%	5,514	43%	1,556	36%	395	33%
Course Success Ratio (1st Year)	0.000-0.249	5,650	15%	2,833	14%	1,923	15%	677	16%	217	18%
	0.250-0.499	5,811	15%	2,832	14%	2,069	16%	736	17%	174	15%
	0.500-0.749	9,927	26%	5,006	25%	3,447	27%	1,181	27%	293	25%
	0.750-1.000	17,130	44%	9,458	47%	5,447	42%	1,737	40%	488	41%
	no valid grades reported	154	0%	61	0%	46	0%	24	1%	23	2%
Duration of CC Attendance (excluding winter intersessions)	1 semester	2,327	6%	1,022	5%	824	6%	344	8%	137	11%
	2-3 semesters	6,611	17%	3,154	16%	2,355	18%	869	20%	233	19%
	4-6 semesters	9,592	25%	4,982	25%	3,220	25%	1,106	25%	284	24%
	7-9 semesters	8,567	22%	4,917	24%	2,646	20%	821	19%	183	15%
	10-12 semesters	6,320	16%	3,514	17%	2,036	16%	605	14%	165	14%
	> 12 semesters	5,255	14%	2,601	13%	1,851	14%	610	14%	193	16%
Transfer Prepared	total transferrable units earned < 60	28,738	74%	13,979	69%	10,040	78%	3,708	85%	1,011	85%
	total transferrable units earned ≥ 60	9,934	26%	6,211	31%	2,892	22%	647	15%	184	15%
Academic Outcome	transfer with credential	3,523	9%	2,285	11%	989	8%	194	4%	55	5%
	transfer without credential	5,504	14%	3,517	17%	1,566	12%	339	8%	82	7%
	academic associate's degree	1,435	4%	886	4%	415	3%	111	3%	23	2%
	vocational associate's degree	873	2%	502	2%	291	2%	65	1%	15	1%
	certificate	927	2%	420	2%	324	3%	153	4%	30	3%
	no credential & no transfer	26,410	68%	12,580	62%	9,347	72%	3,493	80%	990	83%

Table 11: Students Who Enrolled in a Remedial Writing Sequence, by Starting Level: Student Course-Taking Patterns

Fall 2002 First-Time Students		Remedial Writing Segment		First Writing Course = Level 1 Writing		First Writing Course = Level 2 Writing		First Writing Course = Level 3 Writing		First Writing Course = Level 4/5 Writing	
Units Attempted in First Writing	< 3 units	739	2%	61	0%	183	1%	198	5%	297	25%
	3+ units	37,933	98%	20,129	100%	12,749	99%	4,157	95%	898	75%
Term of First Remedial Writing Course	Fall 2002	22,541	58%	12,167	60%	7,440	58%	2,281	52%	653	55%
	Spring 2003	7,256	19%	3,684	18%	2,451	19%	923	21%	198	17%
	Summer 2003	562	1%	297	1%	176	1%	76	2%	13	1%
	Fall 2003	2,484	6%	1,250	6%	815	6%	322	7%	97	8%
	Spring 2004	1,616	4%	779	4%	554	4%	230	5%	53	4%
	after Spring 2004	4,213	11%	2,013	10%	1,496	12%	523	12%	181	15%
Grade in First Remedial Writing Course	A	3,934	10%	2,475	12%	1,060	8%	256	6%	143	12%
	B	7,203	19%	4,465	22%	2,173	17%	396	9%	169	14%
	C	6,043	16%	3,498	17%	1,999	15%	400	9%	146	12%
	D	2,554	7%	1,378	7%	919	7%	188	4%	69	6%
	F	2,688	7%	1,601	8%	871	7%	157	4%	59	5%
	Credit	6,175	16%	2,169	11%	2,390	18%	1,398	32%	218	18%
	No Credit	2,302	6%	712	4%	922	7%	567	13%	101	8%
	Withdrawal	6,591	17%	3,419	17%	2,198	17%	757	17%	217	18%
	Ungraded	261	1%	86	0%	93	1%	67	2%	15	1%
	missing/undetermined	921	2%	387	2%	307	2%	169	4%	58	5%
	passed	23,616	61%	12,693	63%	7,715	60%	2,517	58%	691	58%
	did not pass	15,056	39%	7,497	37%	5,217	40%	1,838	42%	504	42%
Attempted Second Writing Course	attempted	23,829	62%	12,579	62%	8,127	63%	2,479	57%	644	54%
	did not attempt	14,843	38%	7,611	38%	4,805	37%	1,876	43%	551	46%
Delay of Second Writing Course	no delay	11,905	31%	6,034	30%	4,349	34%	1,208	28%	314	26%
	1 semester	3,461	9%	1,710	8%	1,219	9%	440	10%	92	8%
	2 semesters	3,334	9%	1,853	9%	1,060	8%	331	8%	90	8%
	3 semesters	1,343	3%	785	4%	391	3%	127	3%	40	3%
	>3 semesters	3,786	10%	2,197	11%	1,108	9%	373	9%	108	9%
	no second writing course	14,843	38%	7,611	38%	4,805	37%	1,876	43%	551	46%
Highest Writing Course Completed	college-level composition or higher	15,648	40%	10,098	50%	4,435	34%	912	21%	203	17%
	transferrable (below college comp)	154	0%	81	0%	53	0%	16	0%	4	0%
	one level below college	7,655	20%	5,221	26%	1,859	14%	468	11%	107	9%
	two levels below college	3,671	9%	90	0%	3,010	23%	485	11%	86	7%
	three levels below college	1,275	3%	22	0%	33	0%	1,130	26%	90	8%
	four levels below college	319	1%	3	0%	7	0%	3	0%	306	26%
	five levels below college	34	0%	0	0%	0	0%	0	0%	34	3%
	voc writing or did not pass any writing	9,916	26%	4,675	23%	3,535	27%	1,341	31%	365	31%

Table 12: Remedial Writing Sequence Course-Taking Pattern Means, from Regression: Student Demographic Characteristics

Fall 2002 First-Time Students		Mean Level of First Writing	% Attempted at least 3 Units in First Writing	Mean Delay of First Writing	% Passed First Writing on First Try (includes ungraded as passing)	% Attempted Second (More Advanced) Writing Course	Mean Delay of Second (More Advanced) Writing Course	% Completed Level 1 or Higher Writing Course	% Completed College Composition or Higher
All Students		1.66	98%	1.65	61%	62%	1.85	61%	40%
Age at College Entry	<20	1.61	99%	1.39	61%	65%	1.85	64%	44%
	20-25	1.78	97%	2.41	57%	49%	1.93	50%	29%
	>25	1.93	92%	2.96	65%	44%	1.79	49%	24%
	missing	1.79	86%	0.57	79%	43%	0.83	43%	0%
Race/Ethnicity	White	1.46	99%	1.53	64%	63%	1.77	66%	45%
	Black	1.93	97%	2.04	50%	51%	2.07	45%	27%
	Hispanic	1.76	98%	1.66	60%	60%	1.92	57%	36%
	Asian	1.77	97%	1.91	64%	70%	1.76	67%	51%
	Other	1.62	99%	1.40	61%	65%	1.95	63%	43%
	missing	1.54	98%	1.44	65%	62%	1.58	64%	44%
Sex	male	1.65	98%	1.62	57%	58%	1.93	57%	37%
	female	1.66	98%	1.67	65%	65%	1.79	64%	43%
	missing	1.63	95%	1.27	55%	43%	1.89	45%	26%
Citizenship	U.S. citizen	1.62	98%	1.55	61%	61%	1.89	61%	40%
	not U.S. citizen	1.89	96%	2.29	65%	66%	1.66	62%	44%
	missing	1.46	99%	0.99	50%	42%	1.48	46%	23%
Fee Waiver in 2002/2003	received	1.79	98%	1.49	60%	62%	1.80	57%	37%
	did not receive	1.57	98%	1.75	62%	62%	1.88	63%	43%
% BA or Greater in Zip Code	< 12.50%	1.81	97%	1.71	57%	57%	1.95	53%	33%
	12.50% - 24.99%	1.62	98%	1.67	61%	61%	1.88	61%	40%
	25.00% - 37.49%	1.59	99%	1.64	63%	65%	1.80	64%	45%
	> 37.49%	1.55	99%	1.47	66%	68%	1.74	70%	51%
	missing	1.65	98%	1.79	62%	59%	1.65	59%	39%

Table 13: Remedial Writing Sequence Course-Taking Pattern Means, from Regression: Student Goals, Global Enrollment Patterns, and Academic Outcome

Fall 2002 First-Time Students		Mean Level of First Writing	% Attempted at least 3 Units in First Writing	Mean Delay of First Writing	% Passed First Writing on First Try (includes ungraded as passing)	% Attempted Second (More Advanced) Writing Course	Mean Delay of Second (More Advanced) Writing Course	% Completed Level 1 or Higher Writing Course	% Completed College Composition or Higher
Academic Goal (at initial enrollment)	transfer & associate's degree	1.59	99%	1.33	63%	68%	1.79	66%	47%
	transfer only	1.52	99%	1.28	65%	71%	1.65	70%	52%
	academic associate's degree	1.70	98%	1.63	59%	54%	1.75	54%	31%
	vocational associate's degree	1.83	94%	1.90	55%	49%	2.19	49%	25%
	certificate	1.73	97%	2.44	59%	52%	2.18	50%	30%
	other job-related	1.81	98%	2.50	58%	51%	1.98	51%	29%
	abstract	1.76	98%	2.21	58%	55%	2.00	52%	33%
	remediation	2.18	88%	2.96	55%	45%	2.12	41%	22%
	undecided	1.68	99%	1.75	60%	60%	1.98	60%	38%
	not reported	1.49	97%	1.08	59%	53%	1.74	56%	34%
Average Unit Course Load (1st Year; Fall & Spring semesters only)	0.000-5.999	1.83	94%	4.35	55%	42%	2.26	46%	24%
	6.000-8.999	1.74	98%	1.98	52%	48%	2.59	47%	27%
	9.000-11.999	1.67	99%	1.38	57%	61%	2.18	58%	36%
	12.000 or greater	1.57	99%	0.86	68%	73%	1.45	72%	53%
Course Success Ratio (1st Year)	0.000-0.249	1.70	98%	2.22	16%	28%	4.20	24%	13%
	0.250-0.499	1.71	98%	1.32	36%	45%	2.86	39%	20%
	0.500-0.749	1.68	99%	1.33	61%	65%	1.98	61%	36%
	0.750-1.000	1.61	98%	1.73	85%	77%	1.29	80%	59%
	no valid grades reported	2.06	88%	4.05	31%	29%	3.27	31%	18%
Duration of CC Attendance (excluding winter intersessions)	1 semester	1.83	94%	0.01	28%	0%	----------	13%	0%
	2-3 semesters	1.73	97%	1.22	44%	24%	0.86	27%	5%
	4-6 semesters	1.66	98%	1.76	59%	54%	1.62	50%	24%
	7-9 semesters	1.57	99%	1.77	71%	78%	1.77	75%	54%
	10-12 semesters	1.60	99%	1.88	72%	88%	2.12	86%	69%
	> 12 semesters	1.70	98%	2.21	72%	92%	2.22	91%	77%
Academic Outcome	transfer with credential	1.44	99%	0.98	86%	98%	1.15	99%	96%
	transfer without credential	1.46	99%	1.06	74%	79%	1.35	82%	68%
	academic associate's degree	1.49	99%	1.34	85%	96%	1.69	99%	90%
	vocational associate's degree	1.53	99%	2.25	84%	81%	1.92	96%	61%
	certificate	1.78	98%	3.04	68%	59%	2.58	64%	29%
	no credential & no transfer	1.74	98%	1.81	53%	51%	2.18	48%	24%

Table 14: Remedial Writing Sequence Course-Taking Pattern Means, from Regression: Student Course-Taking Patterns

Fall 2002 First-Time Students		Mean Level of First Writing	% Attempted at least 3 Units in First Writing	Mean Delay of First Writing	% Passed First Writing on First Try (includes ungraded as passing)	% Attempted Second (More Advanced) Writing Course	Mean Delay of Second (More Advanced) Writing Course	% Completed Level 1 or Higher Writing Course	% Completed College Composition or Higher
First Nonvoc Writing Course Attempted	college-level composition or higher		----------	----------	----------	----------	----------	----------	----------
	transferrable (below college comp)		----------	----------	----------	----------	----------	----------	----------
	one level below college composition		100%	1.53	63%	62%	2.01	76%	50%
	two levels below college composition		99%	1.71	60%	63%	1.64	49%	34%
	three levels below college composition		95%	1.85	58%	57%	1.76	32%	21%
	four levels below college composition		70%	2.22	58%	50%	1.78	23%	14%
	five levels below college composition		100%	1.36	59%	73%	1.79	44%	32%
	vocational writing only or no writing		----------	----------	----------	----------	----------	----------	----------
Units Attempted in First Writing	< 3 units			1.90	56%	31%	2.82	23%	14%
	3+ units			1.64	61%	62%	1.84	61%	41%
Term of First Remedial Writing Course	Fall 2002				62%	64%	1.70	63%	43%
	Spring 2003				58%	61%	2.50	59%	39%
	Summer 2003				74%	70%	1.45	71%	48%
	Fall 2003				58%	60%	1.73	59%	39%
	Spring 2004				60%	56%	2.47	55%	36%
	after Spring 2004				60%	51%	1.41	54%	31%
Grade in First Remedial Writing Course	A					82%	0.94	88%	67%
	B					82%	1.05	87%	60%
	C					77%	1.32	81%	47%
	D					46%	3.90	41%	28%
	F					30%	5.07	25%	15%
	Credit					81%	1.15	73%	51%
	No Credit					37%	3.85	27%	17%
	Withdrawal					28%	5.20	24%	15%
	Ungraded					25%	5.85	43%	13%
	missing/undetermined					31%	4.12	26%	17%
	passed					80%	1.14	82%	55%
	did not pass					33%	4.57	28%	18%
Attempted Second Writing Course	attempted							85%	65%
	did not attempt							21%	0%
Delay of Second Writing Course	no delay							87%	69%
	1 semester							86%	68%
	2 semesters							84%	63%
	3 semesters							83%	61%
	>3 semesters							80%	55%
	no second writing course							21%	0%
Highest Writing Course Completed	college-level composition or higher	1.44	99%	1.29	83%	100%	1.64		
	transferrable (below college comp)	1.63	99%	1.25	68%	100%	3.02		
	one level below college	1.41	99%	1.88	81%	59%	2.15		
	two levels below college	2.16	97%	1.89	81%	56%	1.88		
	three levels below college	3.02	96%	2.12	83%	44%	1.82		
	four levels below college	3.93	54%	2.21	86%	30%	1.93		
	five levels below college	5.00	100%	0.97	88%	44%	2.80		
	voc writing or did not pass any writing	1.74	97%	1.87	0%	8%	4.01		

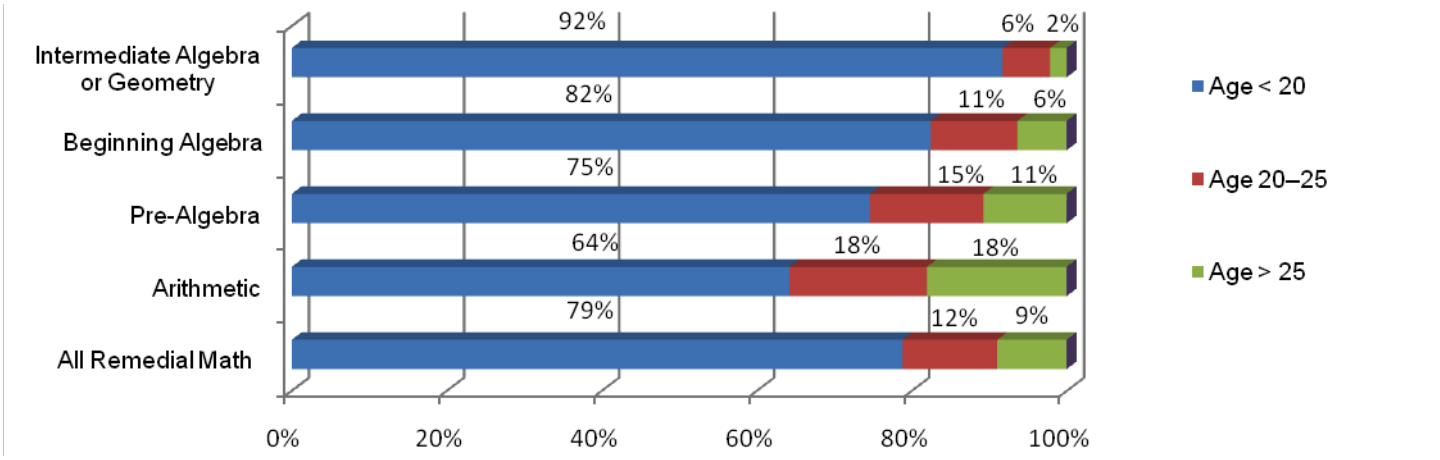
Appendix Six: Variation among Students Who Enrolled in Remedial Mathematics and Writing Sequences, Depending on Starting Level

Note: See Appendix Five, Tables 3-5 and 9-11, for supporting descriptive data.

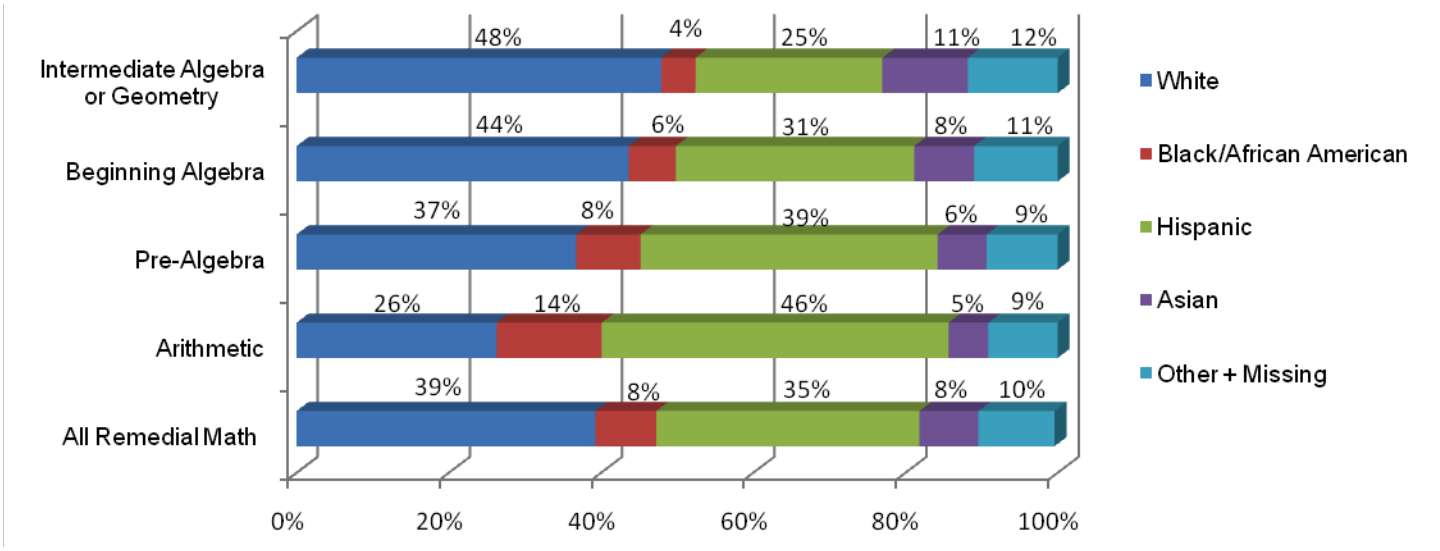
Figure 1: Selected Descriptive Charts, Fall 2002 cohort

Student characteristics and outcomes in the *remedial mathematics sequence*: It depends on where you start

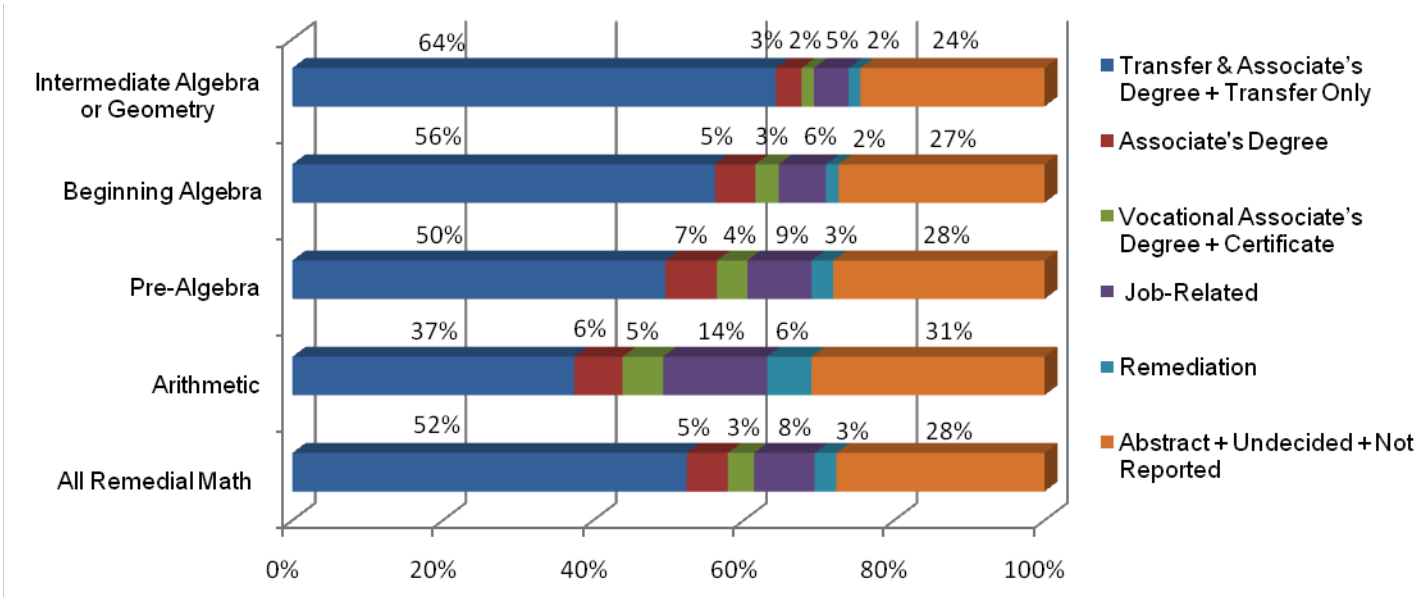
1A. Age (at the time of college entry) of students who enrolled in the remedial mathematics sequence, by starting level and overall



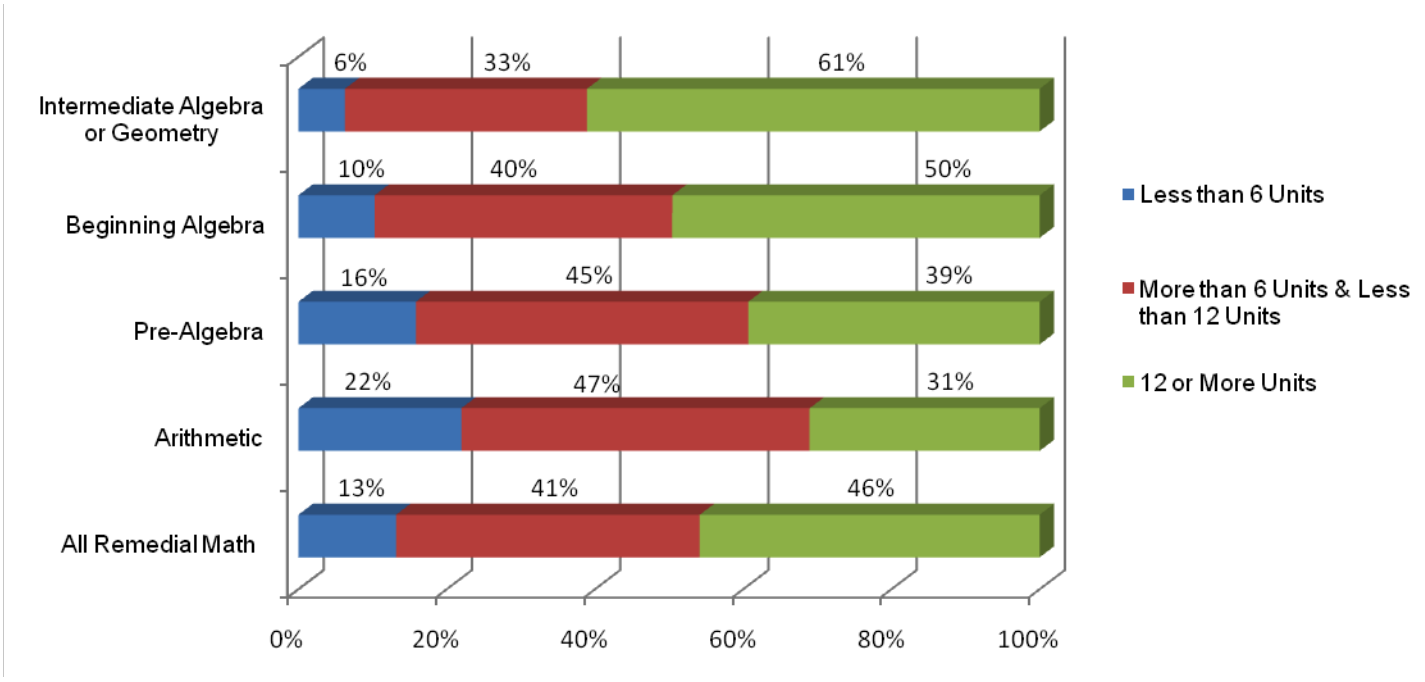
1B. Race/ethnicity of students who enrolled in the remedial mathematics sequence, by starting level and overall



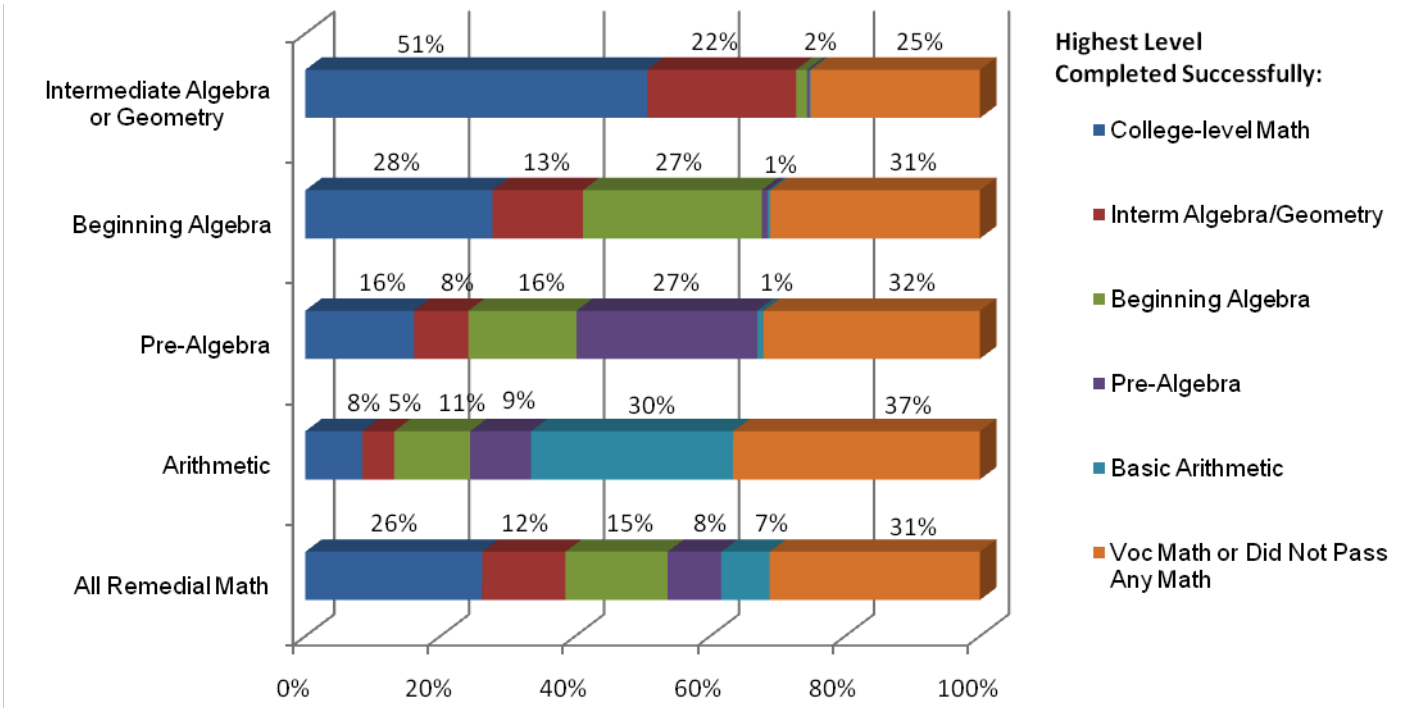
1C. Academic goals of students who enrolled in the remedial mathematics sequence, by starting level and overall



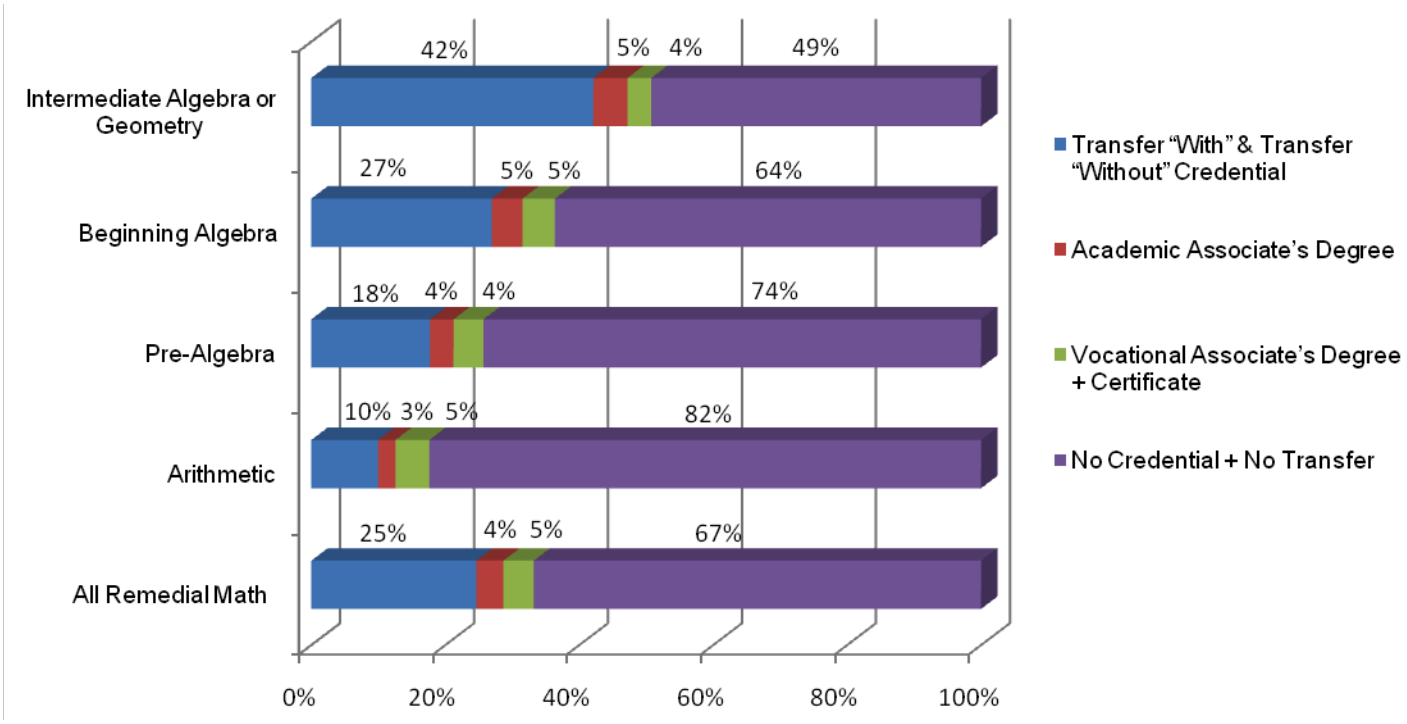
1D. Average first-year unit loads of students who enrolled in the remedial mathematics sequence, by starting level and overall



1E. Highest mathematics course completed by students who enrolled in the remedial mathematics sequence, by starting level and overall



1F. Ultimate academic outcomes of students who enrolled in the remedial mathematics sequence, by starting level and overall

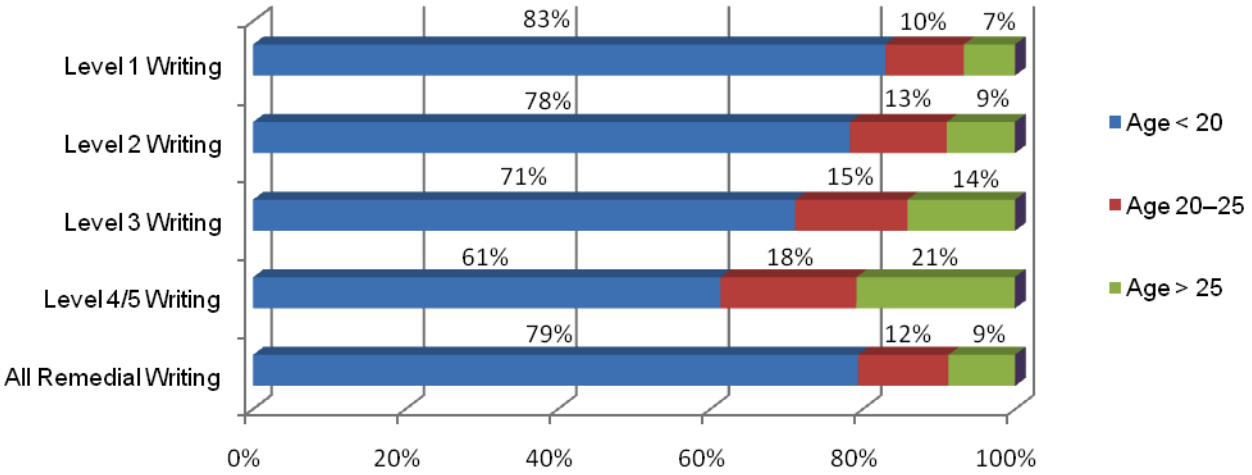


Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10

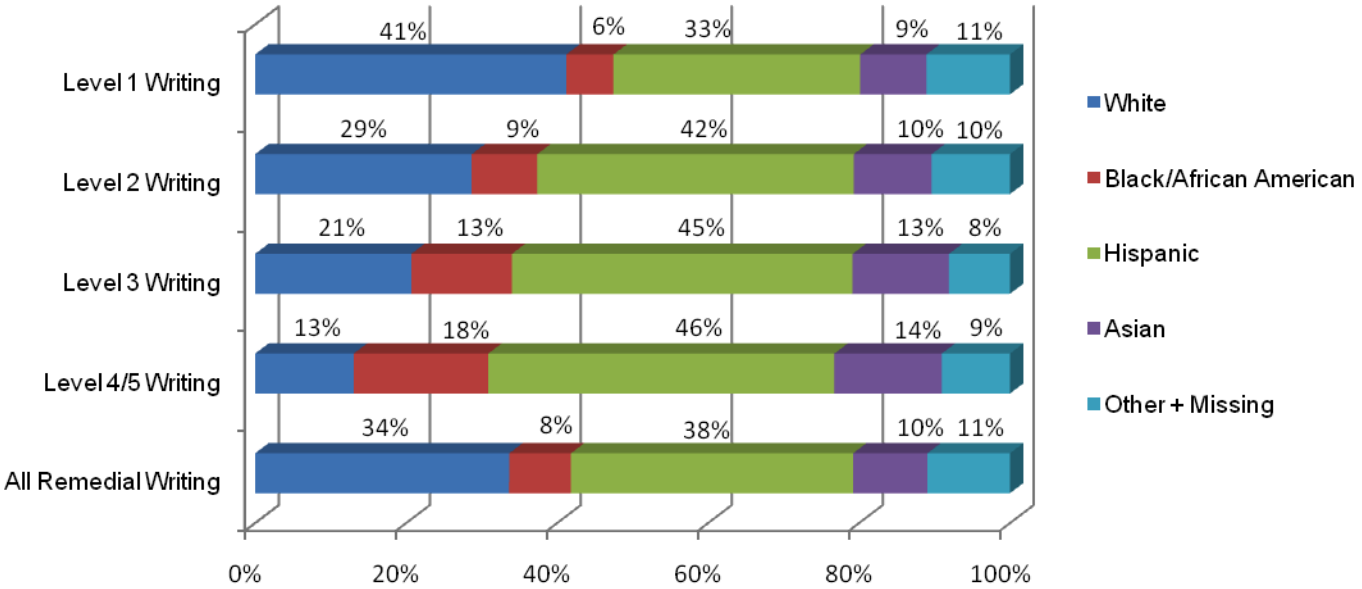
Figure 2: Selected Descriptive Charts (Fall 2002 cohort)

Student characteristics and outcomes in the *remedial writing sequence*: It depends on where you start

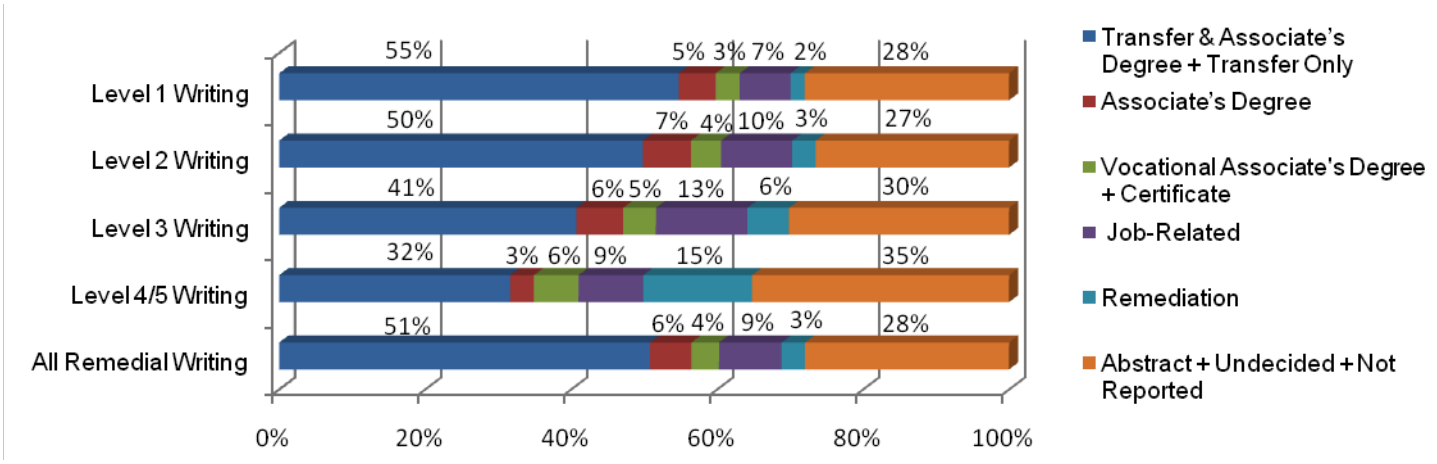
2A. Age (at the time of college entry) of students who enrolled in the remedial writing sequence, by starting level and overall



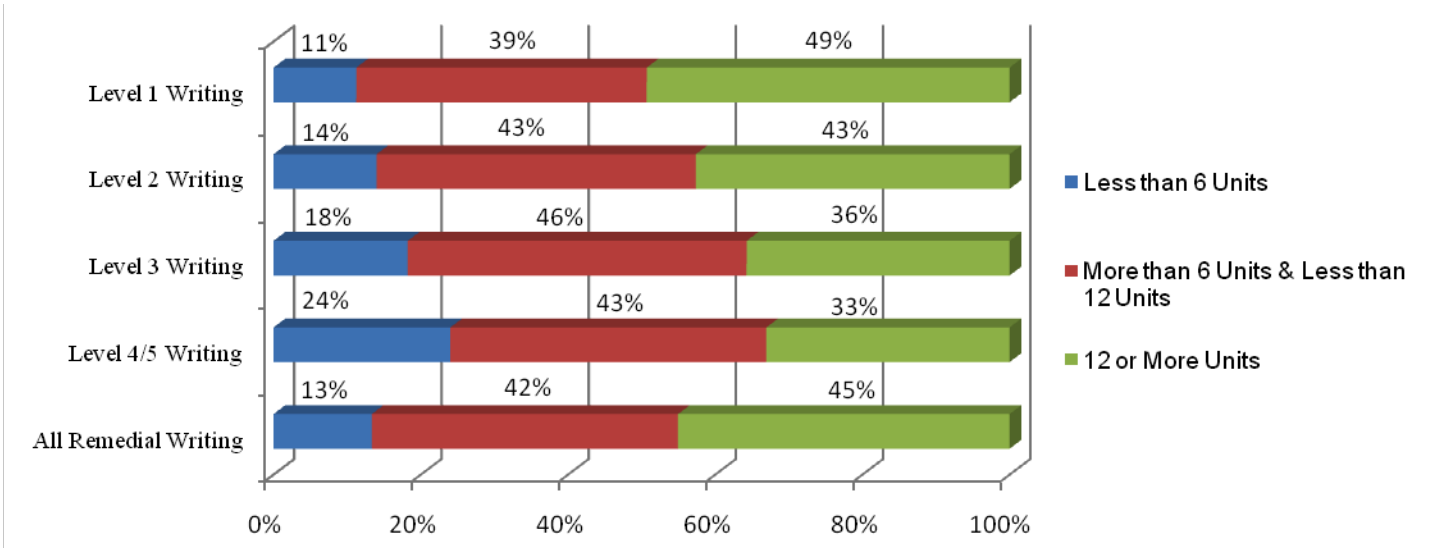
2B. Race/ethnicity of students who enrolled in the remedial writing sequence, by starting level and overall



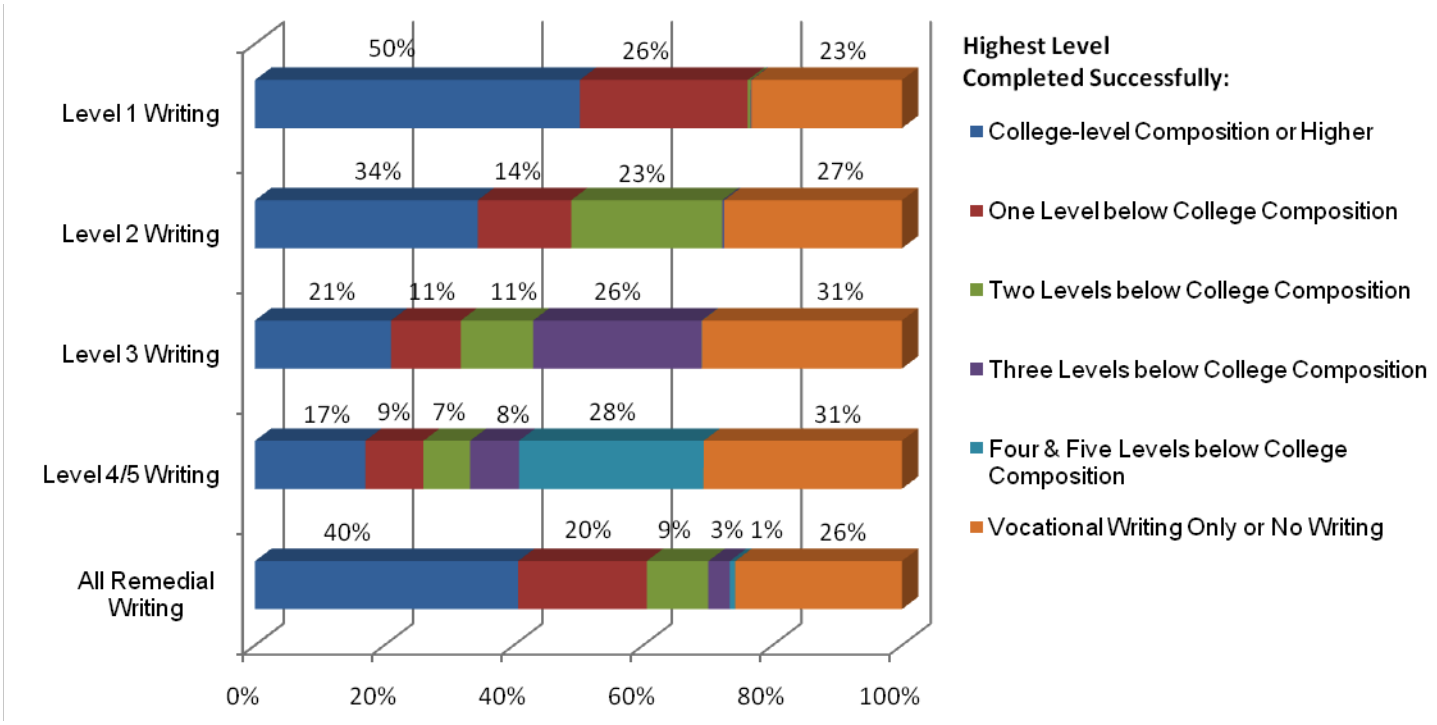
2C. Academic goals of students who enrolled in the remedial writing sequence, by starting level and overall



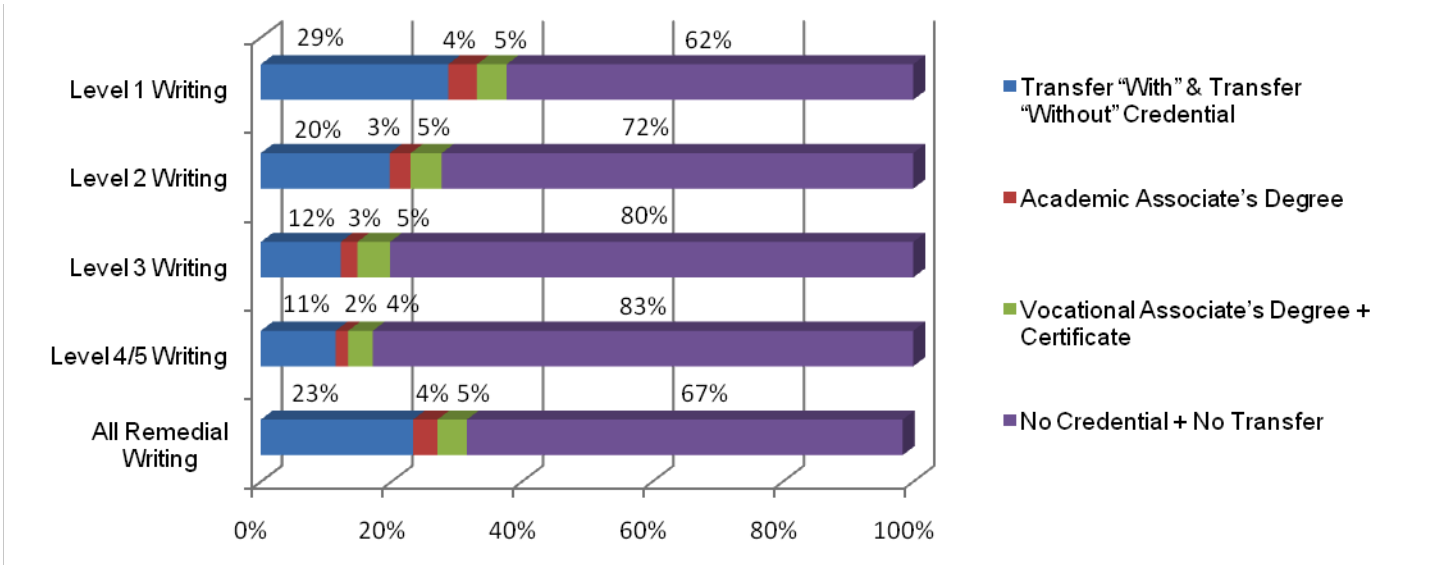
2D. Average first-year unit loads of students who enrolled in the remedial writing sequence, by starting level and overall



2E. Highest writing course completed by students who enrolled in the remedial writing sequence, by starting level and overall



2F. Ultimate academic outcomes of students who enrolled in the remedial writing sequence, by starting level and overall



Data: Student course enrollment records provided by CCC Chancellor's Office Management Information System (COMIS) matched with course listings, descriptions, and prerequisites from the 2002–03 through 2008–09 course catalogs of the colleges. EdSource 6/10

Appendix Seven: Regression Tables

List of Tables

Table 13: Multinomial logistic regression analysis of various long-term credential and transfer outcomes on remedial math course-taking, math attainment, and selected other variables, for those remedial math students who attempted a second math course and remained in the system for at least 10 semesters (N = 12,294; excluded outcome = no credential and no transfer)

Table 14: Multinomial logistic regression analysis of various long-term credential and transfer outcomes on remedial writing course-taking, writing attainment, and selected other variables, for those remedial writing students who attempted a second writing course and remained in the system for at least 10 semesters (N = 10,376; excluded outcome = no credential and no transfer)

Table 1: Logistic regression analysis of delaying (or not) the first remedial math course, among those students who attempted at least one remedial math course

	Model #	1-1	1-2	1-3	1-4	1-5	1-6
	Duration of Attendance (semesters)	2-3	4-6	7-9	10-12	13+	2+
	N	8,204	12,314	11,561	8,257	6,575	46,911
	pseudo r^2	0.06	0.08	0.10	0.10	0.12	0.09
Level of First Math	interm alg/geom	ref	ref	ref	ref	ref	ref
	beg algebra	0.12	0.13*	-0.08	-0.05	-0.04	0.01
	pre-algebra	0.25*	0.19*	0.04	0.06	0.07	0.12*
	arithmetic	0.15	0.19*	-0.05	0.00	0.02	0.05
Avg Course Unit Load	0.000-5.999	1.34*	1.89*	2.22*	2.47*	2.45*	1.96*
	6.000-8.999	0.65*	0.97*	1.27*	1.28*	1.33*	1.11*
	9.000-11.999	0.27*	0.52*	0.67*	0.69*	0.71*	0.61*
	> 11.999	ref	ref	ref	ref	ref	ref
Course Success Ratio	0.000-0.249	-0.24*	-0.25*	0.09	-0.04	0.02	-0.10*
	0.250-0.499	-0.34*	-0.34*	-0.05	-0.21*	-0.19*	-0.21*
	0.500-0.749	-0.24*	-0.20*	-0.03	-0.19*	-0.21*	-0.15*
	> 0.749	ref	ref	ref	ref	ref	ref
Duration of Attendance	2-3 sem	----------	----------	----------	----------	----------	-1.04*
	4-6 sem	----------	----------	----------	----------	----------	-0.38*
	7-9 sem	----------	----------	----------	----------	----------	-0.23*
	10-12 sem	----------	----------	----------	----------	----------	-0.08*
	> 12 sem	----------	----------	----------	----------	----------	ref
Age at College Entry	< 20	ref	ref	ref	ref	ref	ref
	20-25	0.04	0.05	0.38*	0.24*	0.20	0.17*
	>25	0.04	0.15	0.55*	0.50*	0.40*	0.30*
Race/Ethnicity	White	ref	ref	ref	ref	ref	ref
	Black	0.19*	0.18*	0.11	0.06	0.05	0.12*
	Hispanic	0.01	-0.07	-0.08	-0.20*	-0.21*	-0.11*
	Asian	0.15	0.07	-0.13	-0.02	0.15	0.02
	Other	-0.15	-0.10	-0.23*	-0.13	-0.29*	-0.19*
	missing	-0.04	0.16	0.05	0.05	0.24	0.08
Sex	female	0.02	-0.10*	-0.06	-0.02	-0.06	-0.05*
Citizenship	U.S. citizen	ref	ref	ref	ref	ref	ref
	not U.S.	-0.02	0.10	0.02	0.01	0.08	0.06
	missing	-0.17	-0.06	-0.48*	-0.22	0.21	-0.18*
Academic Goal	transfer + AS/AA	ref	ref	ref	ref	ref	ref
	transfer only	0.10	0.05	0.08	0.10	0.01	0.07*
	acad AS/AA	0.00	0.09	0.13	0.23*	0.14	0.12*
	voc AS/AA	-0.03	0.29*	0.25	-0.03	0.12	0.16*

	certificate	0.30	0.31*	0.65*	0.41*	0.35	0.41*
	other job-related	0.16	0.27*	0.41*	0.30*	0.26*	0.30*
	abstract	0.25*	0.29*	0.06	0.09	0.16	0.19*
	remediation	-0.08	-0.06	0.20	0.51*	0.65*	0.17*
	undecided	0.04	0.00	0.02	0.15*	-0.06	0.03
	not reported	0.24*	-0.25	-0.05	0.39*	0.71*	0.12
Fee Waiver	received	0.02	0.13*	0.06	0.06	0.00	0.06*
% BA+ in Zip Code	< 12.50%	ref	ref	ref	ref	ref	ref
	12.50% - 24.99%	-0.22*	-0.10*	-0.10	-0.08	-0.22*	-0.13*
	25.00% - 37.49%	-0.22*	-0.02	-0.09	-0.22*	-0.29*	-0.15*
	> 37.49%	-0.33*	-0.07	-0.17*	-0.19*	-0.28*	-0.19*
	missing	-0.16	0.03	0.11	0.00	-0.20	-0.01
Constant		-0.87*	-0.64*	-0.56*	-0.37*	-0.14	-0.23*

Notes:
1. "ref" is the referent or comparison category for a given set of dummy variables.
2. * indicates that the coefficient is statistically significant at the $p \leq 0.05$ level or greater (i.e., no distinction is made between $p \leq 0.05$, $p \leq 0.01$, or $p \leq 0.001$).

Table 2: Logistic regression analysis of delaying (or not) the first remedial writing course, among those students who attempted at least one remedial writing course

	Model #	2-1	2-2	2-3	2-4	2-5	2-6
Duration of Attendance (semesters)		2-3	4-6	7-9	10-12	13+	2+
	N	6,539	9,537	8,538	6,293	5,242	36,149
	pseudo r^2	0.06	0.09	0.11	0.13	0.13	0.10
Level of First Writing	level 1	ref	ref	ref	ref	ref	ref
	level 2	0.15*	0.04	-0.07	-0.02	0.03	0.03
	level 3	0.13	0.17*	0.18*	0.11	0.26*	0.16*
	level 4/5	-0.11	-0.16	-0.31	0.34	0.58*	0.01
Avg Course Unit Load	0.000-5.999	1.48*	2.03*	2.33*	2.79*	2.35*	2.07*
	6.000-8.999	0.68*	0.93*	1.13*	1.26*	1.23*	1.05*
	9.000-11.999	0.20*	0.51*	0.52*	0.67*	0.61*	0.53*
	> 11.999	ref	ref	ref	ref	ref	ref
Course Success Ratio	0.000-0.249	-0.09	0.08	0.31*	0.25*	0.14	0.12*
	0.250-0.499	-0.11	-0.02	0.10	0.21*	-0.07	0.03
	0.500-0.749	-0.09	0.05	-0.04	0.01	-0.14*	-0.03
	> 0.749	ref	ref	ref	ref	ref	ref
Duration of Attendance	2-3 sem	----------	----------	----------	----------	----------	-1.03*
	4-6 sem	----------	----------	----------	----------	----------	-0.38*
	7-9 sem	----------	----------	----------	----------	----------	-0.24*
	10-12 sem	----------	----------	----------	----------	----------	-0.12*
	> 12 sem	----------	----------	----------	----------	----------	ref
Age at College Entry	< 20	ref	ref	ref	ref	ref	ref
	20-25	0.12	0.24*	0.58*	0.43*	0.43*	0.33*
	>25	0.15	0.56*	0.58*	1.01*	0.89*	0.56*
Race/Ethnicity	White	ref	ref	ref	ref	ref	ref
	Black	0.23*	0.26*	0.24*	0.02	0.46*	0.23*
	Hispanic	0.00	-0.08	-0.01	-0.11	-0.05	-0.06*
	Asian	0.09	0.17	0.25*	0.06	0.08	0.13*
	Other	0.16	-0.02	0.03	-0.28*	-0.26*	-0.08
	missing	0.07	-0.04	0.03	0.16	0.14	0.04
Sex	female	-0.09	-0.17*	-0.11*	-0.14*	-0.13*	-0.13*
Citizenship	U.S. citizen	ref	ref	ref	ref	ref	ref
	not U.S.	-0.09	0.21*	0.18*	0.35*	0.39*	0.23*
	missing	0.14	0.14	-0.27	-0.23	0.13	0.04
Academic Goal	transfer + AS/AA	ref	ref	ref	ref	ref	ref
	transfer only	0.16	-0.05	-0.02	-0.05	0.10	0.01
	acad AS/AA	-0.02	-0.08	0.02	0.13	0.29*	0.04
	voc AS/AA	0.13	0.14	0.41*	-0.12	-0.10	0.13
	certificate	0.34	0.16	0.45*	0.33	0.62*	0.36*
	other job-related	0.32*	0.24*	0.12	-0.04	0.26*	0.20*

	abstract	-0.01	0.12	0.16	0.12	-0.04	0.08
	remediation	0.12	0.23	0.39*	0.54*	0.36	0.27*
	undecided	0.09	0.11	-0.04	-0.04	0.08	0.05
	not reported	0.10	-0.19	0.04	-0.07	0.44	0.02
Fee Waiver	received	0.02	0.11*	0.00	0.06	-0.05	0.04
% BA+ in Zip Code	< 12.50%	ref	ref	ref	ref	ref	ref
	12.50% - 24.99%	-0.16*	0.00	-0.07	-0.07	-0.05	-0.07*
	25.00% - 37.49%	-0.03	0.04	-0.01	-0.05	0.01	-0.01
	> 37.49%	-0.30*	-0.03	-0.22*	-0.09	-0.04	-0.14*
	missing	0.32*	0.22	0.16	0.05	-0.32	0.17*
Constant		-1.11*	-0.95*	-0.83*	-0.78*	-0.68*	-0.56*

Notes:
1. "ref" is the referent or comparison category for a given set of dummy variables.
2. * indicates that the coefficient is statistically significant at the $p \leq 0.05$ level or greater (i.e., no distinction is made between $p \leq 0.05$, $p \leq 0.01$, or $p \leq 0.001$).

Table 3: Logistic regression analysis of passing (or not) the first remedial math course on the first attempt

	Model #	3-1	3-2	3-3	3-4	3-5	3-6
	Duration of Attendance (semesters)	2-3	4-6	7-9	10-12	13+	2+
	N	8,204	12,314	11,561	8,257	6,575	46,911
	pseudo r^2	0.24	0.20	0.15	0.13	0.12	0.18
Level of First Math	interm alg/geom	ref	ref	ref	ref	ref	ref
	beg algebra	0.19*	0.10	0.18*	0.26*	0.18*	0.16*
	pre-algebra	0.48*	0.46*	0.45*	0.75*	0.53*	0.50*
	arithmetic	0.51*	0.43*	0.35*	0.69*	0.69*	0.49*
Units in First Math	3+ units	-0.45*	-0.34*	-0.10	-0.26*	0.07	-0.24*
Term of First Math	Fall 2002	ref	ref	ref	ref	ref	ref
	Spring 2003	-0.85*	-0.38*	-0.29*	-0.21*	-0.25*	-0.39*
	Summer 2003	-0.44	-0.10	0.16	-0.22	0.31	-0.05
	Fall 2003	-1.45*	-0.63*	-0.38*	-0.34*	-0.22*	-0.52*
	Spring 2004	-1.61*	-0.74*	-0.34*	-0.26*	-0.24*	-0.52*
	> Spring 2004	-0.53*	-0.16*	0.08	0.13	0.05	-0.03
Avg Course Unit Load	0.000-5.999	-0.28*	-0.38*	-0.34*	-0.35*	-0.14	-0.31*
	6.000-8.999	-0.01	-0.15*	-0.17*	-0.10	-0.07	-0.10*
	9.000-11.999	0.00	-0.27*	-0.03	-0.02	-0.14*	-0.10*
	> 11.999	ref	ref	ref	ref	ref	ref
Course Success Ratio	0.000-0.249	-3.52*	-2.81*	-2.26*	-2.17*	-2.13*	-2.65*
	0.250-0.499	-2.35*	-2.26*	-2.22*	-1.85*	-1.65*	-2.07*
	0.500-0.749	-1.40*	-1.42*	-1.41*	-1.17*	-1.10*	-1.30*
	> 0.749	ref	ref	ref	ref	ref	ref
Duration of Attendance	2-3 sem	----------	----------	----------	----------	----------	-0.44*
	4-6 sem	----------	----------	----------	----------	----------	-0.23*
	7-9 sem	----------	----------	----------	----------	----------	0.03
	10-12 sem	----------	----------	----------	----------	----------	0.01
	> 12 sem	----------	----------	----------	----------	----------	ref
Age at College Entry	< 20	ref	ref	ref	ref	ref	ref
	20-25	0.29*	0.38*	0.33*	0.36*	0.21*	0.32*
	>25	0.37*	0.33*	0.20*	0.47*	0.43*	0.36*
Race/Ethnicity	White	ref	ref	ref	ref	ref	ref
	Black	-0.57*	-0.57*	-0.62*	-0.45*	-0.48*	-0.55*
	Hispanic	-0.10	-0.25*	-0.13*	-0.11	-0.18*	-0.17*
	Asian	0.06	0.04	0.02	0.25*	0.21*	0.11*
	Other	-0.04	-0.13	0.06	0.02	0.40*	0.03
	missing	-0.06	-0.06	-0.24*	0.09	-0.06	-0.08
Sex	female	0.11*	0.23*	0.20*	0.18*	0.07	0.17*
Citizenship	U.S. citizen	ref	ref	ref	ref	ref	ref
	not U.S.	-0.14	0.10	0.19*	0.27*	0.25*	0.14*

	missing	0.18	0.16	0.01	0.71*	0.35	0.21*
Academic Goal	transfer + AS/AA	ref	ref	ref	ref	ref	ref
	transfer only	0.07	0.07	0.11	0.03	-0.04	0.06
	acad AS/AA	0.08	-0.11	-0.15	-0.13	0.12	-0.06
	voc AS/AA	0.30	-0.21	0.29	-0.38*	-0.12	-0.05
	certificate	0.28	-0.34*	-0.41*	-0.41*	-0.37	-0.26*
	other job-related	0.02	-0.15	-0.09	-0.26*	-0.11	-0.12*
	abstract	-0.03	-0.06	0.07	0.24	-0.12	0.01
	remediation	0.08	-0.30*	-0.32*	-0.02	-0.14	-0.14*
	undecided	0.01	0.01	0.11	0.05	-0.05	0.03
	not reported	0.11	0.04	0.30	0.08	0.45	0.15*
Fee Waiver	received	-0.16*	-0.05	-0.11*	-0.14*	-0.08	-0.11*
% BA+ in Zip Code	< 12.50%	ref	ref	ref	ref	ref	ref
	12.50% - 24.99%	0.07	0.01	0.02	0.06	0.10	0.04
	25.00% - 37.49%	0.00	0.02	0.01	0.04	0.08	0.03
	> 37.49%	0.04	0.04	0.00	-0.01	0.01	0.02
	missing	0.23	0.05	0.11	-0.10	-0.21	0.05
Constant		1.49*	1.46*	1.22*	1.01*	0.75*	1.35*

Notes:
1. "ref" is the referent or comparison category for a given set of dummy variables.
2. * indicates that the coefficient is statistically significant at the $p \leq 0.05$ level or greater (i.e., no distinction is made between $p \leq 0.05$, $p \leq 0.01$, or $p \leq 0.001$).

Table 4: Logistic regression analysis of passing (or not) the first remedial writing course on the first attempt

	Model #	4-1	4-2	4-3	4-4	4-5	4-6
	Duration of Attendance (semesters)	2-3	4-6	7-9	10-12	13+	2+
	N	6,539	9,537	8,538	6,293	5,242	36,149
	pseudo r^2	0.27	0.21	0.18	0.16	0.12	0.21
Level of First Writing	level 1	ref	ref	ref	ref	ref	ref
	level 2	0.01	-0.01	0.12	0.14	0.14	0.06*
	level 3	0.08	0.16*	0.16	0.23*	0.20	0.15*
	level 4/5	0.18	0.31*	0.11	0.25	0.25	0.22*
Term of First Writing	Fall 2002	ref	ref	ref	ref	ref	ref
	Spring 2003	-1.04*	-0.50*	-0.36*	-0.14	-0.34*	-0.49*
	Summer 2003	0.26	-0.06	0.17	0.19	-0.04	0.02
	Fall 2003	-1.64*	-0.78*	-0.37*	-0.01	-0.07	-0.54*
	Spring 2004	-1.44*	-0.66*	-0.21	-0.27	0.26	-0.42*
	> Spring 2004	-0.93*	-0.06	0.02	0.16	0.07	-0.10*
Avg Course Unit Load	0.000-5.999	-0.44*	-0.45*	-0.50*	-0.46*	-0.20	-0.41*
	6.000-8.999	-0.36*	-0.33*	-0.33*	-0.26*	-0.14	-0.27*
	9.000-11.999	-0.16*	-0.13*	-0.15*	-0.13	-0.04	-0.10*
	> 11.999	ref	ref	ref	ref	ref	ref
Course Success Ratio	0.000-0.249	-3.84*	-3.09*	-2.71*	-2.64*	-2.46*	-3.00*
	0.250-0.499	-2.36*	-2.31*	-2.19*	-2.37*	-2.02*	-2.21*
	0.500-0.749	-1.26*	-1.24*	-1.32*	-1.32*	-1.13*	-1.23*
	> 0.749	ref	ref	ref	ref	ref	ref
Duration of Attendance	2-3 sem	----------	----------	----------	----------	----------	-0.63*
	4-6 sem	----------	----------	----------	----------	----------	-0.31*
	7-9 sem	----------	----------	----------	----------	----------	-0.04
	10-12 sem	----------	----------	----------	----------	----------	0.00
	> 12 sem	----------	----------	----------	----------	----------	ref
Age at College Entry	< 20	ref	ref	ref	ref	ref	ref
	20-25	0.10	0.01	0.08	-0.03	-0.13	0.03
	>25	0.27*	0.15	0.13	0.00	-0.24	0.11*
Race/Ethnicity	White	ref	ref	ref	ref	ref	ref
	Black	-0.49*	-0.48*	-0.43*	-0.20	-0.14	-0.38*
	Hispanic	0.03	-0.14*	-0.09	0.05	-0.18	-0.08*
	Asian	0.06	-0.16	-0.20*	-0.42*	-0.51*	-0.27*
	Other	-0.05	-0.01	-0.23*	-0.20	0.08	-0.09
	missing	0.04	0.13	0.02	-0.05	0.18	0.07
Sex	female	0.26*	0.30*	0.37*	0.40*	0.20*	0.31*
Citizenship	U.S. citizen	ref	ref	ref	ref	ref	ref
	not U.S.	-0.18	-0.17*	-0.16	-0.13	-0.34*	-0.19*
	missing	0.13	0.13	-0.10	0.20	0.24	0.07

Academic Goal	transfer + AS/AA	ref	ref	ref	ref	ref	ref
	transfer only	0.02	0.05	-0.04	-0.14	-0.03	-0.02
	acad AS/AA	-0.20	-0.07	0.03	-0.15	0.24	-0.05
	voc AS/AA	-0.25	0.00	-0.57*	-0.19	-0.45*	-0.27*
	certificate	-0.17	-0.19	-0.35	-0.20	0.05	-0.20
	other job-related	-0.19	-0.23*	-0.15	-0.23	-0.03	-0.20*
	abstract	-0.30*	0.02	-0.09	-0.32*	0.06	-0.12*
	remediation	-0.29	-0.62*	-0.42*	-0.82*	-0.22	-0.49*
	undecided	0.15	-0.12	-0.08	-0.08	0.00	-0.05
	not reported	0.34*	0.31*	-0.10	0.22	-0.78*	0.12
Fee Waiver	received	-0.16*	0.01	-0.13*	-0.12	-0.03	-0.08*
% BA+ in Zip Code	< 12.50%	ref	ref	ref	ref	ref	ref
	12.50% - 24.99%	0.13	0.13*	0.05	0.04	0.14	0.10*
	25.00% - 37.49%	0.18	0.13	0.04	0.06	0.13	0.10*
	> 37.49%	0.32*	0.40*	0.24*	0.18	0.14	0.27*
	missing	0.14	0.49*	0.05	-0.04	-0.03	0.16*
Constant		1.84*	1.83*	2.04*	1.98*	1.88*	2.09*

Notes:
1. "ref" is the referent or comparison category for a given set of dummy variables.
2. * indicates that the coefficient is statistically significant at the $p \leq 0.05$ level or greater (i.e., no distinction is made between $p \leq 0.05$, $p \leq 0.01$, or $p \leq 0.001$).

Table 5: Logistic regression analysis of attempting (or not) a second (more advanced) math course

	Model #	5-1	5-2	5-3	5-4	5-5	5-6
	Duration of Attendance (semesters)	2-3	4-6	7-9	10-12	13+	2+
	N	8,204	12,314	11,561	8,257	6,575	46,911
	pseudo r^2	0.34	0.30	0.26	0.19	0.16	0.38
Level of First Math	interm alg/geom	ref	ref	ref	ref	ref	ref
	beg algebra	0.34*	0.08	-0.20*	-0.04	0.30*	0.01
	pre-algebra	0.95*	0.61*	0.33*	0.56*	1.10*	0.57*
	arithmetic	0.80*	0.62*	0.23*	0.49*	1.02*	0.52*
Units in First Math	3+ units	0.97*	0.83*	0.80*	0.56*	0.36*	0.73*
Term of First Math	Fall 2002	ref	ref	ref	ref	ref	ref
	Spring 2003	-1.79*	-0.54*	-0.31*	-0.39*	-0.04	-0.58*
	Summer 2003	-3.07*	-0.46*	-0.47*	-0.37	0.37	-0.51*
	Fall 2003	-1.71*	-0.85*	-0.63*	-0.40*	-0.45*	-0.74*
	Spring 2004	-2.06*	-1.44*	-0.80*	-0.65*	-0.56*	-1.04*
	> Spring 2004	-1.86*	-1.31*	-1.27*	-1.27*	-1.12*	-1.40*
Grade in First Math	passed	2.82*	2.35*	2.06*	1.74*	1.60*	2.15*
Avg Course Unit Load	0.000-5.999	-0.95*	-0.68*	-0.62*	-0.39*	-0.59*	-0.65*
	6.000-8.999	-0.67*	-0.71*	-0.59*	-0.40*	-0.28*	-0.56*
	9.000-11.999	-0.37*	-0.47*	-0.51*	-0.34*	-0.34*	-0.43*
	> 11.999	ref	ref	ref	ref	ref	ref
Course Success Ratio	0.000-0.249	-0.21	-0.48*	-0.50*	-0.68*	0.06	-0.50*
	0.250-0.499	-0.24*	-0.66*	-0.85*	-0.63*	-0.15	-0.61*
	0.500-0.749	-0.11	-0.48*	-0.40*	-0.38*	0.01	-0.34*
	> 0.749	ref	ref	ref	ref	ref	ref
Duration of Attendance	2-3 sem	----------	----------	----------	----------	----------	-3.98*
	4-6 sem	----------	----------	----------	----------	----------	-2.63*
	7-9 sem	----------	----------	----------	----------	----------	-1.49*
	10-12 sem	----------	----------	----------	----------	----------	-0.75*
	> 12 sem	----------	----------	----------	----------	----------	ref
Age at College Entry	< 20	ref	ref	ref	ref	ref	ref
	20-25	0.06	-0.08	-0.17*	-0.19	-0.25	-0.10*
	>25	-0.18	-0.53*	-0.60*	-0.92*	-0.75*	-0.60*
Race/Ethnicity	White	ref	ref	ref	ref	ref	ref
	Black	-0.11	-0.16	-0.44*	-0.18	-0.20	-0.25*
	Hispanic	0.00	-0.17*	-0.15*	0.09	0.21*	-0.06
	Asian	-0.01	0.04	-0.18	0.16	0.53*	0.04
	Other	-0.01	-0.11	-0.34*	-0.17	0.34	-0.13*
	missing	0.21	0.11	-0.10	0.26	0.24	0.09
Sex	female	0.21*	0.11*	0.16*	0.11	0.14	0.12*
Citizenship	U.S. citizen	ref	ref	ref	ref	ref	ref

	not U.S.	0.32*	0.00	-0.13	-0.02	-0.02	-0.02
	missing	0.29	0.12	0.08	-0.09	0.42	0.19
Academic Goal	transfer + AS/AA	ref	ref	ref	ref	ref	ref
	transfer only	0.14	0.26*	0.02	-0.14	-0.21	0.06
	acad AS/AA	-0.15	-0.35*	-0.53*	-0.80*	-0.57*	-0.46*
	voc AS/AA	-0.52*	-0.47*	-1.10*	-0.83*	-0.96*	-0.77*
	certificate	-0.80*	-0.28	-1.09*	-0.08	-0.50	-0.55*
	other job-related	-0.42*	-0.38*	-0.54*	-0.44*	-0.40*	-0.43*
	abstract	-0.40*	-0.21*	-0.27*	-0.42*	-0.43*	-0.30*
	remediation	-0.80*	-0.60*	-0.52*	-0.61*	-0.48*	-0.60*
	undecided	-0.23*	-0.09	-0.19*	-0.16	-0.22*	-0.15*
	not reported	0.08	0.12	-0.08	-0.61*	0.01	-0.07
Fee Waiver	received	-0.05	-0.13*	-0.07	-0.04	-0.05	-0.07*
% BA+ in Zip Code	< 12.50%	ref	ref	ref	ref	ref	ref
	12.50% - 24.99%	0.18	0.01	-0.03	0.24*	0.23*	0.09*
	25.00% - 37.49%	0.12	0.12	0.02	0.30*	0.34*	0.15*
	> 37.49%	0.27*	0.14	0.25*	0.42*	0.33*	0.26*
	missing	0.22	0.02	0.09	0.60*	0.29	0.18*
Constant		-3.68*	-1.32*	0.25	0.72*	0.81*	1.43*

Notes:
1. "ref" is the referent or comparison category for a given set of dummy variables.
2. * indicates that the coefficient is statistically significant at the $p \leq 0.05$ level or greater (i.e., no distinction is made between $p \leq 0.05$, $p \leq 0.01$, or $p \leq 0.001$).

Table 6: Logistic regression analysis of attempting (or not) a second (more advanced) writing course

	Model #	6-1	6-2	6-3	6-4	6-5	6-6
	Duration of Attendance (semesters)	2-3	4-6	7-9	10-12	13+	2+
	N	6,539	9,537	8,538	6,293	6,575	36,149
	pseudo r^2	0.29	0.26	0.26	0.21	0.19	0.40
Level of First Writing	level 1	ref	ref	ref	ref	ref	ref
	level 2	0.55*	0.46*	0.48*	0.49*	0.81*	0.49*
	level 3	0.53*	0.39*	0.26*	0.61*	0.47*	0.41*
	level 4/5	0.24	0.53*	0.40	0.23	0.12	0.36*
Term of First Writing	Fall 2002	ref	ref	ref	ref	ref	ref
	Spring 2003	-1.36*	-0.55*	-0.34*	-0.31*	-0.04	-0.60*
	Summer 2003	-2.51*	-0.90*	-0.91*	-0.44	-0.77*	-0.94*
	Fall 2003	-1.89*	-0.92*	-0.62*	-0.43*	-0.25	-0.80*
	Spring 2004	-2.24*	-1.52*	-1.19*	-0.78*	-0.53*	-1.25*
	> Spring 2004	-1.47*	-1.25*	-1.47*	-1.45*	-1.46*	-1.51*
Grade in First Writing	passed	2.31*	2.14*	1.98*	1.89*	1.63*	2.06*
Avg Course Unit Load	0.000-5.999	-1.04*	-0.69*	-0.44*	-0.45*	-0.34	-0.64*
	6.000-8.999	-0.85*	-0.69*	-0.48*	-0.61*	0.05	-0.61*
	9.000-11.999	-0.38*	-0.30*	-0.25*	-0.26*	-0.25	-0.30*
	> 11.999	ref	ref	ref	ref	ref	ref
Course Success Ratio	0.000-0.249	-0.36*	-0.33*	-0.71*	-0.32*	-0.19	-0.41*
	0.250-0.499	-0.14	-0.56*	-0.80*	-0.60*	-0.29	-0.50*
	0.500-0.749	0.14	-0.30*	-0.34*	-0.14	-0.09	-0.17*
	> 0.749	ref	ref	ref	ref	ref	ref
Duration of Attendance	2-3 sem	----------	----------	----------	----------	----------	-4.20*
	4-6 sem	----------	----------	----------	----------	----------	-2.78*
	7-9 sem	----------	----------	----------	----------	----------	-1.61*
	10-12 sem	----------	----------	----------	----------	----------	-0.68*
	> 12 sem	----------	----------	----------	----------	----------	ref
Age at College Entry	< 20	ref	ref	ref	ref	ref	ref
	20-25	0.09	-0.25*	-0.26*	-0.23	-0.53*	-0.18*
	>25	-0.30*	-0.65*	-0.91*	-1.05*	-0.98*	-0.74*
Race/Ethnicity	White	ref	ref	ref	ref	ref	ref
	Black	-0.09	-0.09	-0.13	0.16	0.33	-0.04
	Hispanic	0.02	-0.06	-0.02	0.24*	0.39*	0.03
	Asian	-0.27	-0.09	0.17	0.43*	0.33	0.06
	Other	0.18	0.02	0.14	0.46*	0.79*	0.18*
	missing	0.16	0.06	0.32	0.32	0.34	0.18*
Sex	female	0.06	0.22*	0.29*	0.28*	0.41*	0.21*
Citizenship	U.S. citizen	ref	ref	ref	ref	ref	ref
	not U.S.	0.10	0.03	-0.05	0.05	-0.16	0.00

	missing	0.41*	0.20	-0.08	0.16	0.23	0.22
Academic Goal	transfer + AS/AA	ref	ref	ref	ref	ref	ref
	transfer only	0.22	-0.02	0.09	0.22	-0.01	0.09
	acad AS/AA	-0.08	-0.49*	-0.38*	-0.52*	-0.71*	-0.40*
	voc AS/AA	-0.39	-0.29	-1.09*	-0.51	-0.23	-0.55*
	certificate	-0.20	-0.71*	-0.67*	-0.09	-0.16	-0.47*
	other job-related	-0.33*	-0.32*	-0.53*	-0.21	-0.36	-0.36*
	abstract	-0.30	-0.08	-0.38*	-0.03	-0.26	-0.18*
	remediation	-0.36	-0.24	-0.47*	-0.40	-0.53	-0.40*
	undecided	-0.15	-0.17*	-0.30*	-0.30*	-0.28	-0.23*
	not reported	-0.24	0.00	0.24	-0.11	-0.57	-0.06
Fee Waiver	received	-0.09	-0.14*	-0.13	-0.24*	-0.13	-0.14*
% BA+ in Zip Code	< 12.50%	ref	ref	ref	ref	ref	ref
	12.50% - 24.99%	-0.01	0.00	0.15	0.20	0.05	0.05
	25.00% - 37.49%	0.01	0.08	0.07	0.35*	0.16	0.10*
	> 37.49%	-0.07	0.13	0.22*	0.10	0.45*	0.12*
	missing	0.17	0.15	0.24	0.72*	-0.18	0.20*
Constant		-1.85*	-0.25*	0.93*	1.39*	1.80*	2.46*

Notes:
1. "ref" is the referent or comparison category for a given set of dummy variables.
2. * indicates that the coefficient is statistically significant at the $p \leq 0.05$ level or greater (i.e., no distinction is made between $p \leq 0.05$, $p \leq 0.01$, or $p \leq 0.001$).

Table 7: Logistic regression analysis of delaying (or not) a second (more advanced) math course, among those students who attempted such a course

	Model #	7-1	7-2	7-3	7-4	7-5
Duration of Attendance (semesters)		4-6	7-9	10-12	13+	4+
	N	5,518	8,163	6,574	5,720	25,975
	pseudo r^2	0.29	0.28	0.30	0.33	0.30
Level of First Math	interm alg/geom	ref	ref	ref	ref	ref
	beg algebra	-0.43*	-0.47*	-0.40*	-0.44*	-0.43*
	pre-algebra	-0.56*	-0.70*	-0.81*	-1.07*	-0.79*
	arithmetic	-0.68*	-0.91*	-0.84*	-0.89*	-0.84*
Units in First Math	3+ units	-0.95*	-1.02*	-0.90*	-1.42*	-1.07*
Term of First Math	Fall 2002	ref	ref	ref	ref	ref
	Spring 2003	2.97*	2.62*	2.53*	2.68*	2.69*
	Summer 2003	0.01	0.05	0.12	0.06	0.07
	Fall 2003	-0.71*	-0.29*	-0.22	-0.01	-0.27*
	Spring 2004	2.75*	2.08*	2.15*	2.12*	2.18*
	> Spring 2004	0.27	0.17	0.32*	0.24*	0.26*
Grade in First Math	passed	-2.35*	-2.70*	-2.85*	-2.95*	-2.69*
Avg Course Unit Load	0.000-5.999	0.94*	0.87*	0.58*	0.59*	0.75*
	6.000-8.999	0.95*	0.99*	0.69*	0.67*	0.83*
	9.000-11.999	0.66*	0.53*	0.51*	0.59*	0.55*
	> 11.999	ref	ref	ref	ref	ref
Course Success Ratio	0.000-0.249	-0.09	0.03	0.38*	0.34	0.11
	0.250-0.499	-0.31*	-0.15	0.04	-0.09	-0.13*
	0.500-0.749	-0.15	-0.10	0.08	0.11	0.00
	> 0.749	ref	ref	ref	ref	ref
Duration of Attendance	2-3 sem	----------	----------	----------	----------	----------
	4-6 sem	----------	----------	----------	----------	-0.49*
	7-9 sem	----------	----------	----------	----------	-0.22*
	10-12 sem	----------	----------	----------	----------	-0.10*
	> 12 sem	----------	----------	----------	----------	ref
Age at College Entry	< 20	ref	ref	ref	ref	ref
	20-25	-0.21*	-0.29*	0.20	-0.04	-0.10
	>25	-0.41*	-0.18	0.11	0.30*	-0.06
Race/Ethnicity	White	ref	ref	ref	ref	ref
	Black	-0.12	0.01	-0.26	0.04	-0.09
	Hispanic	-0.23*	-0.19*	-0.22*	0.10	-0.15*
	Asian	0.20	-0.28*	-0.48*	-0.35*	-0.28*
	Other	-0.19	-0.20	-0.26	0.21	-0.13
	missing	0.06	-0.18	-0.18	0.30	-0.03
Sex	female	0.08	0.15*	0.25*	0.04	0.14*
Citizenship	U.S. citizen	ref	ref	ref	ref	ref

	not U.S.	0.13	-0.06	-0.10	-0.16	-0.07
	missing	-0.12	-0.24	0.55	0.04	-0.02
Academic Goal	transfer + AS/AA	ref	ref	ref	ref	ref
	transfer only	0.00	-0.02	-0.07	0.04	-0.02
	acad AS/AA	0.03	0.39*	-0.10	0.08	0.11
	voc AS/AA	-0.08	-0.30	-0.07	0.59*	0.01
	certificate	-0.08	0.06	-0.35	0.14	-0.03
	other job-related	0.15	0.36*	0.04	0.21	0.19*
	abstract	0.15	0.00	-0.17	0.12	0.01
	remediation	-0.07	-0.22	0.23	0.17	0.02
	undecided	0.03	-0.04	0.14	0.16	0.06
	not reported	-0.04	-0.07	-0.07	0.88*	0.07
Fee Waiver	received	0.01	0.00	-0.09	0.01	-0.02
% BA+ in Zip Code	< 12.50%	ref	ref	ref	ref	ref
	12.50% - 24.99%	-0.15	0.00	-0.01	-0.11	-0.07
	25.00% - 37.49%	-0.16	-0.02	-0.02	0.01	-0.06
	> 37.49%	-0.25*	-0.13	-0.12	-0.16	-0.16*
	missing	0.29	-0.14	-0.44*	-0.30	-0.11
Constant		2.47*	3.14*	3.20*	3.80*	3.35*

Notes:
1. "ref" is the referent or comparison category for a given set of dummy variables.
2. * indicates that the coefficient is statistically significant at the $p \leq 0.05$ level or greater (i.e., no distinction is made between $p \leq 0.05$, $p \leq 0.01$, or $p \leq 0.001$).

Table 8: Logistic regression analysis of delaying (or not) a second (more advanced) writing course, among those students who attempted such a course

	Model #	8-1	8-2	8-3	8-4	8-5
	Duration of Attendance (semesters)	4-6	7-9	10-12	13+	4+
	N	5,114	6,693	5,536	4,840	22,183
	pseudo r^2	0.27	0.28	0.29	0.28	0.28
Level of First Writing	level 1	ref	ref	ref	ref	ref
	level 2	-0.30*	-0.43*	-0.59*	-0.67*	-0.49*
	level 3	-0.39*	-0.40*	-0.44*	-0.45*	-0.41*
	level 4/5	-0.32	-0.39	-0.65*	-0.42*	-0.43*
Term of First Writing	Fall 2002	ref	ref	ref	ref	ref
	Spring 2003	2.99*	2.76*	2.57*	2.44*	2.69*
	Summer 2003	-0.51	-0.24	0.21	0.70*	0.14
	Fall 2003	-0.81*	-0.21	-0.06	0.00	-0.21*
	Spring 2004	3.18*	2.63*	2.12*	2.41*	2.47*
	> Spring 2004	-0.13	-0.05	0.39*	0.37*	0.21*
Grade in First Writing	passed	-1.93*	-2.49*	-2.87*	-2.87*	-2.50*
Avg Course Unit Load	0.000-5.999	1.21*	1.08*	0.47*	0.65*	0.82*
	6.000-8.999	0.79*	0.81*	0.69*	0.68*	0.74*
	9.000-11.999	0.48*	0.49*	0.41*	0.45*	0.46*
	> 11.999	ref	ref	ref	ref	ref
Course Success Ratio	0.000-0.249	0.26	0.60*	0.47*	0.17	0.33*
	0.250-0.499	-0.02	0.35*	0.20	0.18	0.18*
	0.500-0.749	0.04	0.06	0.13	0.18*	0.11*
	> 0.749	ref	ref	ref	ref	ref
Duration of Attendance	2-3 sem	----------	----------	----------	----------	----------
	4-6 sem	----------	----------	----------	----------	-0.46*
	7-9 sem	----------	----------	----------	----------	-0.25*
	10-12 sem	----------	----------	----------	----------	-0.07
	> 12 sem	----------	----------	----------	----------	ref
Age at College Entry	< 20	ref	ref	ref	ref	ref
	20-25	-0.21	0.00	0.35*	0.04	0.05
	>25	-0.06	-0.10	0.25	0.07	0.05
Race/Ethnicity	White	ref	ref	ref	ref	ref
	Black	-0.21	0.08	-0.02	0.11	-0.02
	Hispanic	0.02	-0.01	-0.22*	0.07	-0.04
	Asian	0.19	-0.24*	-0.15	0.12	-0.04
	Other	0.08	0.02	-0.10	-0.06	-0.02
	missing	-0.09	-0.02	-0.42*	0.41	-0.07
Sex	female	0.06	-0.14*	-0.14*	-0.08	-0.08*
Citizenship	U.S. citizen	ref	ref	ref	ref	ref
	not U.S.	-0.17	-0.10	-0.01	0.07	-0.04

	missing	0.05	-0.26	0.29	-0.02	-0.04
Academic Goal	transfer + AS/AA	ref	ref	ref	ref	ref
	transfer only	-0.13	-0.24*	-0.22	-0.06	-0.18*
	acad AS/AA	-0.10	-0.22	0.24	-0.04	-0.05
	voc AS/AA	0.06	-0.36	0.23	0.75*	0.17
	certificate	-0.10	0.44	0.15	-0.04	0.11
	other job-related	0.13	-0.09	0.20	0.24	0.10
	abstract	-0.15	-0.12	0.06	-0.01	-0.08
	remediation	0.34	-0.51*	-0.06	-0.09	-0.09
	undecided	0.14	-0.01	0.18*	0.22*	0.12*
	not reported	0.22	0.10	0.46	0.43	0.27*
Fee Waiver	received	-0.03	0.07	-0.13	-0.08	-0.04
% BA+ in Zip Code	< 12.50%	ref	ref	ref	ref	ref
	12.50% - 24.99%	-0.15	-0.03	-0.09	-0.04	-0.07
	25.00% - 37.49%	-0.17	-0.16	-0.02	-0.17	-0.12*
	> 37.49%	-0.08	-0.05	-0.09	-0.01	-0.06
	missing	-0.09	-0.19	-0.25	-0.01	-0.12
Constant		0.82*	1.61*	2.25*	2.05*	1.84*

Notes:
1. "ref" is the referent or comparison category for a given set of dummy variables.
2. * indicates that the coefficient is statistically significant at the $p \leq 0.05$ level or greater (i.e., no distinction is made between $p \leq 0.05$, $p \leq 0.01$, or $p \leq 0.001$).

Table 9: Logistic regression analysis of completing successfully (or not) a math course in intermediate algebra, geometry, or a higher-level math course, among those students who attempted a second math course, excluding students whose first math course was intermediate algebra or geometry

	Model #	9-1	9-2	9-3	9-4	9-5
Duration of Attendance (semesters)		4-6	7-9	10-12	13+	4+
	N	4,122	5,629	4,875	4,508	19,134
	pseudo r^2	0.35	0.29	0.19	0.14	0.27
Level of First Math	interm alg/geom	----------	----------	----------	----------	----------
	beg algebra	ref	ref	ref	ref	ref
	pre-algebra	-2.20*	-1.94*	-1.44*	-1.38*	-1.72*
	arithmetic	-3.10*	-2.60*	-2.23*	-1.97*	-2.41*
Units in First Math	3+ units	-0.63*	-0.05	-0.17	-0.13	-0.20*
Term of First Math	Fall 2002	ref	ref	ref	ref	ref
	Spring 2003	-0.15	-0.18	0.00	0.04	-0.06
	Summer 2003	-0.99*	-0.69*	0.13	0.00	-0.30*
	Fall 2003	-0.42*	-0.24	-0.36*	0.06	-0.21*
	Spring 2004	-1.16*	-0.33	-0.25	-0.20	-0.33*
	> Spring 2004	0.01	-0.53*	-0.56*	-0.39*	-0.47*
Grade in First Math	passed	0.25	0.34*	0.35*	0.29*	0.31*
Delay of Second Math	no delay	ref	ref	ref	ref	ref
	1 sem delay	-0.32	-0.19	-0.21	-0.12	-0.20*
	2 sem delay	-0.78*	-0.71*	-0.40*	-0.21	-0.50*
	3 sem delay	-1.08*	-0.74*	-0.78*	-0.46*	-0.72*
	> 3 sem delay	-0.54*	-0.90*	-0.89*	-0.73*	-0.82*
Avg Course Unit Load	0.000-5.999	-0.66*	-0.44*	-0.32*	0.08	-0.31*
	6.000-8.999	-0.28*	-0.42*	-0.10	0.07	-0.18*
	9.000-11.999	-0.31*	-0.15	-0.07	-0.01	-0.16*
	> 11.999	ref	ref	ref	ref	ref
Course Success Ratio	0.000-0.249	-1.37*	-1.19*	-0.53*	-0.35*	-0.86*
	0.250-0.499	-2.00*	-1.26*	-0.83*	-0.54*	-1.10*
	0.500-0.749	-1.61*	-1.17*	-0.52*	-0.45*	-0.89*
	> 0.749	ref	ref	ref	ref	ref
Duration of Attendance	2-3 sem	----------	----------	----------	----------	----------
	4-6 sem	----------	----------	----------	----------	-2.31*
	7-9 sem	----------	----------	----------	----------	-1.10*
	10-12 sem	----------	----------	----------	----------	-0.39*
	> 12 sem	----------	----------	----------	----------	ref
Age at College Entry	< 20	ref	ref	ref	ref	ref
	20-25	0.23	0.02	-0.14	-0.09	-0.01
	>25	0.21	-0.27*	-0.38*	-0.42*	-0.30*
Race/Ethnicity	White	ref	ref	ref	ref	ref

	Black	-0.32	-0.36*	-0.24	-0.31*	-0.32*
	Hispanic	-0.40*	-0.13	0.02	0.12	-0.09*
	Asian	0.31	0.10	0.43*	0.12	0.19*
	Other	-0.36	-0.09	0.02	0.23	-0.05
	missing	-0.08	0.06	0.21	0.63*	0.19
Sex	female	0.07	0.16*	0.11	-0.09	0.06
Citizenship	U.S. citizen	ref	ref	ref	ref	ref
	not U.S.	-0.24	0.19	0.19	0.19	0.10
	missing	0.56	0.48	-0.12	0.15	0.31*
Academic Goal	transfer + AS/AA	ref	ref	ref	ref	ref
	transfer only	0.23	0.16	0.12	0.17	0.18*
	acad AS/AA	-0.45*	0.09	-0.42*	-0.25	-0.24*
	voc AS/AA	-0.16	-1.25*	-0.39	-0.37	-0.58*
	certificate	-0.64	-0.41	-0.17	-0.03	-0.26
	other job-related	-0.35	-0.36*	-0.36*	-0.10	-0.27*
	abstract	-0.14	0.09	0.20	-0.18	0.00
	remediation	-0.14	-0.35	-0.43	0.00	-0.25*
	undecided	-0.08	-0.10	0.09	0.08	0.00
	not reported	0.29	0.33	0.41	-0.24	0.20
Fee Waiver	received	-0.14	-0.30*	-0.24*	-0.13	-0.22*
% BA+ in Zip Code	< 12.50%	ref	ref	ref	ref	ref
	12.50% - 24.99%	0.00	-0.14	-0.12	0.02	-0.07
	25.00% - 37.49%	0.01	-0.08	-0.06	0.10	-0.01
	> 37.49%	0.15	0.13	0.02	0.19	0.12*
	missing	-0.04	0.14	-0.24	0.11	-0.01
Constant		2.19*	2.48*	2.54*	2.32*	3.36*

Notes:
1. "ref" is the referent or comparison category for a given set of dummy variables.
2. * indicates that the coefficient is statistically significant at the $p \leq 0.05$ level or greater (i.e., no distinction is made between $p \leq 0.05$, $p \leq 0.01$, or $p \leq 0.001$).

Table 10: Logistic regression analysis of completing successfully (or not) a Level 1 writing course or a higher-level writing course, among those students who attempted a second writing course, excluding students whose first writing course was a Level 1 writing course

	Model #	10-1	10-2	10-3	10-4	10-5
	Duration of Attendance (semesters)	4-6	7-9	10-12	13+	4+
	N	2,490	2,867	2,506	2,463	10,345
	pseudo r^2	0.21	0.21	0.17	0.14	0.26
Level of First Writing	level 1	----------	----------	----------	----------	----------
	level 2	ref	ref	ref	ref	ref
	level 3	-1.42*	-1.23*	-1.16*	-0.98*	-1.21*
	level 4/5	-2.12*	-1.90*	-1.32*	-1.54*	-1.66*
Term of First Writing	Fall 2002	ref	ref	ref	ref	ref
	Spring 2003	-0.51*	-0.18	-0.36*	0.19	-0.30*
	Summer 2003	-1.37*	-0.97*	-0.37	-0.09	-0.69*
	Fall 2003	-0.36	-0.66*	-0.77*	-0.58*	-0.56*
	Spring 2004	-0.41	-1.14*	-1.35*	-0.60	-0.96*
	> Spring 2004	-0.37	-0.79*	-1.12*	-1.26*	-0.93*
Grade in First Writing	passed	0.25	0.24	0.35*	0.53*	0.32*
Delay of Second Writing	no delay	ref	ref	ref	ref	ref
	1 sem delay	-0.31	-0.17	0.06	-0.07	-0.13
	2 sem delay	-0.33*	-0.78*	-0.61*	-0.24	-0.52*
	3 sem delay	-0.83*	-0.95*	-0.65*	-0.28	-0.73*
	> 3 sem delay	-0.35*	-0.98*	-0.91*	-0.72*	-0.76*
Avg Course Unit Load	0.000-5.999	-0.33	0.09	-0.15	0.01	-0.05
	6.000-8.999	-0.45*	-0.18	0.04	-0.14	-0.20*
	9.000-11.999	-0.27*	-0.02	0.01	0.00	-0.11
	> 11.999	ref	ref	ref	ref	ref
Course Success Ratio	0.000-0.249	-1.55*	-1.14*	-0.31	-0.44	-0.97*
	0.250-0.499	-1.78*	-1.47*	-1.14*	-0.50*	-1.34*
	0.500-0.749	-1.11*	-0.94*	-0.65*	-0.47*	-0.87*
	> 0.749	ref	ref	ref	ref	ref
Duration of Attendance	2-3 sem	----------	----------	----------	----------	----------
	4-6 sem	----------	----------	----------	----------	-2.94*
	7-9 sem	----------	----------	----------	----------	-1.86*
	10-12 sem	----------	----------	----------	----------	-0.77*
	> 12 sem	----------	----------	----------	----------	ref
Age at College Entry	< 20	ref	ref	ref	ref	ref
	20-25	0.09	0.03	0.34	-0.09	0.08
	>25	0.20	-0.36	0.09	-0.31	-0.12
Race/Ethnicity	White	ref	ref	ref	ref	ref
	Black	0.02	-0.75*	-0.73*	-0.62*	-0.46*
	Hispanic	-0.19	-0.57*	-0.50*	-0.08	-0.36*

	Asian	-0.06	-0.26	-0.14	-0.08	-0.14
	Other	-0.51*	-0.45*	-0.40	-0.38	-0.43*
	missing	0.23	-0.32	0.58	-0.14	0.01
Sex	female	0.25*	0.07	0.29*	0.18	0.17*
Citizenship	U.S. citizen	ref	ref	ref	ref	ref
	not U.S.	-0.08	0.36*	0.06	-0.05	0.06
	missing	0.07	-0.31	-0.53	----------	-0.02
Academic Goal	transfer + AS/AA	ref	ref	ref	ref	ref
	transfer only	0.38*	0.17	0.05	-0.31	0.16
	acad AS/AA	0.09	-0.30	-0.23	-0.45	-0.16
	voc AS/AA	0.33	0.00	-0.46	-0.69	-0.06
	certificate	-0.20	-0.91*	-0.23	-1.06*	-0.68*
	other job-related	-0.09	-0.08	-0.05	-0.19	-0.06
	abstract	0.23	-0.25	-0.38	-0.33	-0.11
	remediation	-0.69*	-0.70*	-0.48	-0.39	-0.64*
	undecided	0.19	-0.07	0.07	0.04	0.04
	not reported	-0.13	0.02	-0.50	-0.93	-0.27
Fee Waiver	received	-0.24*	-0.12	-0.33*	-0.31	-0.25*
% BA+ in Zip Code	< 12.50%	ref	ref	ref	ref	ref
	12.50% - 24.99%	0.32*	0.16	0.18	0.25	0.22*
	25.00% - 37.49%	0.41*	0.10	0.40	0.17	0.25*
	> 37.49%	0.82*	0.29	-0.03	0.47	0.40*
	missing	0.31	0.03	0.49	-0.39	0.16
Constant		1.24*	2.73*	3.33*	3.53*	4.21*

Notes:
1. "ref" is the referent or comparison category for a given set of dummy variables.
2. * indicates that the coefficient is statistically significant at the $p \leq 0.05$ level or greater (i.e., no distinction is made between $p \leq 0.05$, $p \leq 0.01$, or $p \leq 0.001$).

Table 11: Logistic regression analysis of completing successfully (or not) a college-level math course, among those students who attempted a second math course

	Model #	11-1	11-2	11-3	11-4	11-5
	Duration of Attendance (semesters)	4-6	7-9	10-12	13+	4+
	N	5,518	8,163	6,574	5,720	25,975
	pseudo r^2	0.48	0.32	0.20	0.17	0.29
Level of First Math	interm alg/geom	ref	ref	ref	ref	ref
	beg algebra	-2.23*	-1.50*	-1.43*	-1.34*	-1.60*
	pre-algebra	-3.62*	-2.81*	-2.20*	-2.35*	-2.69*
	arithmetic	-4.51*	-3.36*	-2.87*	-2.72*	-3.21*
Units in First Math	3+ units	-0.36	-0.06	-0.11	-0.19	-0.16*
Term of First Math	Fall 2002	ref	ref	ref	ref	ref
	Spring 2003	0.07	0.00	-0.01	0.03	0.03
	Summer 2003	-0.32	-0.28	-0.08	-0.20	-0.18
	Fall 2003	-0.55*	-0.20	-0.18	-0.25*	-0.23*
	Spring 2004	-0.63	-0.37*	-0.18	-0.02	-0.19*
	> Spring 2004	-0.28	-0.46*	-0.54*	-0.47*	-0.48*
Grade in First Math	passed	0.29*	0.04	0.01	0.13	0.10*
Delay of Second Math	no delay	ref	ref	ref	ref	ref
	1 sem delay	-0.25	-0.16	-0.14	-0.13	-0.16*
	2 sem delay	-0.68*	-0.60*	-0.48*	-0.23*	-0.46*
	3 sem delay	-0.73*	-0.76*	-0.67*	-0.32*	-0.59*
	> 3 sem delay	-0.27	-0.84*	-0.95*	-0.79*	-0.83*
Avg Course Unit Load	0.000-5.999	-0.81*	-0.78*	-0.26*	0.02	-0.44*
	6.000-8.999	-0.99*	-0.64*	-0.08	-0.05	-0.37*
	9.000-11.999	-0.91*	-0.33*	-0.14	0.02	-0.29*
	> 11.999	ref	ref	ref	ref	ref
Course Success Ratio	0.000-0.249	-1.90*	-1.44*	-0.82*	-0.21	-1.01*
	0.250-0.499	-2.42*	-1.67*	-1.01*	-0.48*	-1.25*
	0.500-0.749	-2.00*	-1.23*	-0.61*	-0.37*	-0.95*
	> 0.749	ref	ref	ref	ref	ref
Duration of Attendance	2-3 sem	----------	----------	----------	----------	----------
	4-6 sem	----------	----------	----------	----------	-2.01*
	7-9 sem	----------	----------	----------	----------	-0.81*
	10-12 sem	----------	----------	----------	----------	-0.20*
	> 12 sem	----------	----------	----------	----------	ref
Age at College Entry	< 20	ref	ref	ref	ref	ref
	20-25	0.21	-0.03	-0.09	-0.23*	-0.09
	>25	0.15	-0.32*	-0.57*	-0.47*	-0.42*
Race/Ethnicity	White	ref	ref	ref	ref	ref
	Black	-0.61*	-0.49*	-0.25	-0.39*	-0.41*
	Hispanic	-0.68*	-0.07	-0.06	-0.08	-0.17*

	Asian	-0.34	0.07	0.09	0.05	-0.01
	Other	-0.58*	-0.26*	-0.12	-0.21	-0.29*
	missing	-0.07	0.00	0.13	0.15	0.05
Sex	female	0.23*	0.16*	0.02	-0.10	0.06*
Citizenship	U.S. citizen	ref	ref	ref	ref	ref
	not U.S.	-0.17	0.00	0.09	0.24*	0.07
	missing	-0.30	0.38	0.07	0.51	0.22
Academic Goal	transfer + AS/AA	ref	ref	ref	ref	ref
	transfer only	0.07	0.18	-0.05	0.07	0.09
	acad AS/AA	-0.31	-0.20	-0.41*	-0.49*	-0.36*
	voc AS/AA	-0.64	-1.62*	-0.69*	-0.23	-0.77*
	certificate	-0.51	-0.63*	-0.33	-0.25	-0.40*
	other job-related	-0.50*	-0.42*	-0.31*	-0.02	-0.28*
	abstract	-0.25	-0.09	0.05	-0.30	-0.14
	remediation	-0.02	-0.23	-0.34	-0.07	-0.25*
	undecided	-0.15	-0.01	-0.05	-0.08	-0.07
	not reported	0.48	0.10	0.17	0.01	0.14
Fee Waiver	received	-0.13	-0.32*	-0.15*	-0.01	-0.17*
% BA+ in Zip Code	< 12.50%	ref	ref	ref	ref	ref
	12.50% - 24.99%	0.18	0.00	0.06	-0.07	0.01
	25.00% - 37.49%	0.14	0.21*	0.14	0.07	0.14*
	> 37.49%	0.37*	0.36*	0.32*	0.19	0.32*
	missing	0.00	0.42*	0.08	0.31	0.19
Constant		2.55*	2.84*	2.90*	2.72*	3.57*

Notes:
1. "ref" is the referent or comparison category for a given set of dummy variables.
2. * indicates that the coefficient is statistically significant at the $p \leq 0.05$ level or greater (i.e., no distinction is made between $p \leq 0.05$, $p \leq 0.01$, or $p \leq 0.001$).

Table 12: Logistic regression analysis of completing successfully (or not) a college-level writing course, among those students who attempted a second writing course

	Model #	12-1	12-2	12-3	12-4	12-5
	Duration of Attendance (semesters)	4-6	7-9	10-12	13+	4+
	N	5,114	6,693	5,536	4,840	22,183
	pseudo r^2	0.31	0.28	0.17	0.13	0.28
Level of First Writing	level 1	ref	ref	ref	ref	ref
	level 2	-1.56*	-1.69*	-1.18*	-1.11*	-1.43*
	level 3	-2.58*	-2.70*	-1.95*	-1.73*	-2.24*
	level 4/5	-3.54*	-3.23*	-2.43*	-2.00*	-2.62*
Term of First Writing	Fall 2002	ref	ref	ref	ref	ref
	Spring 2003	-0.36*	-0.23*	-0.15	0.17	-0.15*
	Summer 2003	-1.36*	-0.80*	-0.17	-0.29	-0.57*
	Fall 2003	-0.49*	-0.49*	-0.54*	-0.17	-0.41*
	Spring 2004	-0.49	-0.76*	-0.54*	-0.16	-0.51*
	> Spring 2004	0.09	-0.83*	-0.66*	-0.71*	-0.66*
Grade in First Writing	passed	0.12	0.23*	0.30*	0.27*	0.23*
Delay of Second Writing	no delay	ref	ref	ref	ref	ref
	1 sem delay	-0.18	-0.02	-0.14	-0.31*	-0.14*
	2 sem delay	-0.49*	-0.59*	-0.54*	-0.42*	-0.52*
	3 sem delay	-0.66*	-1.02*	-0.48*	-0.55*	-0.67*
	> 3 sem delay	-0.48*	-0.91*	-0.99*	-0.93*	-0.86*
Avg Course Unit Load	0.000-5.999	-0.62*	-0.27	-0.20	-0.03	-0.29*
	6.000-8.999	-0.57*	-0.33*	-0.04	0.16	-0.22*
	9.000-11.999	-0.53*	-0.33*	-0.08	0.06	-0.27*
	> 11.999	ref	ref	ref	ref	ref
Course Success Ratio	0.000-0.249	-1.89*	-1.11*	-0.67*	-0.12	-1.01*
	0.250-0.499	-2.03*	-1.57*	-0.82*	-0.52*	-1.30*
	0.500-0.749	-1.51*	-1.11*	-0.59*	-0.31*	-0.97*
	> 0.749	ref	ref	ref	ref	ref
Duration of Attendance	2-3 sem	----------	----------	----------	----------	----------
	4-6 sem	----------	----------	----------	----------	-2.69*
	7-9 sem	----------	----------	----------	----------	-1.52*
	10-12 sem	----------	----------	----------	----------	-0.71*
	> 12 sem	----------	----------	----------	----------	ref
Age at College Entry	< 20	ref	ref	ref	ref	ref
	20-25	0.08	-0.13	-0.02	-0.07	-0.06
	>25	-0.27	-0.33*	-0.34*	-0.33*	-0.37*
Race/Ethnicity	White	ref	ref	ref	ref	ref
	Black	-0.31*	-0.35*	-0.09	-0.42*	-0.27*
	Hispanic	-0.40*	-0.25*	-0.15	-0.11	-0.25*
	Asian	0.14	0.07	0.32*	0.10	0.13

	Other	-0.33*	-0.21	0.13	0.02	-0.13
	missing	0.28	-0.13	0.73*	-0.13	0.16
Sex	female	0.22*	0.16*	0.09	0.15	0.14*
Citizenship	U.S. citizen	ref	ref	ref	ref	ref
	not U.S.	-0.06	0.42*	0.05	0.14	0.14*
	missing	-0.33	-0.40	0.03	-0.35	-0.27
Academic Goal	transfer + AS/AA	ref	ref	ref	ref	ref
	transfer only	0.10	0.05	-0.08	-0.08	0.03
	acad AS/AA	-0.34*	-0.27	-0.45*	-0.40*	-0.36*
	voc AS/AA	-0.09	-0.69*	-0.48	-0.79*	-0.54*
	certificate	-0.51	-0.52	-0.80*	-0.34	-0.56*
	other job-related	-0.29	-0.36*	-0.28*	-0.44*	-0.33*
	abstract	0.15	-0.06	-0.20	-0.44*	-0.10
	remediation	-0.44	-0.44	-0.52*	-0.70*	-0.57*
	undecided	-0.03	-0.04	-0.11	-0.24*	-0.09
	not reported	-0.30	0.42	-0.60*	0.04	-0.11
Fee Waiver	received	-0.28*	-0.18*	-0.18*	-0.21*	-0.24*
% BA+ in Zip Code	< 12.50%	ref	ref	ref	ref	ref
	12.50% - 24.99%	0.18	0.21*	0.06	-0.01	0.12*
	25.00% - 37.49%	0.41*	0.29*	0.22	0.07	0.26*
	> 37.49%	0.67*	0.56*	0.44*	0.18	0.49*
	missing	0.27	0.52*	0.27	0.32	0.34*
Constant		1.80*	2.71*	2.78*	3.13*	4.00*

Notes:
1. "ref" is the referent or comparison category for a given set of dummy variables.
2. * indicates that the coefficient is statistically significant at the $p \leq 0.05$ level or greater (i.e., no distinction is made between $p \leq 0.05$, $p \leq 0.01$, or $p \leq 0.001$).

Table 13: Multinomial logistic regression analysis of various long-term credential and transfer outcomes on remedial math course-taking, math attainment, and selected other variables, for those remedial math students who attempted a second math course and remained in the system for at least 10 semesters (*N* = 12,294; excluded outcome = no credential and no transfer)

		Certificate	Voc Assoc Degree	Acad Assoc Degree	Transfer without Credential	Transfer with Credential
Highest Math Course	college math	-0.58*	0.21	1.79*	2.49*	4.24*
	interm alg/geom	-0.26	0.26*	0.76*	0.53*	1.37*
	all other outcomes	ref	ref	ref	ref	ref
Level of First Math	interm alg/geom	ref	ref	ref	ref	ref
	beg algebra	0.13	0.10	0.20*	0.18*	0.27*
	pre-algebra	0.13	-0.24	0.15	0.06	0.47*
	arithmetic	0.31	-0.17	0.16	-0.25*	0.46*
Units in First Math	3+ units	0.18	0.41*	0.11	-0.17	0.10
Term of First Math	Fall 2002	ref	ref	ref	ref	ref
	Spring 2003	0.01	-0.16	-0.04	0.26*	0.04
	Summer 2003	0.38	-1.25*	-0.01	0.58*	0.31
	Fall 2003	0.14	-0.29	0.07	0.38*	0.19
	Spring 2004	-0.40	-0.09	-0.03	0.33*	0.21
	> Spring 2004	0.28	-0.22	-0.10	0.23*	0.25*
Grade in First Math	passed	0.02	0.47*	0.17	-0.48*	-0.28*
Delay of Second Math	no delay	ref	ref	ref	ref	ref
	1 sem delay	-0.36	-0.10	-0.04	-0.36*	-0.08
	2 sem delay	-0.12	0.11	-0.11	-0.31*	-0.08
	3 sem delay	0.11	-0.13	0.12	-0.07	-0.01
	> 3 sem delay	0.08	0.20	0.24*	-0.45*	-0.14
Avg Course Unit Load	0.000-5.999	-0.63*	-0.85*	-0.90*	-0.68*	-0.93*
	6.000-8.999	-0.33*	-0.42*	-0.51*	-0.55*	-0.57*
	9.000-11.999	0.06	-0.31*	-0.22*	-0.35*	-0.47*
	> 11.999	ref	ref	ref	ref	ref
Course Success Ratio	0.000-0.249	-0.77*	-1.46*	-1.16*	-0.31*	-0.95*
	0.250-0.499	-0.95*	-1.46*	-0.80*	-0.39*	-0.72*
	0.500-0.749	-0.50*	-0.86*	-0.71*	-0.22*	-0.39*
	> 0.749	ref	ref	ref	ref	ref
Duration of Attendance	2-3 sem	----------	----------	----------	----------	----------
	4-6 sem	----------	----------	----------	----------	----------
	7-9 sem	----------	----------	----------	----------	----------
	10-12 sem	-0.43*	-0.40*	-0.40*	0.64*	0.57*
	> 12 sem	ref	ref	ref	ref	ref
Age at College Entry	< 20	ref	ref	ref	ref	ref
	20-25	0.25	0.32*	-0.07	-0.35*	-0.15

	>25	0.57*	1.15*	0.44*	-0.74*	0.07
Race/Ethnicity	White	ref	ref	ref	ref	ref
	Black	-0.18	-0.55*	-0.13	0.35*	0.40*
	Hispanic	0.05	-0.43*	-0.31*	-0.36*	-0.12
	Asian	0.15	-0.52*	-0.46*	0.03	-0.13
	Other	-0.10	-0.15	-0.25	-0.08	-0.14
	missing	-0.26	-0.17	0.07	-0.08	-0.07
Sex	female	-0.09	0.00	0.37*	0.07	0.39*
Citizenship	U.S. citizen	ref	ref	ref	ref	ref
	not U.S.	0.01	0.20	-0.40*	-0.20*	-0.23*
	missing	0.61	0.26	0.66*	-0.07	0.46
Academic Goal	transfer + AS/AA	ref	ref	ref	ref	ref
	transfer only	-0.41	-0.03	-0.21	0.03	-0.18
	acad AS/AA	0.32	0.53*	0.44*	-0.18	-0.16
	voc AS/AA	0.48	1.03*	0.31	-0.20	-0.34
	certificate	1.05*	0.45	0.20	0.01	0.05
	other job-related	0.31	0.46*	0.28*	-0.39*	-0.12
	abstract	-0.19	0.14	0.01	-0.07	-0.11
	remediation	-0.22	0.30	-0.40	0.01	-0.58*
	undecided	0.08	-0.02	0.22*	-0.06	-0.05
	not reported	0.41	0.49	0.23	0.07	0.45
Fee Waiver	received	-0.05	0.07	0.06	-0.06	0.23*
% BA+ in Zip Code	< 12.50%	ref	ref	ref	ref	ref
	12.50% - 24.99%	-0.15	-0.05	0.08	0.10	0.08
	25.00% - 37.49%	-0.09	-0.23	-0.04	0.24*	0.09
	> 37.49%	-0.18	-0.55*	-0.23*	0.44*	0.10
	missing	0.03	-0.65	0.24	0.19	-0.14
Constant		-2.22*	-2.08*	-2.27*	-1.98*	-4.14*

Notes:
1. "ref" is the referent or comparison category for a given set of dummy variables.
2. * indicates that the coefficient is statistically significant at the $p \leq 0.05$ level or greater (i.e., no distinction is made between $p \leq 0.05$, $p \leq 0.01$, or $p \leq 0.001$).

Table 14: Multinomial logistic regression analysis of various long-term credential and transfer outcomes on remedial writing course-taking, writing attainment, and selected other variables, for those remedial writing students who attempted a second writing course and remained in the system for at least 10 semesters (*N* = 10,376; excluded outcome = no credential and no transfer)

		Certificate	Voc Assoc Degree	Acad Assoc Degree	Transfer without Credential	Transfer with Credential
Highest Writing Course	college comp	-0.24	1.43*	2.88*	1.49*	4.20*
	level 1	0.32	1.48*	1.46*	-0.21	1.66*
	all other outcomes	ref	ref	ref	ref	ref
Level of First Writing	level 1	ref	ref	ref	ref	ref
	level 2	0.18	0.11	-0.15	-0.01	-0.03
	level 3	0.39*	-0.30	-0.22	-0.53*	-0.27*
	level 4/5	0.25	-0.39	-0.12	-0.17	-0.01
Term of First Writing	Fall 2002	ref	ref	ref	ref	ref
	Spring 2003	0.02	0.01	-0.07	0.07	0.10
	Summer 2003	0.21	0.43	-0.31	0.24	0.19
	Fall 2003	0.05	0.14	0.10	0.16	0.11
	Spring 2004	0.32	0.18	0.07	0.32*	0.36*
	> Spring 2004	0.25	0.14	-0.35*	-0.21	-0.15
Grade in First Writing	passed	0.37*	0.29*	0.07	-0.06	0.00
Delay of Second Writing	no delay	ref	ref	ref	ref	ref
	1 sem delay	-0.16	0.07	-0.13	-0.07	-0.13
	2 sem delay	0.07	0.17	-0.12	-0.13	-0.10
	3 sem delay	0.06	0.13	-0.23	-0.12	-0.08
	> 3 sem delay	0.45*	0.07	-0.16	-0.52*	-0.55*
Avg Course Unit Load	0.000-5.999	-0.47*	-1.12*	-0.87*	-0.67*	-0.99*
	6.000-8.999	-0.33*	-0.56*	-0.66*	-0.64*	-0.73*
	9.000-11.999	0.14	-0.39*	-0.23*	-0.40*	-0.58*
	> 11.999	ref	ref	ref	ref	ref
Course Success Ratio	0.000-0.249	-0.85*	-1.63*	-1.34*	-0.38*	-0.96*
	0.250-0.499	-0.88*	-1.29*	-0.78*	-0.28*	-0.70*
	0.500-0.749	-0.25*	-0.84*	-0.75*	-0.24*	-0.50*
	> 0.749	ref	ref	ref	ref	ref
Duration of Attendance	2-3 sem	----------	----------	----------	----------	----------
	4-6 sem	----------	----------	----------	----------	----------
	7-9 sem	----------	----------	----------	----------	----------
	10-12 sem	-0.49*	-0.41*	-0.44*	0.47*	0.44*
	> 12 sem	ref	ref	ref	ref	ref
Age at College Entry	< 20	ref	ref	ref	ref	ref
	20-25	0.24	0.38*	0.05	-0.30*	-0.17
	>25	0.73*	0.95*	0.50*	-0.87*	-0.19

Race/Ethnicity	White	ref	ref	ref	ref	ref
	Black	-0.02	-0.47*	-0.25	0.30*	-0.03
	Hispanic	0.01	-0.40*	-0.30*	-0.26*	-0.04
	Asian	-0.36	-0.37*	-0.09	0.82*	0.41*
	Other	-0.43	-0.30	-0.26	-0.04	-0.23
	missing	0.13	0.26	0.09	0.28	0.25
Sex	female	0.11	-0.13	0.15*	-0.18*	0.13*
Citizenship	U.S. citizen	ref	ref	ref	ref	ref
	not U.S.	-0.01	0.46*	-0.03	0.26*	0.20*
	missing	0.51	0.32	0.74*	0.00	0.60*
Academic Goal	transfer + AS/AA	ref	ref	ref	ref	ref
	transfer only	0.15	-0.06	-0.08	0.05	-0.01
	acad AS/AA	0.25	0.49*	0.31	-0.31	-0.30*
	voc AS/AA	0.37	0.63*	0.17	-0.27	-0.79*
	certificate	1.20*	-0.07	0.01	-0.41	-0.12
	other job-related	0.17	0.30	0.26	-0.40*	-0.15
	abstract	-0.07	0.16	-0.13	-0.16	-0.08
	remediation	0.24	0.19	-0.02	-0.23	-0.71*
	undecided	0.05	0.04	0.34*	-0.01	-0.08
	not reported	0.04	0.87*	0.72*	0.39	0.83*
Fee Waiver	received	-0.05	0.02	0.05	-0.15*	0.16*
% BA+ in Zip Code	< 12.50%	ref	ref	ref	ref	ref
	12.50% - 24.99%	-0.36*	-0.09	0.07	0.18*	0.03
	25.00% - 37.49%	-0.14	-0.39*	-0.03	0.27*	0.18
	> 37.49%	-0.20	-0.54*	-0.27*	0.44*	0.15
	missing	-0.24	-0.48	0.20	0.17	0.18
Constant		-2.56*	-2.83*	-3.31*	-1.96*	-4.51*

Notes:
1. "ref" is the referent or comparison category for a given set of dummy variables.
2. * indicates that the coefficient is statistically significant at the $p \leq 0.05$ level or greater (i.e., no distinction is made between $p \leq 0.05$, $p \leq 0.01$, or $p \leq 0.001$).

Appendix Eight: Charts Summarizing the Quantitative Findings

Variables correlated with movement through California's remedial mathematics and writing sequences, among students in the first-time Fall 2002 cohort

The following six charts summarize the quantitative findings from the regression analyses conducted for this study—discussed in detail by Peter Riley Bahr on pages 46–57 of the main report—as these relate to student movement through remedial sequences.

In particular, the charts provide a "bird's-eye view" of how differences in student course-taking behaviors, demographics, and other variables appeared to correlate with the likelihood of a student in the Fall 2002 cohort to:

1. Delay a first remedial course.
2. Achieve a passing grade on the first attempt in the first remedial course.
3. After the first remedial course, enroll in a second (more advanced) course.
4. Among students who attempted a second (more advanced) course, delay this second course.
5. Successfully complete a remedial mathematics course one level below college algebra, or a remedial writing course one level below college composition.
6. Successfully complete a college-level course in mathematics or writing.

The variables that generally had the **strongest** relationships with each of these outcomes, in mathematics and writing respectively, are printed in **blue type** in each chart that follows.

In addition, each summary chart specifies the *pages in the main report* where the corresponding regression analyses were discussed in detail, and the *particular regression tables in Appendix Seven* from which these summaries were distilled.

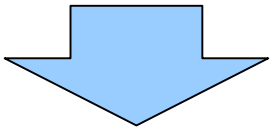
1. Who tends to *delay* their first remedial course?

Limit: **Students attended more than one semester.**

Note: **Students who persist for longer periods of time have more opportunity to enroll in a first remedial mathematics or writing course. See pages 44–46 of the main report for additional cautionary considerations.**

Mathematics (46,911 students)	Writing (36,149 students)
Net of other variables…	
Related to starting level	
• There were **no consistent differences between students who began at different levels of a mathematics sequence** with respect to the likelihood of delaying their first remedial course.	• There were **no consistent differences between students who began at different levels of a writing sequence** with respect to the likelihood of delaying their first remedial course.
Related to full-time or part-time enrollment during the first year	
• **Students who enrolled part-time** (on average) during their first year were **more likely to delay** their first remedial mathematics course than were full-time students. The fewer the units a student took per semester during their first year, the more likely they were to delay. Part-time students likely have a lower chance of enrolling in a first remedial math course in any given interval of time simply because part-time students take fewer classes.	• **Student who enrolled part-time** (on average) during their first year were **more likely to delay** their first remedial writing course than were full-time students. The fewer the units a student took per semester during their first year, the more likely they were to delay. Part-time students likely have a lower chance of enrolling in a first remedial writing course in any given interval of time simply because part-time students take fewer classes.
Related to student characteristics and incoming goals	
• **Students residing in zip codes with the highest rates of bachelors-level (or higher) attainment** were **less likely to delay** their first remedial mathematics course, compared with students residing in zip codes with the lowest rates of such attainment. • **Students who entered with an "other job-related" goal** were **more likely to delay** their first remedial mathematics course than students who aspired to transfer with an associate degree.	• **Black/African American, male, non-U.S. citizen, and students who were older than 19 years of age at college entry** were **more likely to delay** their first remedial writing course, compared with white, female, U.S. citizen, and "traditional college-age" students, respectively.

See pages 47–48 of the main report for detailed discussion. See Appendix Seven, Tables 1 and 2, for corresponding regression tables. EdSource 6/10

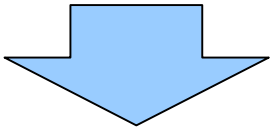


2. Who tends to *pass* their first remedial course on the first attempt?

Limit: **Students attended more than one semester.**

Mathematics (46,911 students)	Writing (36,149 students)
Net of other variables…	
Related to starting level	
• **Students who began at lower levels** of a mathematics sequence were **more likely to pass** their first remedial mathematics course on the first attempt, compared with students who began in Intermediate Algebra/Geometry.	
Related to delay of first remedial course	
• **Students who enrolled immediately** (in Fall 2002) in their first remedial mathematics course were **more likely to pass** on the first attempt than students who deferred their first remedial mathematics course until Spring 2003 or the 2003–04 academic year. (Students who delayed their first course until **Summer 2003** do not appear to have been disadvantaged, however.)	
Related to passing courses	
• Not surprisingly, **students who passed fewer than 75% of their first-year courses** were **less likely to pass** their first remedial mathematics course on the first attempt, compared with students who passed 75% or more of their first-year courses.	• Not surprisingly, **students who passed fewer than 75% of their first-year courses** were **less likely to pass** their first remedial writing course on the first attempt, compared with students who passed 75% or more of their first-year courses.
Related to full-time or part-time enrollment during the first year	
• **Students who enrolled in fewer than six units per semester** (on average) during their first year were **less likely to pass** their first remedial mathematics course on the first attempt, compared with students who enrolled full-time during their first year.	• **Students who enrolled full-time** (on average) during their first year were generally **more likely to pass** their first writing course on the first attempt, compared with students who enrolled in fewer than 12 units per semester during their first year. The fewer the units a student took per semester during their first year, the lower their likelihood on passing.
Related to student characteristics and incoming goals	
• **Black/African American, male, and "traditional college-age" students** were **less likely to pass** their first remedial mathematics course on the first attempt, compared with white, female, and older students, respectively.	• **Male students** were **less likely to pass** their first remedial writing course on the first attempt, compared with female students.

See pages 48–49 of the main report for detailed discussion. See Appendix Seven, Tables 3 and 4, for corresponding regression tables. EdSource 6/10

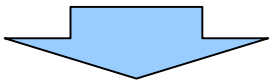


3. After the first remedial course, who tends to *enroll in a second, more advanced course*?

Limit: **Students attended more than one semester.**

Mathematics (46,911 students)	Writing (36,149 students)
Net of other variables…	
Related to starting level	
• **Students who began in Arithmetic or Pre-Algebra** were **more likely to attempt** a second, more advanced mathematics course, compared with students who began in Intermediate Algebra/Geometry.	• **Students who began two or three levels below college composition** were **more likely to attempt** a second, more advanced writing course, compared with students who began one level below.
Related to delay of first remedial course	
• **Students who delayed their first remedial mathematics course until Fall 2003 or later** were **less likely to attempt** a second, more advanced mathematics course—even if they enrolled for long periods of time—compared with students who began promptly in Fall 2002.	• **Students who delayed their first remedial writing course** were **less likely to attempt** a second, more advanced writing course, compared with students who began promptly in Fall 2002.
Related to passing courses	
• **Students who did not pass their first remedial mathematics course** were **less likely to attempt** a second, more advanced mathematics course, compared with students who passed their first course on the first attempt.	• **Students who did not pass their first remedial writing course** were **less likely to attempt** a second, more advanced writing course, compared with students who passed their first course on the first attempt. • In addition, **students who passed fewer than 25% of their first-year courses** were **less likely to attempt** a second, more advanced writing course, compared with students who passed 75% or more of their first-year courses.
Related to full-time or part-time enrollment during the first year	
• **Students who enrolled full-time** (on average) during their first year were **more likely to attempt** a second, more advanced mathematics courses than were students who enrolled in fewer than 12 units per semester during their first year.	• **Students who enrolled full-time** (on average) during their first year were **more likely to attempt** a second, more advanced writing courses than were students who enrolled in fewer than 12 units per semester during their first year.
Related to units in first remedial course	
• **Students whose first math course provided fewer than three units** were **less likely to attempt** a second, more advanced mathematics course, compared with students whose first course offered at least 3 units.	
Related to student characteristics and incoming goals	
• **Students who were older than 25 years of age** when they entered community college were **less likely to attempt** a second, more advanced mathematics course than "traditional college-age" students. • **Students residing in zip codes with the highest rates of bachelors-level (or higher) attainment** were **more likely to attempt** a second, more advanced mathematics course, compared with students residing in zip codes with the lowest rates of such attainment. • **Students who entered intending to complete an academic or vocational associate degree, for the purpose of remediation, or with an "abstract" or "other job-related" goal** were **less likely to attempt** a second, more advanced mathematics course than students who aspired to transfer with an associate degree.	• **Students who were older than 25 years of age** when they entered community college were **less likely to attempt** a second, more advanced writing course than "traditional college-age" students. • **Female students** were **more likely to attempt** a second, more advanced writing course than were male students. • **Students who entered intending to complete an academic associate degree** were **less likely to attempt** a second, more advanced writing course than students who aspired to transfer with an associate degree.

See pages 49–51 of the main report for detailed discussion. See Appendix Seven, Tables 5 and 6, for corresponding regression tables. EdSource 6/10

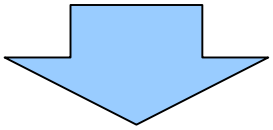


4. Among students who attempt a second, more advanced course, *who tends to delay their second course*?

Limit: **Students attended for four or more semesters; attempted a second, more advanced course.**

Mathematics (25,975 students)	Writing (22,183 students)
Net of other variables…	
Related to starting level	
• **Students who began at lower levels of remedial mathematics coursework** were **less likely to delay** a second, more advanced math course (if they took one) than student who began with Intermediate Algebra/Geometry.	• **Students who began at two or three levels below college composition** were **less likely to delay** a second, more advanced writing course (if they took one) than students who began only one level below college composition.
Related to delay of first remedial course	
• **Students who delayed their first remedial mathematics course until Spring 2003 or Spring 2004** were **more likely to delay** a second, more advanced math course (if they took one) because of the intrusion of the summer term.	• **Students who delayed their first remedial writing course until Spring 2003 or Spring 2004** were **more likely to delay** a second, more advanced writing course (if they took one) because of the intrusion of the summer term.
Related to passing courses	
• **Students who did not pass their first remedial mathematics course** were **more likely to delay** a second, more advanced math course (if they took one) because of the need to retake the initial course.	• **Students who did not pass their first remedial writing course** were **more likely to delay** a second, more advanced writing course (if they took one) because of the need to retake the initial course.
Related to full-time or part-time enrollment during the first year	
• **Students who enrolled full-time** (on average) during their first year were **less likely to delay** a second, more advanced math course (if they took one) than students who enrolled in fewer than 12 units per semester during their first year.	• **Students who enrolled full-time** (on average) during their first year were **less likely to delay** a second, more advanced writing course (if they took one) than students who enrolled in fewer than 12 units per semester during their first year.

See pages 51–53 of the main report for detailed discussion. See Appendix Seven, Tables 7 and 8, for corresponding regression tables. EdSource 6/10

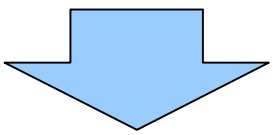


5. Who tends to *complete successfully* a remedial math course *one level below* college algebra (or higher), or a remedial writing course *one level below* college composition (or higher)?

Limit: **Students attended for four or more semesters; attempted a second, more advanced course.**
Further limit: **For math, excludes students who began in Intermediate Algebra/Geometry. For writing, excludes students who began one level below college composition.**

Mathematics (19,134 students)	Writing (10,345 students)
Net of other variables…	
Related to starting level	
• **Students who began at the lowest levels of remedial mathematics coursework** were **much less likely to complete Intermediate Algebra/Geometry** than students who began in Beginning Algebra, even if they enrolled for many semesters.	• **Students who began at the lowest levels of remedial writing coursework** were **much less likely to complete the course one level below college composition** than students who began two levels below, even if they enrolled for many semesters.
Related to delay of first remedial course	
• **Students who delayed their first remedial mathematics course until after Spring 2004** were **less likely to complete Intermediate Algebra/Geometry** than students who began immediately in Fall 2002, even among those students who remained in the system for very long periods of time.	• **Students who delayed their first remedial writing course until Fall 2003 or later** were **less likely to complete the course one level below college composition** than students who began immediately in Fall 2002.
Related to passing courses	
• **Students who passed their first remedial mathematics course** were **more likely to complete Intermediate Algebra/Geometry** than students who did not pass their first remedial math course. • In addition, **students who passed fewer than 75% of their first-year courses** were **less likely to complete Intermediate Algebra/Geometry** than students who passed 75% or more of their first-year courses, although this relationship diminishes in magnitude as students remain in the system for progressively longer periods of time.	• **Students who passed fewer than 75% of their first-year courses** were **less likely to complete the course one level below college composition** than students who passed 75% or more of their first-year courses, although this relationship diminishes in magnitude as students remain in the system for progressively longer periods of time.
Related to delay of second, more advanced course	
• **Students who delayed a second, more advanced math course by more than one semester** were **less likely to complete Intermediate Algebra/Geometry** than students who did not delay.	• **Students who delayed a second, more advanced writing course by more than one semester** were **less likely to complete the course one level below college composition** than students who did not delay.
Related to student characteristics and incoming goals	
• **Students who were older than 25 years of age** when they entered community college were **less likely to complete Intermediate Algebra/Geometry** than "traditional college-age" students.	• **Black/African American students** were **less likely to complete the course one level below college composition** than white students.

See pages 53–54 of the main report for detailed discussion. See Appendix Seven, Tables 9 and 10, for corresponding regression tables. EdSource 6/10



6. Who tends to *complete successfully a college-level course* in math or writing?

Limit: **Students attended for four or more semesters; attempted a second, more advanced course.**

Mathematics (25,975 students)	Writing (22,183 students)
Net of other variables…	
Related to starting level	
• **Students who began at the three lower levels of remedial mathematics coursework** were **much less likely to complete a college-level math course** than students who began in Intermediate Algebra, even if they enrolled for many semesters.	• **Students who began at the four lower levels of remedial writing coursework** were **much less likely to complete college composition** than students who began only one level below, even if they enrolled for many semesters.
Related to delay of first remedial course	
• **Students who delayed their first remedial mathematics course until after Spring 2004 were less likely to complete a college-level math course** than students who began immediately in Fall 2002, even among those students who remained in the system for very long periods of time.	• Some evidence suggests that **students who delayed their first remedial writing course until Fall 2003 or later** were **less likely to complete college composition** than students who began immediately in Fall 2002—but this relationship is somewhat ambiguous compared with math.
Related to passing courses	
• **Students who passed fewer than 75% of their first-year courses** were generally **less likely to complete a college-level math course** than students who passed 75% or more of their first-year courses, although this relationship diminishes in magnitude as students remain in the system for progressively longer periods of time.	• **Students who passed their first remedial writing course** were **more likely to complete college composition** than students who did not pass their first remedial writing course. • In addition, **students who passed fewer than 75% of their first-year courses** were generally **less likely to complete college composition** than students who passed 75% or more of their first-year courses, although this relationship diminishes in magnitude as students remain in the system for progressively longer periods of time.
Related to delay of second, more advanced course	
• **Students who delayed a second, more advanced math course by more than one semester** were **less likely to complete a college-level math course** than students who did not delay, even if they enrolled for many semesters.	• **Students who delayed a second, more advanced writing course by more than one semester** were **less likely to complete college composition** than students who did not delay, even if they enrolled for many semesters.
Related to student characteristics and incoming goals	
• **Black/African American students** were **less likely to complete a college-level math course** than white students. • **Students residing in zip codes with the highest rates of bachelors-level (or higher) attainment** were **more likely complete a college-level math course**, compared with students residing in zip codes with the lowest rates of such attainment. • **Students who were older than 25 years of age** when they entered community college were **less likely to a college-level math course** than "traditional college-age" students.	• **Black/African American students** were **less likely to complete college composition** than white students. • **Students residing in zip codes with the highest rates of bachelors-level (or higher) attainment** were **more likely complete college composition**, compared with students residing in zip codes with the lowest rates of such attainment. In addition, **students who received a fee waiver** were **less likely to complete college composition** than students who did not receive a fee waiver. • **Students who were older than 25 years of age** when they entered community college were **less likely to complete college composition** than "traditional college-age" students. • **Students who entered intending to complete an academic associate degree, or with an "other job-related" goal,** were **less likely to complete college composition** than students who aspired to transfer with an associate degree.

See pages 54–55 of the main report for detailed discussion. See Appendix Seven, Tables 11 and 12, for corresponding regression tables. EdSource 6/10

Works cited

Academic Affairs Division, California Community Colleges System Office. (2008). *Report on the System's Current Programs in English as a Second Language (ESL) and Basic Skills*. Sacramento: Board of Governors of the California Community Colleges.

Academic Senate for California Community Colleges. (1997). *Good Practice for the Implementation of Prerequisites*. Sacramento.

———. (2003). *A Survey of Effective Practices in Basic Skills*. Sacramento.

———. (2004). *Issues in Basic Skills Assessment and Placement in the California Community Colleges*. Sacramento.

———. (2010). *Practices that Promote Equity in Basic Skills in California Community Colleges*. Sacramento.

Academic Senate for California Community Colleges & California Community Colleges Chancellor's Office. (2010). *Coding the Student Progress Pathway through Basic Skills English, ESL, Mathematics and Reading Courses in California Community Colleges*. Sacramento.

Academy for College Excellence. (2010). Cabrillo College's Academy for College Excellence Receives $3.6 Million to Expand Academic Support Program for Under-prepared Students. Press release, March 8, 2010. Aptos: Cabrillo College. http://academyforcollegeexcellence.org/ace-receives-36-million-grant/ (Accessed June 16, 2010.)

American Association of Community Colleges. (2010). About the Voluntary Framework of Accountability. Washington, DC. http://www.aacc.nche.edu/resources/aaccprograms/vfa/Pages/default.aspx (Accessed June 16, 2010.)

American Association of Community Colleges, Association of Community College Trustees, Center for Community College Student Engagement, League for Innovation in the Community College, National Institute for Staff and Organizational Development, and Phi Theta Kappa Honor Society. (2010). *Democracy's Colleges: Call To Action*. http://www.aacc.nche.edu/newsevents/News/articles/Documents/callaction_04202010.pdf (Accessed June 16, 2010.)

Badway, N.N. (2005). *Watsonville Digital Bridge Academy – Report I: Student Outcomes Evaluation, Cohorts 1 & 2*. Higher Education Evaluation and Research Group.

Bahr, Peter Riley. (2008). "Does Mathematics Remediation Work?: A Comparative Analysis of Academic Attainment among Community College Students." *Research in Higher Education*, 49(5), 420–450.

———. (2009). Educational Attainment as Process: Using Hierarchical Discrete-Time Event History Analysis to Model Rate of Progress. *Research in Higher Education*, 50(7), 691–714.

———. (2010a). The Bird's Eye View of Community Colleges: A Behavioral Typology of First-Time Students based on Cluster Analytic Classification. *Research in Higher Education*, 51(8), in press.

———. (2010b). Making Sense of Disparities in Mathematics Remediation: What is the Role of Student Retention? *Journal of College Student Retention*, 12(1), 25–49.

———. (2010c). Preparing the Underprepared: An Analysis of Racial Disparities in Postsecondary Mathematics Remediation. *Journal of Higher Education*, 81(2), 209–237.

———. (2010d). Revisiting the Efficacy of Postsecondary Remediation: The Moderating Effects of Depth/Breadth of Deficiency. *Review of Higher Education*, 33(2), 177–205.

Bailey, T. (2009). Challenge and Opportunity: Rethinking the Role and Function of Developmental Education in Community College. *New Directions for Community Colleges*, no. 145: 11–30.

Bailey, T., Jeong, D.W., & Cho, S. (2008). *Referral, Enrollment, and Completion in Developmental Education Sequences in Community Colleges*. New York: Community College Research Center, Teachers College, Columbia University.

Barr, J. (2005). Online Informed Self-Placement for Math. *iJournal*, no. 10. http://www.ijournal.us/issue_10/ij_issue10_08.html. (Accessed June 16, 2010.)

Basic Skills Initiative. (2009). *2009 ESL/Basic Skills Professional Development Grant Progress Report*. California Community Colleges Basic Skills Initiative.

Berger, D.M. (1997). Mandatory Assessment and Placement: The View from an English Department. *New Directions for Community Colleges*, no. 100: 33–41.

Bill & Melinda Gates Foundation. (2010). Foundation Giving $110 Million to Transform Remedial Education. Press release, April 20, 2010. Seattle. http://www.gatesfoundation.org/press-releases/Pages/new-ideas-for-remedial-education-in-community-college-100420.aspx (Accessed June 16, 2010.)

Board of Governors of the California Community Colleges. (1987). *Proposals for Strengthening Academic Standards*. Item 4, January 22, 1987. Sacramento.

———. (1991). *Matriculation: A Report on Third-Year Implementation, 1989-90*. Sacramento.

———. (1993). *The Model District Policy on Prerequisites, Corequisites, and Advisories on Recommended Preparation*. Sacramento. http://www.asccc.org/Publications/Papers/Model_prerequisites.html. (Accessed June 16, 2010.)

Bond, L. (2009). *Toward Informative Assessment and a Culture of Evidence*. Stanford: The Carnegie Foundation for the Advancement of Teaching.

Boroch, D., Hope, L., et al. (2010). *Student Success in Community Colleges: A Practical Guide to Developmental Education*. San Francisco, CA: Jossey-Bass.

Brown, R.S., & Niemi, D.N. (2007). *Investigating the Alignment of High School and Community College Assessments in California*. San Jose: National Center for Public Policy and Higher Education.

Brown, S.E., & Romero, M.A. (1991). Letter, Re: Settlement in *Christopher Romero-Frias, et al. v. David Mertes, et al.*, Case No. 502341, Sacramento Superior Court. June 7, 1991.

Bunch, G.C. (2008). Language Minority Students and California Community Colleges: Current Issues and Future Directions. *Community College Policy Research*, No. 1 (Spring 2008).

———. (2010). *How Testing and Placement Policies Affect Language Minority Students in CA Community Colleges*. Presented at the PACE Seminar for Educational Policymakers and Scholars, Sacramento, March 26, 2010. http://www.stanford.edu/group/pace/PODCASTS/slideshows/2010_MAR_26_PACE_SEMINAR_SLIDES.pdf. (Accessed June 16, 2010.)

Bunch, G.C., & Panayotova, D. (2008). Latinos, Language Minority Students, and the Construction of ESL. *Journal of Hispanic Higher Education* 7(1): 6–30.

Cabrillo College. (2010). *Schedule of Classes – Spring 2010*. Aptos.

California Budget Project. (2009). *Basic Skills Education in California*. Sacramento.

California Community College Assessment Association Test-Development Feasibility Taskforce. (2008). *Evaluation of Feasibility of CCC-Developed and Managed Placement Assessment Instruments*. California

Community College Assessment Association.

California Community Colleges Chancellor's Office. (1997). *Prerequisites, Corequisites, Advisories, and Limitations On Enrollment*. Sacramento.

———. (2006). *California Community Colleges Supplemental Learning Assistance and Tutoring Regulations and Guidelines*. Sacramento.

———. (2009). *Basic Skills Accountability Report*. Sacramento.

———. (2010a). *Surveys – How Community College Districts are Responding to Budget Cuts*. Sacramento.

———. (2010b). Workload Reduction Report, submitted to Members of the California State Legislature and the California Department of Finance. March 1, 2010. Sacramento.

———. (2010c). California Community Colleges Make Concerted Effort to Meet Demand. Press release, June 3, 2010. Sacramento. http://www.cccco.edu/Portals/4/News/press_releases/2010/June 3 2010 Media Briefing.docx. (Accessed June 15, 2010.)

California Postsecondary Education Commission. (1983). *Promises to Keep: Remedial Education in California's Public Colleges and Universities*. Sacramento.

California State University Office of the Chancellor. (2008). General Education Breadth Requirements – Executive Order 1033. http://www.calstate.edu/eo/EO-1033.html. (Accessed April 10, 2010.)

Callan, P.M. (2009). *California Higher Education, The Master Plan, and the Erosion of College Opportunity*. San Jose: National Center for Public Policy and Higher Education.

Career Ladders Project, Career Advancement Academies. http://www.careerladdersproject.org/projects/career.php. (Accessed June 16, 2010.)

Carnegie Foundation for the Advancement of Teaching. (2008). *Basic Skills for Complex Lives: Designs for Learning in the Community College*. Stanford.

Center for Student Success. (2007). *Basic Skills as a Foundation for Student Success in California Community Colleges*, Second edition. The Research and Planning Group for California Community Colleges.

———. (2009). *Contextualized Teaching & Learning: A Faculty Primer*. The Research and Planning Group for California Community Colleges; Academic Senate for California Community Colleges; Basic Skills Initiative; Bay Area Workforce Funding Collaborative.

Chaffey College, Chaffey College Success Centers. http://www1.chaffey.edu/success/index2.shtml. (Accessed June 16, 2010.)

Chaffey College Office of Institutional Research. (2009a). *Fall 2006 First-Time College Student Behavior Following Requirement to Access Success Center*. Rancho Cucamonga: Chaffey College.

———. (2009b). *Research Briefs from Institutional Research – Focus Areas to Increase Accountability Reporting for Community Colleges (ARCC) Outcomes for 2008*. Rancho Cucamonga: Chaffey College.

Collins, M.L. (2008). *It's Not About the Cut Score: Redesigning Placement Assessment Policy to Improve Student Success*. Boston: Jobs for the Future.

———. (2009). *Setting Up Success in Developmental Education: How State Policy Can Help Community Colleges Improve Student Outcomes*. Boston: Jobs for the Future.

Commission for the Review of the Master Plan for Higher Education. (1986). *The Challenge of Change: A Reassessment of the California Community Colleges*. Sacramento.

Community College of Baltimore County, Accelerated Learning Project. http://faculty.ccbcmd.edu/~padams/ALP/indexa.html. (Accessed April 10, 2010.)

Consultation Council Task Force on Assessment. (2008). *Report of the Consultation Council Task Force on Assessment to the Board of Governors of the California Community Colleges*. Sacramento: Consultation Council of the California Community Colleges.

Dowd, A., Lord, L., et al. (2009). *Performance Funding for Practitioner Inquiry in California: A Model for Improving Institutional Effectiveness?* Presented at the 2009 AERA Annual Meeting, San Diego, California. April 2009.

EdSource. (2008). *High School to Community College: New Efforts to Build Shared Expectations*. Mountain View.

EdSource. (2009). *Algebra Policy in California: Great Expectations and Serious Challenges*. Mountain View.

———. (2010a). *Community College Funding 2009–10: Increased Demand, Reduced Resources*. Mountain View.

———. (2010b). *2010 Resource Cards on California Education*. Mountain View.

Epper, R.M., & Baker, E.D. (2009). *Technology Solutions for Developmental Math: An Overview of Current and Emerging Practices*. Funded by the William and Flora Hewlett Foundation and the Bill & Melinda Gates Foundation.

Felder, J.E., Finney, J.E., & Kirst, M.W. (2007). *"Informed Self-Placement" at American River College: A Case Study*. San Jose: National Center for Public Policy and Higher Education.

Finton, J., & Fulks, J. (2008). *A Comparison of Basic Skills Success Rates and Basic Skills Action Planning Strategies in the California Community Colleges*. Academic Senate for California Community Colleges.

Fulks, J. (2009). What Do Students Think About Prerequisites? Give a Listen to Their Views! *Academic Senate for California Community Colleges Senate Rostrum*, (May): 24–25.

Fulks, J., and others. (2008). Scaffolding and Foundational Support for College Success: The Role of Prerequisites (Chapter 16). In Fulks, Allencraig, and others (Eds.), *Constructing a Framework for Success: A Holistic Approach to Basic Skills (Basic Skills Handbook)*. Sacramento: Academic Senate for California Community Colleges. http://www.cccbsi.org/basic-skills-handbook. (Accessed June 16, 2010.)

Fulks, J., Alancraig, M., et al. (2008). More on Basic Skills Coordinators: Sustaining the Architect (Chapter 18). In Fulks, Allencraig, and others (Eds.), *Constructing a Framework for Success: A Holistic Approach to Basic Skills (Basic Skills Handbook)*. Sacramento: Academic Senate for California Community Colleges. http://www.cccbsi.org/basic-skills-handbook. (Accessed June 16, 2010.)

Goldrick-Rab, S. (2009). The American Graduation Initiative White Page. Drafted for the American Graduation Initiative Jam. Knowledge in the Public Interest. kpublic.com

Grubb, W.N., & Associates. (1999). *Honored But Invisible: An Inside Look at Teaching in Community Colleges*. New York: Routledge.

Hayward, C. (2009). *Placement Level Analysis of the California Community College System*. Aptos: Cabrillo College.

Hern, K., Arnold, C., & Samra, R. (2009). *Student Success and Persistence in Accelerated Developmental English*. Hayward: Chabot College.

Intersegmental Committee of Academic Senates ESL Task Force. (2006). *ESL Students in California Public Higher Education*. Sacramento.

Jaschik, S. "How to Judge Community Colleges." *Inside Higher Ed* April 20, 2010. http://www.insidehighered.com/news/2010/04/20/accountable (Accessed June 16, 2010.)

Jackson State Community College. *Tennessee Board of Regents: Developmental Studies Redesign Initiative*. Saratoga Springs: The National Center for Academic Transformation. http://www.thencat.org/States/TN/Abstracts/JSCC Algebra_Abstract.htm. (Accessed April 10, 2010.)

Jenkins, D., Zeidenberg, M., & Kienzl, G.S. (2009). *Educational Outcomes of I-BEST, Washington State Community and Technical College System's Integrated Basic Education and Skills Training Program: Findings from a Multivariate Analysis*. New York: Community College Research Center, Teachers College, Columbia University.

Jenkins, D., Zeidenberg, M., et al. (2009). *Educational Outcomes of Cabrillo College's Digital Bridge Academy: Findings from a Multivariate Analysis*. New York: Community College Research Center, Teachers College, Columbia University.

Jobs for the Future and Complete College America. (2009). *State Levers to Improve Degree Completion by Developmental Education Students*. Meeting summary, October 22, 2009. Boston.

Jones, D., & Ewell, P. (2009) *Utilizing College Access and Completion Funds to Improve Postsecondary Attainment in California*. National Center for Higher Education Management Systems. June, 2009

Legislative Analyst's Office. (2008). *Back to Basics: Improving College Readiness of Community College Students*. Sacramento.

Lieu, M.W. (2010). Putting Prerequisites into Context: How We Got to Where We Are. *Academic Senate for California Community Colleges Senate Rostrum*, (January): 12–14.

Long, J. S. (1997). *Regression models for categorical and limited dependent variables*. Thousand Oaks, California: Sage.

Mahon, R. (2009). *A Selective History of CCC Prerequisites*. Sacramento: Academic Senate for California Community Colleges. http://www.asccc.org/ExecCom/Committees/Curriculum-Prerequisite_Project.htm. (Accessed June 16, 2010.)

Mertes, D. (1991). Letter to Manuel Romero, Regional Counsel, Mexican American Legal Defense and Educational Fund. May 28, 1991.

Moore, C., Shulock, N. , et al. (2007). *Beyond the Open Door: Increasing Student Success in the California Community Colleges*. Sacramento: Institute for Higher Education Leadership & Policy, California State University, Sacramento.

Moore, C., & Shulock, N. (2009). *The Grades Are In – 2008*. Sacramento: Institute for Higher Education Leadership and Policy, California State University, Sacramento.

Navarro, D.J. (2008). *Digital Bridge Academy: A Transformative Education to Bridge the Digital Divide*. Aptos: Digital Bridge Academy, Cabrillo College.

Offenstein, J., & Shulock, N. (2009). *Community College Student Outcomes: Limitations of the Integrated Postsecondary Education Data Systems (IPEDS) and Recommendations for Improvement*. Sacramento: Institute for Higher Education Leadership and Policy, California State University, Sacramento.

Offenstein, J., Moore, C., & Shulock, N. (2010). *Advancing by Degrees: A Framework for Increasing College Completion*. Sacramento: Institute for Higher Education Leadership and Policy, California State University, Sacramento; and Washington, D.C.: The Education Trust.

Perin, D. (2006). Can Community Colleges Protect Both Access and Standards? The Problem of Remediation. *Teachers College Record* 108(3): 339–373.

Prince, D., & Jenkins, D. (2005). Building Pathways to Success for Low-Skill Adult Students: Lessons for Community College Policy and Practice From a Longitudinal Student Tracking Study. *CCRC Brief*, no. 25. New York: Community College Research Center, Teachers College, Columbia University

Powers, D. A., & Xie, Y. (2000). *Statistical methods for categorical data analysis*. San Diego, California: Academic Press.

Provasnik, S., & Planty, M. (2008). *Community Colleges: Special Supplement to The Condition of Education 2008*. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education.

Pusser, B., & Levin, J. (2009). *Re-imagining Community Colleges in the 21st Century*. Washington, DC: Center for American Progress.

Research and Planning Group for California Community Colleges. (2004). Letter to Chancellor Mark Drummond. May 21, 2004.

———. (2009). *Basic Skills Outcomes Capacity (BSOC) Project: A study of the use of evidence in California community colleges*.

Reyes, D. (1988). College Accused of Using Exams to Bar Minorities. *Los Angeles Times*, May 19, 1988.

Roksa, J., Jenkins, D, et al. (2009). *Strategies for Promoting Gatekeeper Course Success Among Students Needing Remediation: Research Report for the Virginia Community College System*. New York: Community College Research Center, Teachers College, Columbia University.

Shulock, N., & Moore, C. (2007a). *Rules of the Game: How State Policy Creates Barriers to Degree Completion and Impedes Student Success in the California Community Colleges*. Sacramento: Institute for Higher Education Leadership & Policy, California State University, Sacramento.

———. (2007b). *Invest in Success: How Finance Policy Can Increase Student Success at California's Community Colleges*. Sacramento: Institute for Higher Education Leadership and Policy, California State University, Sacramento.

Shulock, N., Moore, C., et al. (2008). *It Could Happen: Unleashing the Potential of California's Community Colleges to Help Students Succeed and California Thrive*. Sacramento: Institute for Higher Education Leadership & Policy, California State University, Sacramento.

Strategic Plan Assessment Action Planning Group. (2009). *End-of-Year Report – May 2009*. Sacramento: California Community Colleges Chancellor's Office.

Times Wire Services. (1991). Latinos Settle Dispute With 2-Year Colleges. *Los Angeles Times*. June 4, 1991.

University of Southern California Center for Urban Education & Evergreen Valley College. (2009). *Applying the CUE Equity Model to Institutional Self-Assessment of Basic Skills*. Los Angeles.

U.S. Department of Education. (2010). U.S. Education Secretary Appoints Members and Chair of New Committee on Measures of Student Success. Press release, June 2, 2010. Washington, DC. http://www.ed.gov/news/press-releases/us-education-secretary-appoints-members-and-chair-new-committee-measures-student. (Accessed June 16, 2010.)

Venezia, A., Kirst, M.K., & Antonio, A.L. (2003). *Betraying the College Dream: How Disconnected K–12 and Postsecondary Education Systems Undermine Student Aspirations*. Stanford: Stanford Institute for Higher Education Research, Stanford University.

Washington State Board for Community and Technical Colleges. (2005). *I-BEST: A Program Integrating Adult Basic Education and Workforce Training*. Olympia.

———. (2007). *Meeting Washington State's Needs for an Education Citizenry and Vital Economy: An Initiative for Measuring Colleges and Awarding Funds for Improving Student Achievement and Success*. Olympia.

———. (2009). *Integrated Basic Education and Skills Trainings (I-BEST)*. Olympia.

Weissman, E., Cerna, O., et al. (2009). *Promoting Partnerships for Student Success: Lessons from the SSPIRE Initiative*. Oakland: MDRC.

Wiseley, W.C. (2009). *Effectiveness of Contextual Approaches to Developmental Math in California Community Colleges*. Dissertation. Stockton: University of the Pacific.