EdSource
Engaging Californians on Key Education Challenges

ISSUE BRIEF
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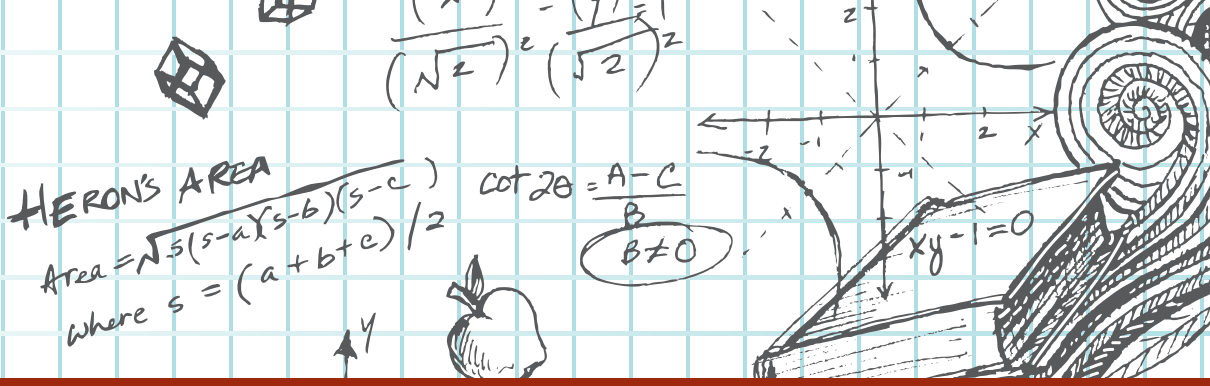


Passing When It Counts

Math courses present barriers to student success in California Community Colleges

Overview

Large numbers of students in California's 112 community colleges are struggling to pass college-level math classes, including courses they need to complete a degree or transfer to a four-year institution.

Community college students' success in rigorous math is crucial to their futures and to any effort to improve college completion rates in California. Students must complete at least Intermediate Algebra to earn an associate degree, or have demonstrated proficiency at that level on an assessment test. Beyond that, students who hope to transfer to a University of California or California State University campus with math credits must take higher-level math courses, such as Calculus.

An EdSource analysis found that in fall 2010:

- 55% of students who enrolled in a math course that they could apply toward an associate degree or use to transfer passed it during the term.
- These rates have essentially remained unchanged since fall 1992, the earliest term for which the California Community Colleges publish comparable data.
- Pass rates in these math courses varied by student ethnicity, with African Americans passing only 41% of the time.
- Pass rates also varied by college. At most colleges, 50% to 60% of enrollees in these math courses passed them during the term.

Math success is a challenge not only for California, but also for most other states. In recent years, much attention has been focused on students taking remedial or "developmental" courses that they need just to be eligible to take college-level courses. Much less attention has been devoted to students taking college-level math courses.

What makes math completion especially challenging is that students often come to math with a high degree of anxiety, frequently rooted in earlier failures. Succeeding in math at the outset could provide students with "early momentum" that would contribute to their overall success in college. Conversely, lack of success could discourage them from completing their studies.

Increasing the success rates in more advanced math courses remains a continuing challenge for California and the nation. This issue brief underscores the need to make math success a priority at not only the developmental or remedial level, but at all levels of math instruction.

This Issue Brief focuses on math courses that count toward an associate degree

This report uses data from the Chancellor's Office Management Information Systems (COMIS) that is downloadable from the Chancellor's Office's Data Mart website.

The report focuses on student enrollments in fall 2010 in community college math courses that met both of the following criteria:

- Courses focused on the operations, concepts, and applications of mathematics. (The courses are coded in COMIS as "Mathematics, General (1701).")
- Students could count these math courses toward an associate degree if they passed. (The courses are also coded in COMIS as "Credit—Degree Applicable.")

These courses include:

- Courses that provide transfer credit to the University of California or the California State University, such as Calculus.
- Courses that count toward an associate degree but *do not* provide transfer credit—most importantly Intermediate Algebra, but sometimes (depending on the college) including courses such as Elementary Algebra.

Notes: Students must demonstrate competency in mathematics at least at the level of Intermediate Algebra to fulfill the minimum competency requirement in mathematics for an associate degree from a California community college. Students do this by passing a course in Intermediate Algebra (or a local equivalent) or by "placing out" of the course through assessment (such as by scoring highly on a placement test). However, according to California's *Basic Skills Accountability* report, about 85% of community college students who are assessed for placement in math *do not* place out of Intermediate Algebra, meaning they must *pass the course* to earn a degree.[1]

Math courses that students *could not count* toward an associate degree, including "basic skills" courses such as Arithmetic, also are discussed occasionally in this report. (These are coded in COMIS as "Credit—Not Degree Applicable.") Statewide student success data for these courses are provided on the EdSource website.

1 See Table C1.

Did you know?

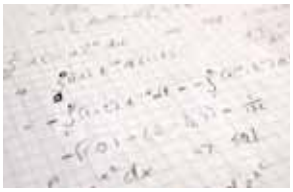
California community colleges serve a very diverse group of students with many backgrounds and academic and career goals. For example:

- Six in ten public high school graduates in California who go on to a public college or university go to community college.
- At the same time, nearly half of community college students in the state are at least 25 years old.

The data in this report provide no insight into whether all students who took math courses in fall 2010 aspired to complete an associate degree or transfer to a four-year university.

Students had more difficulty passing math courses than those in other disciplines

For example, students passed courses they could apply toward a degree more often in every humanities discipline—such as English (67% of fall 2010 enrollees passed)—and in the physical and biological sciences (66% passed).



DATA ANALYSIS

1. In fall 2010, 55% of students who enrolled in math courses that count toward a degree passed them

To succeed in a math course that counts toward an associate degree, a community college student must:

- **Remain in the course until the end of the term**—in other words, not drop or withdraw early. (Withdrawing from a course does not necessarily mean a student was likely to fail it, or that the student might not pass it on a later attempt.)
- **Receive a passing grade,** in the form of passing credit (if enrolled on a pass/fail basis) or a grade of "C" or higher.

In fall 2010, 55% of all enrollments in these math courses resulted in the student passing the course, as the flow chart on page 4 shows.

This result is much the same as a decade ago and even longer. The comparable success rate was 54% in fall 2000—and in fall 1992, the earliest year for which comparable data are publicly available.[2]

Two kinds of math courses count toward an associate degree:

- Courses such as Intermediate Algebra that students can apply toward a degree *but not toward transfer;* and
- Courses such as Calculus that also provide transfer credit.

The lower-level courses, such as Intermediate Algebra, posed more difficulty for students in fall 2010: 51% of students who enrolled in these courses passed them during that term, compared with 59% of students who enrolled in transferable math courses such as Calculus.

For the math course success rates of individual colleges, see an interactive map and an Excel file on the EdSource website.

2 Note that, over time, individual colleges may have adjusted their policies for which math courses students may count toward an associate degree; how this might have affected the historical success rates just discussed is not clear.

Passing individual courses is not the only important aspect of community college students' progress in mathematics

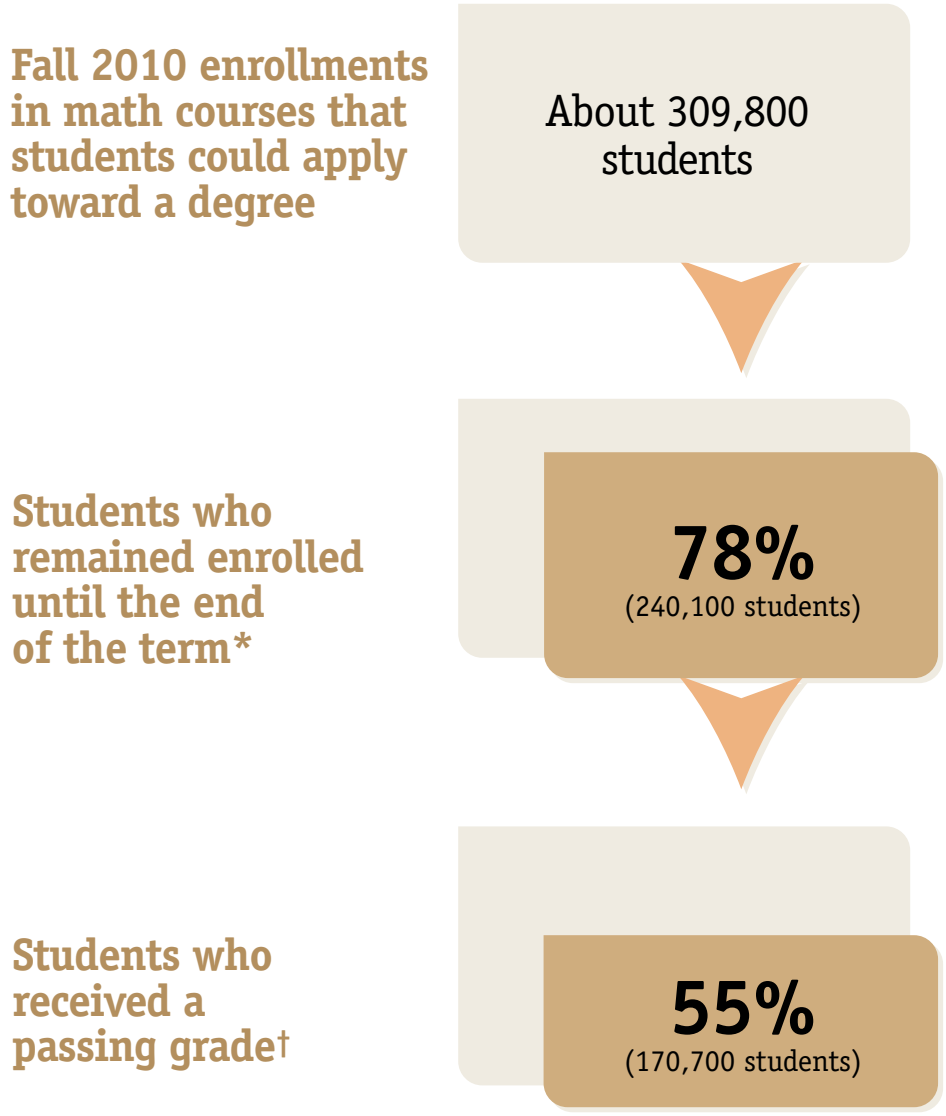
Equally important as passing individual courses is how community college students move through *sequences* of math courses. For example, community colleges in California require many students to complete additional courses *before* they can take math courses that count for a degree or transfer. Colleges generally do this after assessing students to determine the course level at which they should begin.

This is important, in part, because not all students make it from one course level to the next. According to the system's most recent *Basic Skills Accountability* report, only 14% of students who begin in a math course such as Pre-algebra—three levels below math courses that provide transfer credit—complete *within eight years* a math course they can use to transfer to the University of California or California State University.[3]

How students move through sequences of math courses is outside the scope of this report. The issue is discussed at some length in the October 2010 EdSource report, *Something's Got to Give.*

3 See Table D1.

STUDENTS PASSING A MATH COURSE THAT COUNTS TOWARD AN ASSOCIATE DEGREE



Notes: The data above are limited to courses coded as "Credit—Degree Applicable" and "Mathematics, General (1701)." Enrollment totals are rounded to the nearest 100. Comparable data for math courses that *do not* count toward an associate degree are provided at EdSource's website.

The number of students reflects total enrollments. Any student who enrolled in more than one of these math courses during the term would have been counted as more than one enrollment.

* The state-reported "retention rate."

† The state-reported "success rate."

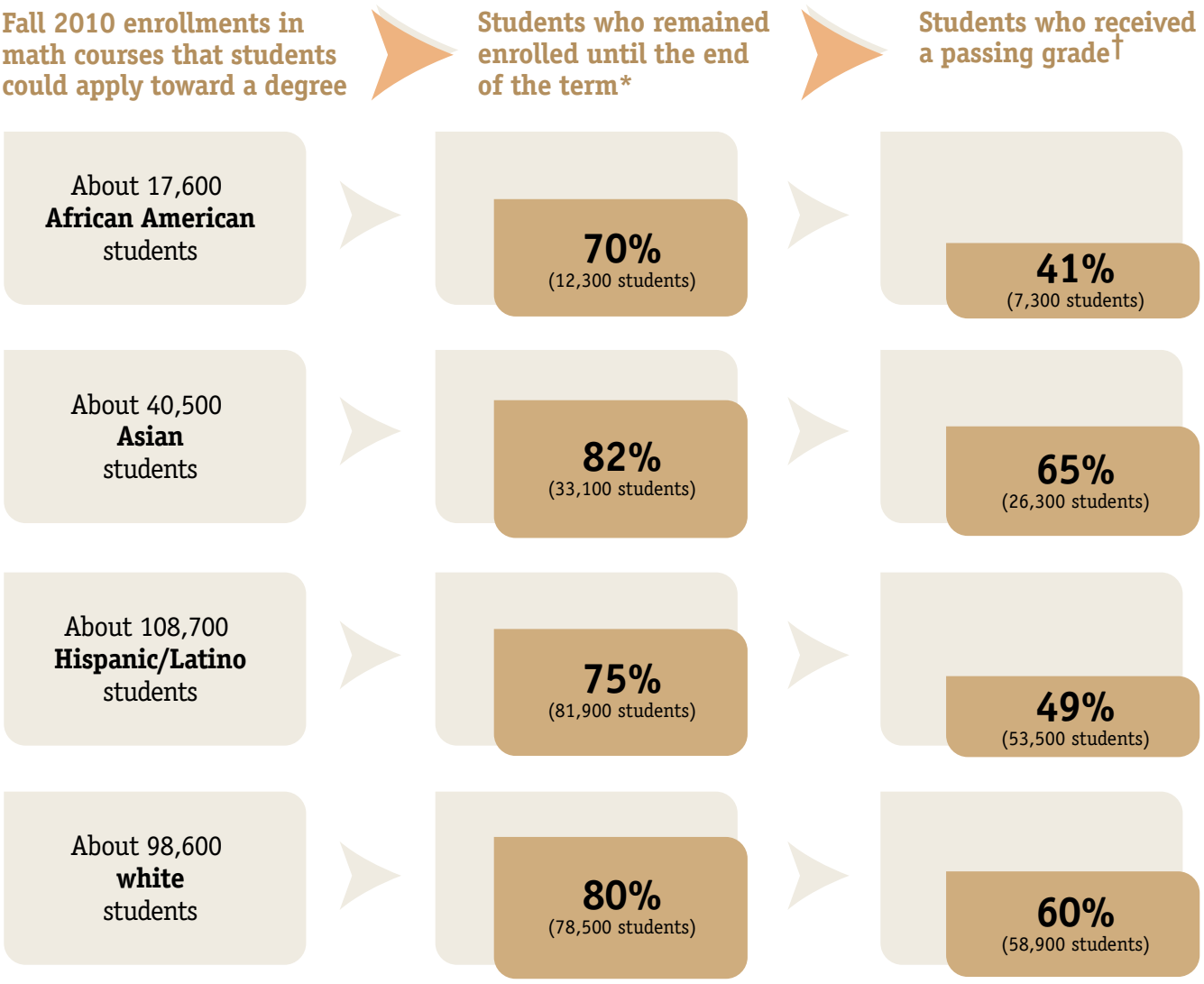
Data: California Community Colleges Chancellor's Office Data Mart, accessed July 2011. EdSource 1/12

2. Math course success varied by student ethnicity

Students' success in math courses that apply toward a degree varies by student background—in particular by student ethnicity. As the flow charts show, in fall 2010:

- Asian students were most successful in these courses.
- Hispanic/Latino and white students enrolled in these math courses in the greatest numbers compared with other ethnic groups. But Latino students were much less successful in them than were white students.
- Math course outcomes for African American students are most troubling: only 41% of African American enrollees in these math courses passed them during the term.

STUDENTS PASSING A MATH COURSE THAT COUNTS TOWARD AN ASSOCIATE DEGREE, BY ETHNICITY



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The number of students reflects total enrollments. Any student who enrolled in more than one of these math courses during the term would have been counted as more than one enrollment.

* The state-reported "retention rate."

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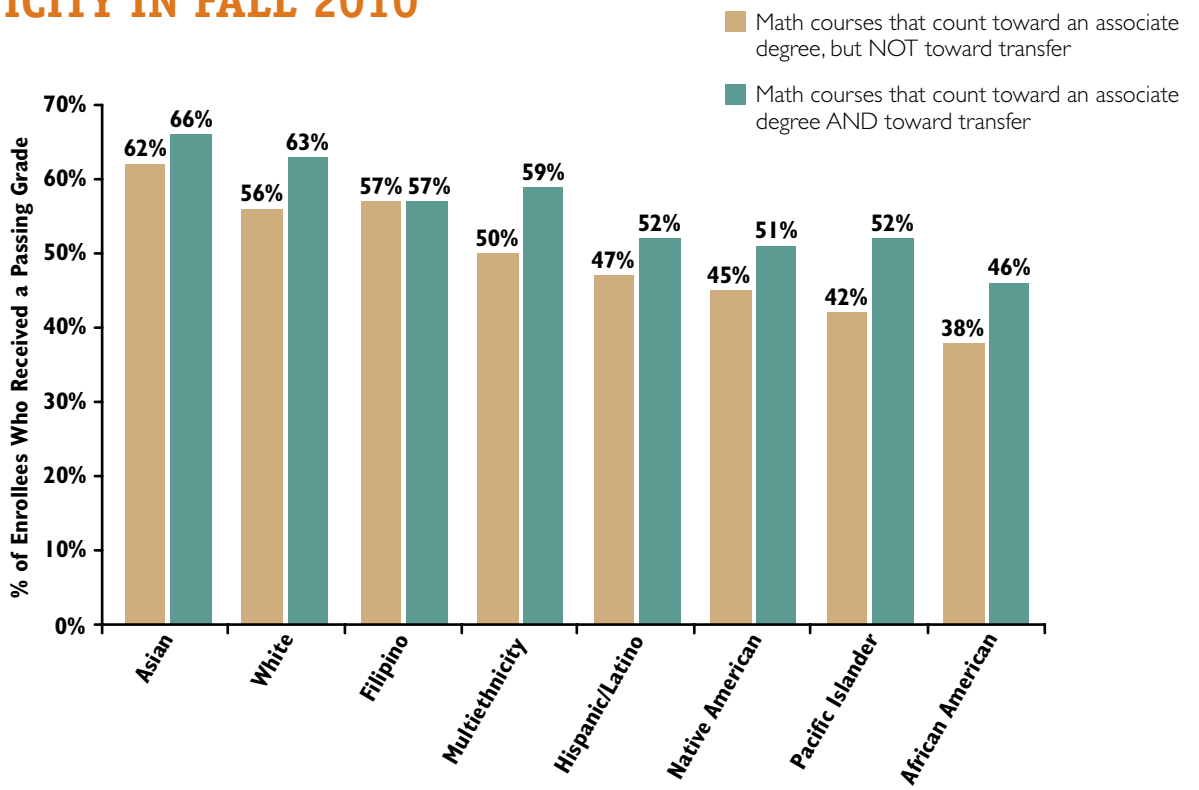
Data: California Community Colleges Chancellor's Office Data Mart, accessed July 2011. EdSource 1/12

For nearly all ethnic groups during fall 2010, students who enrolled in math courses that provide transfer credit (such as Calculus) were more likely to pass them than were students who enrolled in math courses such as Intermediate Algebra.

But as the bar chart on this page shows, there were gaps in course success among different ethnic groups at both of these levels of math coursework, with the starkest gaps being between Asians and African Americans.

DISPARITIES IN MATH COURSE SUCCESS BY STUDENT ETHNICITY IN FALL 2010



Notes: The data above are limited to courses coded as "Mathematics, General (1701)." For each group of students, the success rate for "Math courses that count toward an associate degree, but NOT toward transfer," was derived by subtracting total enrollments and successes in "Transferable" courses from those in "Credit–Degree Applicable" ones during the same term. The success rates for "Math courses that apply toward an associate degree AND toward transfer" are the state-reported success rates for "Transferable" courses.

Students whose ethnicity is unknown are not shown in the bar chart above; they represented 7% of enrollments in these math courses.

Any student who enrolled in more than one of these math courses during the term would have been counted as more than one enrollment.

Data: California Community Colleges Chancellor's Office Data Mart, accessed July and September 2011. EdSource 1/12

Little variation among age groups or between genders was found

During fall 2010, there was little variation among different *age groups* in how often students who enrolled in math courses they could apply toward a degree passed them. For most age groups, about 56% to 57% of enrollees passed these courses during the term. Exceptions included students who were 20 to 24 years old (52% of enrollees passed during the term) and students who were younger than 18 years old (70% passed). These youngest enrollees likely included K–12 students who were taking a college math course.

Overall, there was only a small difference between *female and male* enrollees in this respect during fall 2010: 56% of female enrollees in these math courses passed them during the term, compared with 54% of male enrollees.

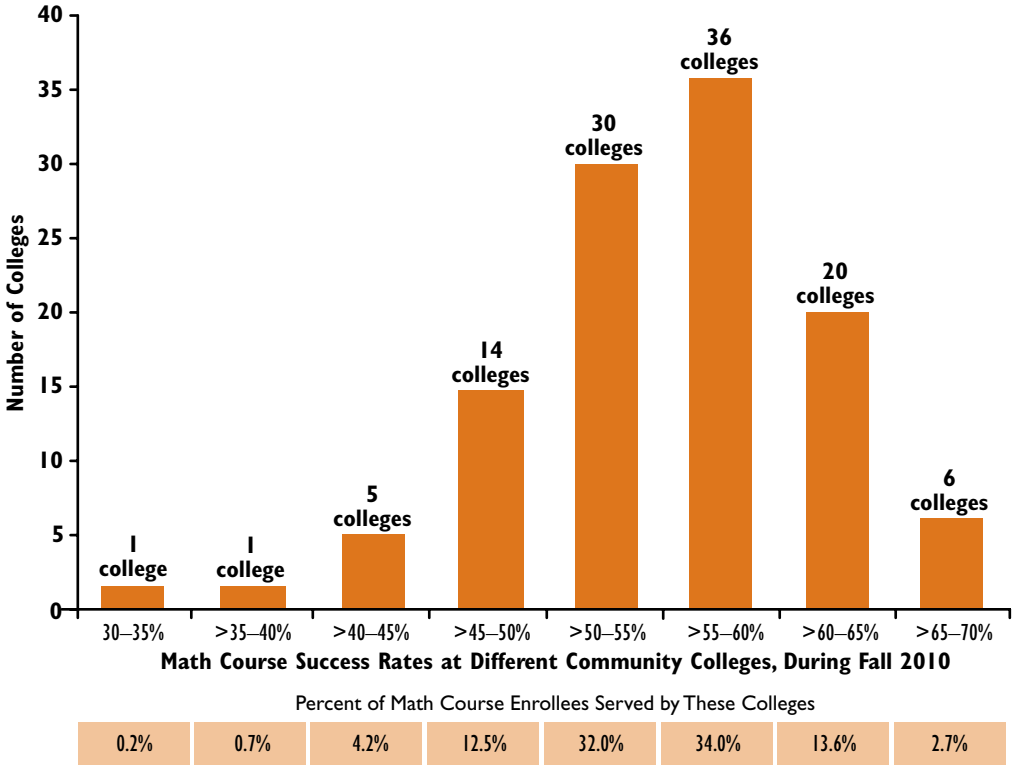
3. Students' math course success also varied among colleges

In fall 2010, student success in math courses that apply toward an associate degree also varied among California's community colleges. As discussed in the next section, possible reasons for this variation include students' backgrounds and how long it has been since they last took a math course, the quality and ongoing evaluation of instruction, and how students are placed into these math courses.

- At more than half of colleges, between 50% and 60% of students who enrolled in these math courses passed them during the term. This resembles the statewide rate of 55%.
- At 26 colleges, more than 60% of enrollees passed during the term.
- At 21 colleges, less than half passed.

For the math course success rates of individual colleges, see an interactive map and an Excel file on the EdSource website.

FALL 2010 SUCCESS RATES IN MATH COURSES THAT COUNT TOWARD AN ASSOCIATE DEGREE, AMONG CALIFORNIA COMMUNITY COLLEGES



Notes: The data above are limited to courses coded as "Credit–Degree Applicable" and "Mathematics, General (1701)."
The vast majority of data shown above are based on math course success rates reported by the state in July 2011. However, updated data from November 2011 was used for two colleges for which EdSource confirmed errors in the July data. Note that these data exclude Los Angeles Community College District's Instructional Television program, which Data Mart includes as a separate institution.

Data: California Community Colleges Chancellor's Office Data Mart, accessed July 2011 and November 2011. EdSource 1/12

K–12 data underscore the need to effectively provide community college students with additional preparation in math

In 2011, a little more than half of California 11th graders—a slow but steady improvement over previous years—had progressed far enough in their study of mathematics to be eligible to participate in the state's Early Assessment Program (EAP) in mathematics, which provides early feedback about students' readiness for transferable math courses.

Only 11th graders who are taking or have already completed Algebra II—effectively, Intermediate Algebra—can participate in the EAP in math. This reflects the fact that students must complete this much math to qualify for admission to a four-year public state university.

The 49% of 11th graders who were not EAP-eligible in math in 2011 are more likely to depend on the California Community Colleges for access to postsecondary education and to need more help in math.

DISCUSSION

CAN CALIFORNIA'S COMMUNITY COLLEGES IMPROVE STUDENT SUCCESS IN MATH COURSES THAT COUNT TOWARD A DEGREE?

For the many students who arrive at a California community college underprepared in math, passing Intermediate Algebra is essential for completing an associate degree. Depending on the discipline, some associate degree programs also require additional math courses. And only math courses beyond Intermediate Algebra provide students with transfer credit. Ideally, these courses would be gateways to further achievement rather than stumbling blocks.

Improving students' basic skills has been a major goal of recent community college reforms

Much of California's recent policy attention to community college students' success in mathematics has focused on lower-level "basic skills" courses that do not apply toward an associate degree. This was motivated by a 2006 change to state regulations by the system's Board of Governors that raised the minimum level of math competency required for a degree.

Beginning with students who entered in fall 2009, all California community college students are required to demonstrate competency in math at least at the level of Intermediate Algebra to receive an associate degree. Students do this by passing the course or by placing out of it through assessment. Prior to this, the state's minimum requirement was competency in Elementary Algebra, though some colleges had higher local requirements.

However, instructional and student services officers at colleges around the state worried that the higher standard could put a degree out of reach for many students unless colleges also improved their ability to provide underprepared students the basic skills they need to succeed. To resolve this concern, the statewide Academic Senate and the organizations of Chief Instructional Officers and Chief Student Services Officers proposed what would become California's Basic Skills Initiative, a statewide effort to document and disseminate best practices for strengthening students' basic skills and improving their prospects for success.

Community college faculty in California and the nation are experimenting with different approaches to improving students' basic skills, depending upon the particular problems they hope to address. Approaches include establishing

"student success centers" that provide extra academic and other support connected with students' regular courses, and establishing "learning communities" that build stronger connections between groups of students and faculty across multiple courses and services. Some programs provide additional math or English preparation in the context of an occupation or a research project to help students see the relevance of their learning and bolster confidence in their ability to reach their goals. Some colleges nationally have even abandoned traditional math course sequences below the college level in favor of small units that students take as needed to fulfill their academic or career goals,[4] or are developing alternative sequences designed to prepare students for college-level Statistics rather than Calculus.[5]

This focus on basic skills could be yielding some success. The statewide success rate in math courses that students cannot count toward a degree has increased during the past several years, from 49% in fall 2007 to 53% in fall 2010. But considered over a longer period of time, the current rate is not much different than at various points during the past two decades.[6] Whether this recent improvement will continue and result in notable increases in course success in higher-level math courses systemwide remains to be seen.

These data prompt deeper questions about local practices and policies

An analysis of why colleges differ in their math course success rates is beyond the scope of this report. However, the data presented here should prompt deeper questions about local practices and policies at individual colleges.

For example, regarding instruction and curriculum:

- How is the quality of mathematics instruction at a college evaluated and improved?
- What is a college's philosophy about how mathematics and mathematics instruction relate to students' different academic and career goals? Do math courses provide clear and relevant paths toward these?
- If students enter their math classes feeling they are not capable in the subject—"I'm not good at math"—do their courses reinforce this perception or help them overcome it?

4 Examples of these approaches are discussed on pages 71–80 of EdSource's recent study of developmental education in the California Community Colleges. See also EdSource's recent blog on related work in Virginia.

5 For example, the Carnegie Foundation for the Advancement of Teaching is partnering with colleges in five states, including in California, to develop and pilot a one-year course sequence that builds to college-level Statistics.

6 However, changes in how colleges have defined which math courses students may count toward an associate degree may have some bearing on these historical success rates, though it is not clear how much.

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Regarding the students that colleges serve through these math courses:

- To what extent do students enroll in math directly out of high school? After passing another math course at the college? After taking math at a different college? How well do the current course expectations align with their prior math instruction?
- When did students at a given college last take a math course? What do faculty know about students' prior math experiences and test scores, and about students' goals?
- What particular issues related to students' backgrounds, prior math preparation, and language proficiency must a college address?

And related to other college policies:

- Who gets placed directly into math courses that apply toward a degree?

CONCLUSION

MATHEMATICS IS VITAL TO CALIFORNIA'S ONGOING CONVERSATION ABOUT COMMUNITY COLLEGE STUDENT SUCCESS

Statewide, slightly more than half of community college students who enroll in math courses that count toward an associate degree pass them during that term. A student who does not pass can try again later and succeed. But retaking a course takes valuable time and costs both the student and the state.

Math course success is certainly not the only factor at play in whether students achieve a degree or transfer, and not all aspects of these goals are under community colleges' control. But as education leaders deliberate about how to improve student success—including considering the recommendations of the California Community Colleges Student Success Task Force that were recently adopted by the Board of Governors—the data described in this brief can serve as a prompt for renewed attention to the quality and goals of math instruction.