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Preparing Students for Success in California's Community Colleges

SUMMARY

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In its current form, developmental education may be one of the largest impediments to success in California's community colleges. Each year, hundreds of thousands of students are deemed underprepared for college and placed into developmental (also known as remedial or basic-skills) courses. Yet most never earn a degree or certificate, or transfer to a four-year college. Helping these students succeed is key to closing the labor shortfall of 1.1 million degree holders projected in California by 2030.

This report presents a statistical portrait of developmental education, describing the enrollment patterns and characteristics of developmental education students, their journey through developmental coursework, and their academic outcomes. We find that:

- **Developmental education affects a lot of students.** The vast majority (80%) of students entering community colleges enroll in at least one developmental course in math, English, or both during their college journey.
- **Underrepresented student groups are overrepresented in developmental courses.** Eighty-seven percent of both Latino and African American students enroll in developmental education, compared to 70 percent of Asian American and 74 percent of white students. Among low-income students, 86 percent enroll in developmental coursework.
- **Developmental sequences are lengthy, delaying students' college careers.** Students placed into developmental math take an average of 2.5 terms to complete the sequence, while developmental English students take an average of 1.9 terms. These developmental courses cannot be applied toward a degree.
- **Attrition is high.** Only 44 percent of developmental math students successfully complete the sequence, while 60 percent of developmental English students do so. Students who start lower in the sequence are much more likely to drop out—only 17 percent of students who start four levels below college level in math complete the developmental sequence (31% for English).
- **Most developmental education students do not advance to and succeed in college coursework.** Only about one-quarter of students (27%) who take a developmental math course eventually complete a college math course with a grade of C or better, and less than half (44%) of developmental English students do so.

- **Long-term outcomes are even worse.** Only 16 percent of developmental education students earn a certificate or associate degree within six years. Twenty-four percent successfully transfer to four-year colleges.
- **Concerns about equity and poor outcomes have led to state funding and institutional reforms.** Many colleges have redesigned developmental sequences by eliminating potential exit points where students often drop out and aligning coursework with students' programs of study. Common approaches include compressing two-semester sequences into a single term and offering tailored pathways for different majors. Our review found that 65 percent of the state's community colleges offered at least one redesigned developmental math course or sequence, with the scope and intensity of reforms varying a great deal across campuses. However, enrollment in redesigned courses represented only 8 percent of total enrollment in developmental math.
- **Reforms are also underway to improve placement accuracy into developmental education.** These efforts focus on using a common assessment and measures like high school achievement data to supplement placement tests. The PPIC report *Determining College Readiness in California's Community Colleges: A Survey of Assessment and Placement Policies* examines this set of reforms and provides a baseline of current policies in the system.

While recent reforms are promising, more rigorous research is needed to assess whether they improve student outcomes over the long term and narrow achievement gaps. Enhancing the efficacy of developmental education—and shortening how long it takes to complete—will eliminate key barriers preventing many community college students from achieving their academic goals. Identifying successful practices in developmental coursework and bringing them to scale will be essential to increase educational opportunity and equity in the state.

Introduction

Community colleges are vital to postsecondary education in California and the United States. Statewide and nationally, community colleges serve almost half of all undergraduate students and over half of Latino and African American students. These open-access institutions offer a relatively affordable option for students to pursue vocational education or prepare for transfer to a four-year institution.[1] And they provide postsecondary access to many low-income and non-traditional students, including older adults who work while enrolled (American Association of Community Colleges 2016; Rodriguez, Cuellar Mejia, and Johnson 2016a). The contribution of community colleges to the production of subbaccalaureate credentials is substantial. In 2013–14, community colleges across the country awarded nearly 1.3 million associate degrees and certificates (American Association of Community Colleges 2016). In California, the state's community colleges awarded over 170,000 associate degrees and certificates.

Community colleges also play an important role in the production of bachelor's degrees. Transfer students from community colleges make up more than half of all graduates at the California State University (CSU) and comprise about 31 percent of graduates at the University of California (UC) (Jackson, Cook, and Johnson 2016).[2] Compared to other states, California relies heavily on community colleges as a point of entry to postsecondary education—the state ranks fifth nationwide in the share of recent high school graduates who enroll in community colleges and 47th in the share who start at four-year institutions (Jackson, Bohn, and Johnson 2016). Given this reliance on community colleges, it will be impossible to meet the increasing demand for college-educated workers unless there are significant increases in the number of transfers from community colleges to four-year institutions.

California is projected to be 1.1 million bachelor's degrees short of economic demand by 2030 (Johnson, Bohn, and Cuellar Mejia 2015). Expanding access to higher education could help shrink this gap, but California also needs to boost the likelihood that students who enroll will stay and earn degrees. Removing the obstacles preventing more community college students from achieving their academic goals—and shortening the amount of time they need to do so—is crucial for the health of the state's economy.

Poor Outcomes Led to Reforms in Developmental Education

The vast majority of students who enter community colleges never earn a degree or vocational certificate, or transfer to a four-year college. In California and across the country, the single greatest impediment to earning a postsecondary credential is the sizeable share of students who are identified as underprepared for college and placed into developmental—also known as remedial or basic-skills—education (MDRC 2013). Developmental education aims to provide underprepared students with the foundational skills they will need to succeed in college-level courses.

In the 113 colleges that comprise the California Community Colleges (CCC), the largest public higher education system in the country, 80 percent of entering students take at least one developmental course in reading, writing, or math at some point in their college career. Latino, African American, and low-income students are disproportionately represented among those taking developmental courses: half of developmental education students are Latino or

[1] Nationally, tuition and fees at a community college are about one-third of the cost of four-year colleges (American Association of Community Colleges 2016), and six to twelve times less than California's public universities (Johnson, Jackson, and Cuellar Mejia 2016).
[2] Transfer students from community college to CSU and UC have similar graduation rates when compared to first-time freshmen at those universities.

African American, and about 70 percent are low-income students. Meanwhile, among students deemed college ready, about 30 percent are Latino or African American, and roughly 46 percent are low-income students.[3]

Relatively few students emerge from these developmental sequences—only 27 percent of students who took at least one developmental math course and 44 percent of those who took developmental English completed a college-level course in the same discipline. Moreover, most of these students are not achieving their long-term academic goals: only 16 percent of students who ever enrolled in developmental coursework completed a degree or certificate, and only 24 percent transferred after six years. Unquestionably, rethinking the criteria and mechanisms used by colleges to determine who is placed into developmental education and improving student outcomes in developmental education would increase educational opportunity and reduce achievement gaps in the state.

Why are developmental education students lagging so far behind? The structure of developmental education is a primary factor. Long course sequences create several opportunities for students to drop out. Many students pass at least one of their developmental courses but fail to enroll in the next course. Even worse, many who complete their developmental sequence never enroll in college-level courses (Bailey et al. 2010). In addition, many argue that developmental education has a narrow academic focus and, too often, is not aligned with students' preferred program of study (Hern and Shell 2013; Burdman 2013). Finally, colleges vary a great deal in whether and how they integrate support services, like supplemental instruction and tutoring, into developmental course offerings (Rutschow and Schneider 2011).

The direct and indirect costs of developmental education, including opportunity costs, are considerable—both to students and colleges. Arguably, students bear the most significant costs. They not only incur course-related costs, such as tuition and books, but also must delay their progress through college. Students increasingly spend significant portions of their limited financial aid packages—and sometimes take on debt—to afford developmental courses that do not count toward a degree.[4] Perhaps the greatest burden is the substantial amount of time students spend enrolled before dropping out or transferring to a four-year college, leading to significant opportunity costs in the form of foregone income. For example, the typical student who is placed four levels below college level in math will take 11 terms to transfer to a four-year college, if they make it to transfer at all. This is three more terms than the typical student who is placed directly into college-level coursework. Moreover, for many of these students, the remediation they receive in math is poorly aligned with their program of study, which can reduce students' motivation.

Policymakers in California and many other states have taken notice. In recent years, the state legislature has poured a significant amount of resources into developmental education, mostly through apportionments (Legislative Analyst's Office 2016a). In 2015–16, the state provided more than $400 million in apportionments for English, math, tutoring, and study-skills courses.[5] Categorical programs have also offered a steady source of funding in the recent past. The state has provided at least $20 million annually since 2007–08 for its Basic Skills Initiative, which aims to improve basic-skills instruction so that more students reach college-level math and English and progress toward a degree, a certificate, or transfer.[6] The 2015–16 budget package also enacted two one-time grant programs: $60 million for the Community Colleges Basic Skills and Student Outcomes Transformation Program and $10 million for the Basic Skills Partnership Pilot Program.[7] The 2016–17 budget

[3] Statistics calculated based on data for the 2009–10 student cohort.

[4] Nationwide, the amount of federal Pell Grants awarded to developmental education students at community colleges amounted to $4.6 billion in 2011–12 (or 14% of all Pell Grant aid). This is four times higher than what it was in 1999–00 (Mitchell 2014)

[5] This represents 5 percent of the $7.7 billion that California Community Colleges received.

[6] The Basic Skills Initiative (BSI) was a grant-funded initiative from the California Community Colleges Chancellor's Office, which began in 2006 as part of the strategic planning process. The goal of the BSI was to improve student access and success.

[7] The Community Colleges Basic Skills and Student Outcomes Transformation Program aims to assist California's community colleges in improving delivery of basic-skills instruction by adopting or expanding the use of evidence-based models of placement, remediation, and student support that accelerate the progress of

enacted an increase of $30 million in one-time Proposition 98 General Fund spending to fund additional basic skills transformation grants in 2016–17. Starting in 2017–18, these funds will be allocated as part of a revised Student Success for Basic Skills Students Program that focuses on implementing practices that increase students' transition to college-level courses (Legislative Analyst's Office 2016b).

In recent years, concerns about poor outcomes and high costs, and increasing interest in improving college completion rates, have led to a national movement to reform developmental education. California's community colleges have made significant improvements in various areas:

1. **Colleges are changing the way they assess and place students, with the goal of placing more students directly into transferable college-level courses and making access more equitable**. Research shows that a large number of students placed into remediation could have been successful if allowed to enroll directly in college-level courses (Scott-Clayton 2012). Reforms include adjusting cut scores used for placement, using robust multiple measures of assessment and placement, and requiring algebra-based testing and remediation only for access to courses that require substantial algebra (California Acceleration Project 2015).
2. **Colleges have redesigned developmental sequences and created alternative pathways to better meet student needs**. Two-thirds of California's community colleges now offer redesigned sequences to help students make faster progress. Accelerated and compressed courses are particularly common among colleges that are redesigning their developmental sequences. Campuses are also offering alternative math pathways that align with students' programs of study (e.g., giving students in non-STEM majors the option of taking statistics instead of intermediate algebra).
3. **Colleges have used resources from the state to integrate supplemental instruction and tutoring into developmental courses** (California Community Colleges Chancellor's Office 2013). Programs such as learning communities, summer bridge programs, case management, and study centers have been implemented by many colleges across the state (Weissman et al. 2009).

This report presents a detailed statistical portrait of developmental education in California's community colleges. Using student-level data from the California Community Colleges Chancellor's Office (CCCCO) and information collected from college catalogs and websites, we begin by describing the share of students enrolled in developmental education, as well as the structure and length of traditional developmental sequences in math and English and the variation that exists across colleges.[8] Next, we recount students' characteristics, their progression through developmental math and English sequences, and their short- and long-term academic outcomes. In particular, we describe how the level of placement (i.e., the number of levels below college-level coursework) of students entering the developmental sequence is associated with different student characteristics and academic outcomes. We also compare the academic outcomes of developmental education students to the outcomes of students deemed college ready. Next, we highlight common reforms that colleges have implemented in recent years to address concerns with developmental math education. We describe the prevalence of different approaches in terms of the number of colleges offering a given approach and student enrollment. Finally, we consider the implications of these findings and identify directions for future research.

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underprepared students toward achieving their college and career goals. The Basic Skills Partnership Pilot Program aims to enable colleges receiving the award to develop pilot programs of efficient and effective methods of coordinating remedial instruction and services between the CCC and CSU systems to better meet the needs of students.

[8] English as a Second Language (ESL) sequences in California's community colleges are outside the scope of this report. The relationship between developmental English sequences and ESL sequences is complex. Traditional ESL pathways include a series of sequential courses in four broad areas: reading, writing, grammar, and listening and speaking. There is considerable variation across colleges in not only the length of sequences offered across these four areas, but also whether or not students are required to complete the ESL sequence before starting developmental English coursework (Perry et al. 2010).

The textbox below presents the definitions of terms used in this report and includes the Taxonomy of Programs (TOP) codes associated with certain courses, where relevant.

Glossary of Terms

College-level English courses: English courses that are either degree-applicable or transferable. TOP codes 150100, 150300, 150400, 150700.

College-level math courses: math courses that are either degree-applicable or transferable. In California, not all degree-applicable courses are transferable. TOP code 170100.

College-ready student: a student who never enrolled in developmental education, that is, who started in college-level math/English. Also referred to as a non-remedial student.

Developmental education: instruction in foundational skills in English (reading and 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 (The RP Group 2007). The terms basic skills, remedial, developmental, and college-preparatory are often used interchangeably to refer to this set of courses.

Developmental education courses: math and English (reading and writing) credit-bearing courses below college level. Identified by data element CB21 in the MIS database.

Developmental education English student: a student enters our developmental education English cohort if he or she ever attempted at least one English course (reading or writing) below college level. TOP code 150100 or 152000.

Developmental education math student: a student enters our developmental education math cohort if he or she ever attempted at least one math course below college level. TOP code 170100.

Developmental education sequence completers: developmental education students who successfully completed a course one level below college level, regardless of where in the developmental sequence they started, the number of courses/levels it took them to complete, or subsequent enrollment in a college-level math or English course.

Intermediate algebra: this course often satisfies the graduation requirement for an associate degree. This means that for students seeking an associate degree, intermediate algebra is the highest level of math they will need to take. However, it is not a transferable course to UC or CSU. Community college students seeking to transfer to four-year universities must successfully complete a transferable math course, and until recently, that course had intermediate algebra as a prerequisite. In this report, intermediate algebra is coded as part of developmental math, not as a college-level course. Coded as one level below college level according to data element CB21.

Only developmental math/English student: developmental education math (English) student who never enrolled in a developmental English (math) course.

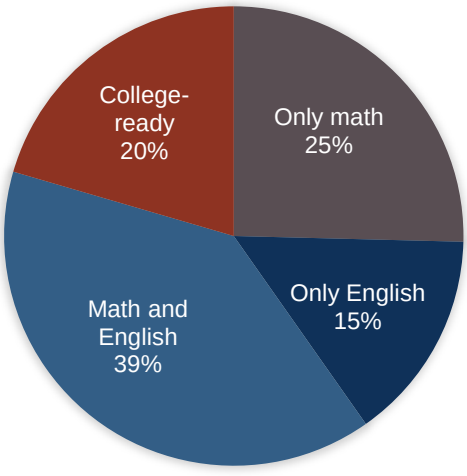
The data used in this report come from the California Community College Chancellor's Office Management Information System (MIS). Specifically, we use a longitudinal dataset of students enrolled in every college in the California Community College system. This dataset includes student demographics, course enrollment, and student outcomes. Additionally, the system has information on each course (title, credit status, transfer status, basic-skills status, subject, etc.).

We focus on first-time students who started their college career in the 2009–10 academic year and who attempted at least one math or English course. Focusing on this cohort allows us to track students for six years. We restrict our analysis to credit-bearing courses. One underlying assumption in this study is that students take developmental education coursework in hopes of eventually taking a college-level course in the same discipline to earn a degree or certificate, or transfer to a four-year university. California does not collect statewide, student-level data on the academic readiness or recommended placement of students when they enter community colleges. Therefore, this report can shed light only on students who actually enrolled in a developmental education course at some point during their studies. It cannot describe students who may have needed such coursework but did not enroll in it.

Most Students Enroll in Developmental Courses

Four in five students (about 247,500) who started their college journey at one of California's community colleges during the academic year 2009–10 took at least one developmental course in math or English (Figure 1). Half of these students took at least one course in both subject areas. Math is a greater challenge than English for entering students: 65 percent of developmental education students enrolled in a developmental math course, compared to 54 percent in developmental English.

FIGURE 1
Eighty percent of students take at least one developmental course

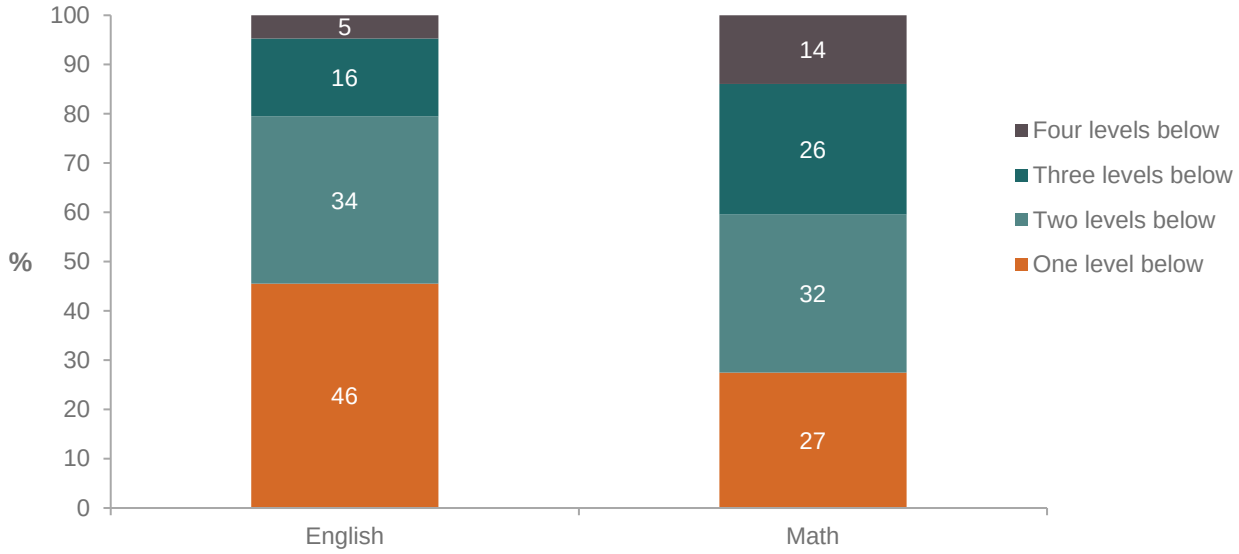


SOURCE: Authors' calculations based on CCCCO MIS data.
NOTE: See Technical Appendix A for more details.

The vast majority of developmental math students (73%) entered the developmental sequence at least two levels below college level (elementary algebra or lower). Meanwhile, the most common entry point for developmental English students was one level below college level (Figure 2). Greater shares of developmental math students start their developmental sequence three or four levels below college level compared to developmental English students. This is due to only one-quarter of community colleges in the system offering four-level English sequences, as noted below, while the majority of community colleges offer four levels of developmental math.

FIGURE 2

Forty percent of developmental math students started three or four levels below college level



SOURCE: Authors' calculations based on CCCCO MIS data.

NOTE: See Technical Appendix A for more details.

Developmental Sequences Are Long

Traditionally, California's community colleges offer developmental education through long course sequences that are disconnected from substantive programs of study—for example, traditional developmental math education involves algebra-based coursework, regardless of whether students are going to a STEM or liberal arts major. This challenges the definition of developmental education as offering "foundational" skills. If these skills are not aligned with students' program of study, they are by definition not foundational. To assess the length and structure of developmental sequences in California's community colleges, we performed an exhaustive scan of 2015–16 college catalogs and institutional websites.

Developmental English sequences. The length and structure of developmental English sequences vary widely across the CCC system. Many colleges offer separate sequences in reading and writing, with reading sequences often being longer than writing sequences. For example, 34 colleges (or 30%) require students to enroll in separate sequences in reading and writing, 55 colleges (49%) have only one English sequence, and the remaining 24 colleges (21%) offer both separate and integrated sequences. Additionally, there is variation in the number of levels of developmental English offered. We find that two colleges offer only one level of developmental English, 46 offer two levels, 47 offer three levels, and 18 offer four levels.

Developmental math sequences. Math sequences are structured more consistently than English sequences. In general, colleges offer four levels of developmental math, with the lowest level pertaining to basic arithmetic, followed by pre-algebra (three levels below college level), beginning algebra (two levels below), and intermediate algebra (one level below). However, there is considerable variation in the use of alternative formats, such as computer-mediated, self-paced instruction and lab requirements, and in the availability of alternative developmental education paths, such as statistics pathways. It is not uncommon for a developmental math course to be offered as both a single-semester course and a two-semester extended sequence (i.e., covering the same material in two semesters, rather than one). More colleges offer elementary algebra (36 colleges) and intermediate algebra (28 colleges) as a two-semester sequence than arithmetic (seven colleges) or pre-algebra (four colleges). Usually this two-semester sequence is designed for students who have been unsuccessful in previous attempts, have not studied algebra recently, are anxious about their math skills, or desire a slower paced course.

In recent years, community colleges have made progress in redesigning their developmental sequences in an effort to improve student retention and success. For the most part, reforms were designed with two goals in mind: (1) moving students into college-level coursework more quickly by changing definitions of college readiness, mainstreaming students with concurrent remedial support, and reducing as many exits points as possible, and (2) providing a more targeted approach that aligns with students' needs and programs of study. While two-thirds of colleges have started to offer redesigned sequences, so far, only a small share of students are affected by these reforms. A later section of this report will explore the most common reforms taking place in developmental math education.

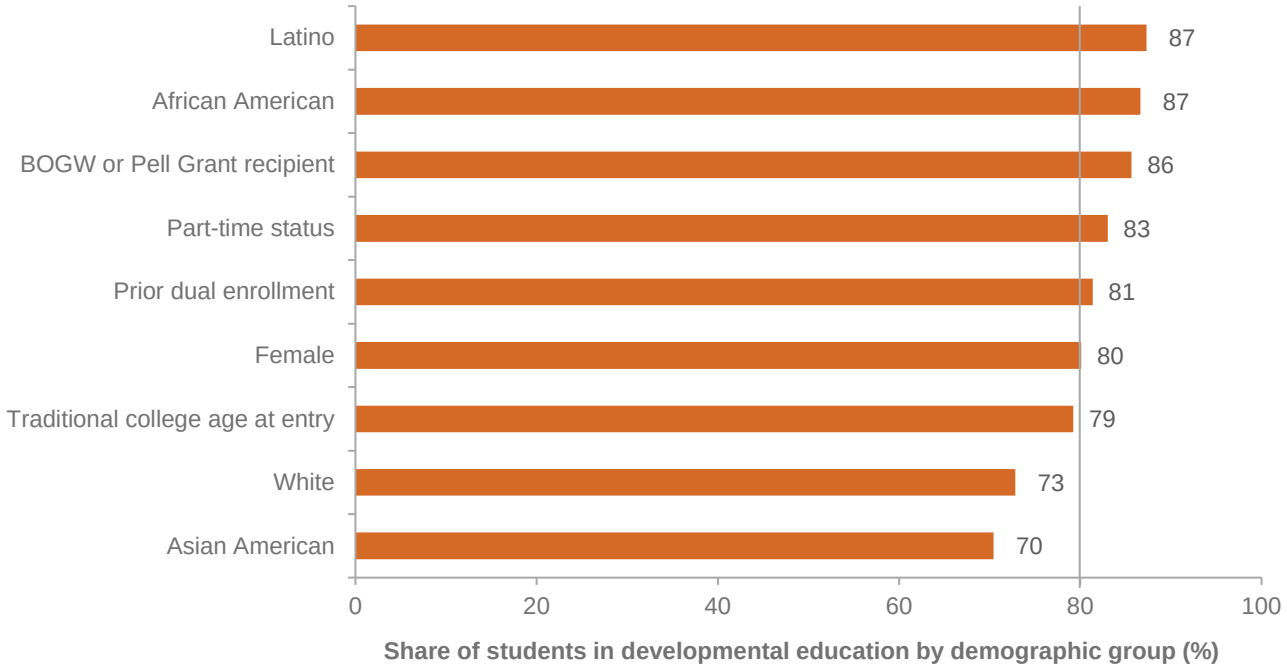
Developmental Education Students Are Often Latino, African American, or Low Income

Students from groups that are historically underrepresented in higher education are more likely to have taken a developmental education course at some point in their college career. Indeed, 87 percent of both Latino and African American students took at least one developmental math or English course, compared to 70 percent of Asian and 73 percent of white students (Figure 3). Likewise, 86 percent of recipients of California Community Colleges Board of Governors Fee Waivers (BOGW) or Pell Grants—our proxy for low-income status—are developmental education students.

If we compare the demographic breakdown of developmental students to the demographic breakdown of students deemed college ready, we find significant differences. About 41 percent of students ever enrolled in developmental coursework were Latino, compared to 23 percent of college-ready students. Likewise, those who enrolled in developmental education were more likely to be low-income (71% versus 46%) and part-time students (73% versus 66%) than those students who started in college-level math and English. Unsurprisingly, developmental education students were less likely to have started their college career as dual-enrollment students by taking college courses while still enrolled in high school (13% versus 22%).

FIGURE 3

Latino, African American, and low-income students are overrepresented in developmental education



SOURCE: Authors calculations based on CCCCO MIS data.

NOTE: See Technical Appendix A for more details.

While developmental education students differ in important ways from college-ready students, there is also considerable variation when examining students who enter developmental sequences at various levels. Notably, the proportions of Latino, African American, low-income, part-time, and older students are higher among those who started the developmental education sequence at lower levels (Table 1).

Students who delay entry into college for several years after finishing high school are more likely to be placed into lower levels of developmental education. Specifically, only 6 percent of developmental math students who started one level below college level were older than 25 years old; this share increases to 26 percent among students who started four levels below college level. Similarly, the share of developmental math students who are recipients of BOGW or Pell Grants increases from 64 percent to 82 percent when comparing students who started one level versus four levels below college level. The increase in the share of part-time students (students taking on average fewer than 12 units per term during their college career) is nearly identical. Overall, as shown by the increase in participation in the Disabled Student Programs and Services (DSPS) and the Extended Opportunity Programs and Services (EOPS), the share of students disadvantaged by disability, language, social, economic, and educational circumstances is larger among students who started at lower levels in the developmental sequence.[9]

Developmental education students not only differ in their demographic and socioeconomic characteristics, they also differ in their academic background. In the case of developmental math, students who started three or four levels below college level were more likely to have completed a GED certificate or another certificate of high

[9] The DSPS program provides support services, specialized instruction, and educational accommodations to students with disabilities so that they can participate as fully and benefit as equitably from the college experience as their non-disabled peers. The EOPS program's primary goal is to encourage the enrollment, retention and transfer of students disadvantaged by language, social, economic, and educational circumstances, and to facilitate the successful completion of their goals and objectives in college. EOPS offers academic and support counseling, financial aid, and other support services.

school equivalency/completion, as opposed to a high school diploma, than students who entered the sequence one or two levels below college level (10% of those who started four levels below college level versus 4% of those who started one level below). Students who started lower in the sequence were also less likely to have been dual-enrollment students. The same demographic and academic trends hold true for developmental English students.

TABLE 1

Students who entered the developmental sequence at lower levels are more likely to be from disadvantaged groups

	Share of students (%)					
	College-ready	All dev. education	One level below	Two levels below	Three levels below	Four levels below
Developmental math students						
25 years or older	8	13	6	11	19	26
African American	4	8	5	7	10	16
Asian American	25	11	15	10	8	7
Latino	24	42	36	41	49	45
White	38	30	34	33	25	22
Female	48	53	50	51	56	59
BOGW or Pell Grant recipient	51	72	64	71	77	82
Completed GED/HS equivalency certificate	3	7	4	6	9	10
DSPS participant	3	7	4	5	9	15
EOPS participant	5	11	7	9	14	17
Part-time status	50	72	63	71	78	81
Prior dual enrollment	23	13	16	13	10	9
Developmental English students						
25 years or older	11	12	10	12	17	21
African American	5	10	7	10	15	21
Asian American	14	13	13	13	12	15
Latino	29	44	41	47	49	39
White	43	24	29	22	16	14
Female	52	52	52	52	54	54
BOGW or Pell Grant recipient	57	74	69	76	82	84
Completed GED/ HS equivalency certificate	6	7	6	7	7	8
DSPS participant	4	8	5	8	14	17
EOPS participant	6	12	9	13	16	21
Part-time status	60	73	70	73	79	78
Prior dual enrollment	19	12	14	11	9	9

SOURCES: Authors' calculations based on CCCCO MIS data.

NOTES: See Technical Appendix A for more details. EOPS refers to the Extended Opportunity Programs and Services, which offers support services to students disadvantaged by language, social, economic, and educational circumstances. DSPS refers to Disabled Student Programs and Services, which offers support services to students with disabilities. The columns indicating one to four levels below refer to the share of students starting the developmental sequence at that number of levels below college level.

Developmental Education Can Be a Rocky Journey

Students who are placed in developmental education do not always follow a straightforward path to completing their developmental sequence. Most developmental education students took their first developmental education course during their first year of enrollment, but only about half took this course during their first term of enrollment. Students may delay enrollment in developmental courses for multiple reasons. For example, they may be undecided about their academic goal, plan to retest and hope to place at a higher level, or lack access to adequate counseling and advising.[10] Other reasons may be related to class availability, since courses can fill up early and incoming students have low registration priority.

Many students took both developmental English and math courses (Table 2). Nearly three in four developmental English students took at least one developmental math course, while 61 percent of developmental math students took at least one developmental English course. Developmental math students who started three or four levels below college level were even more likely to also take developmental English. Students in developmental math took an average of 2.5 terms to complete the sequence, while students in developmental English took an average of 1.9 terms to do so.

TABLE 2

The journey through developmental education varies depending on where a student starts in the sequence

	All dev. education	One level below	Two levels below	Three levels below	Four levels below
Developmental math students					
Took at least one developmental English course for credit	61%	49%	59%	69%	74%
Average success rate in developmental math courses	53%	65%	52%	47%	44%
Successfully completed the sequence	44%	75%	44%	27%	17%
Average number of terms needed to complete the sequence	2.5	1.4	2.8	4.1	4.9
Developmental English students					
Took at least one developmental math course for credit	73%	72%	75%	72%	74%
Average success rate in developmental English courses	65%	71%	62%	56%	53%
Successfully completed the sequence	60%	77%	51%	37%	31%
Average number of terms needed to complete the sequence	1.9	1.3	2.5	3.4	4.2

SOURCES: Authors' calculations based on CCCCO MIS data.

NOTES: See Technical Appendix A for more details.

Many developmental education students require more than one attempt to successfully complete a given developmental course.[11] This is a more common phenomenon among developmental math students than among developmental English students. On average, a developmental math student successfully completed 53 percent of the developmental courses attempted, while a developmental English student successfully completed 65 percent. As expected, the lower the student starts in the sequence, the lower the average success rates. On average, a

[10] According to PPIC's Statewide Survey of Assessment and Placement Policies and Practices, nearly 40 percent of colleges do not allow retesting after students begin the developmental education sequence (Rodriguez, Cuellar Mejia, and Johnson 2016b).

[11] Successfully complete means passing the course with a grade of C or better.

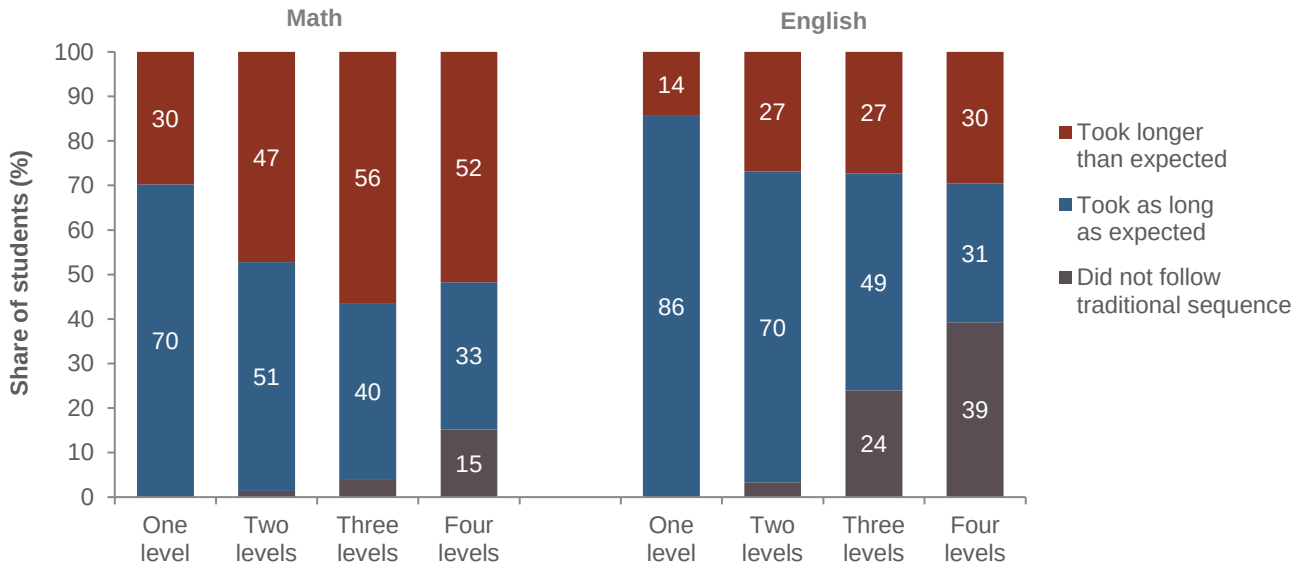
developmental math student who started the sequence three or four levels below college level successfully completed fewer than half of the courses attempted. Developmental math students who started one level below college level successfully completed on average 65 percent of courses attempted. This, of course, has implications for the number of terms students are enrolled in developmental education coursework. For example, a student who started the developmental sequence four levels below college level may take more than two years of developmental coursework before enrolling in a transfer-level course.[12]

Fewer than half of all developmental math students (44%) completed the sequence within six years. A higher share of developmental English students (60%) completed the English sequence. Among those who took at least one developmental course in both math and English, only 36 percent of students completed both sequences (not shown). Again, students who started in the lowest levels in the developmental sequences were less likely to succeed: only 17 percent of developmental math students who started four levels below college level completed the developmental math sequence.

Among developmental math students who completed the sequence, only 33 percent of those who started four levels below transfer actually enrolled in four terms of developmental math. Roughly half of the students took longer (between five and nine terms), and the remaining 15 percent did not follow the traditional course sequence (Figure 4). The typical developmental math student took one extra term to complete the sequence. The outlook for developmental English students is better at every starting level. We see more students completing in the expected number of terms and more students who did not follow the traditional path.

FIGURE 4

Students who complete the developmental sequence may take longer than expected to do so, especially in math



SOURCE: Authors' calculations based on CCCCO MIS data.

NOTE: Sample restricted to those students who completed the developmental sequence. See Technical Appendix A for more details. The number of terms enrolled in developmental education is not necessarily the same as the number of terms enrolled in CCC. "Took as long as expected" means that the number of terms students took corresponded to the number of levels below college level.

[12] This includes both primary terms (spring and fall) and other terms (summer and winter intersessions).

Withdrawing from the course or getting a failing grade is not the only reason why students took longer than expected. For example, students may have taken two-term extended coursework for some or all of the courses in the sequence. There are also many potential reasons why students did not follow the traditional sequence: they may have decided to skip courses, enrolled in a compressed or accelerated course (described in more detail later in this report), or retested and received a better placement.

High Attrition Is a Big Concern

There is consensus among researchers and practitioners that the more levels of developmental courses students must go through, the more exit points where students fall away, and the less likely students are to ever complete college English or math (Bailey et al. 2010). This problem becomes apparent when examining the progression of students through the developmental math and writing sequences at California's community colleges (Figure 5).

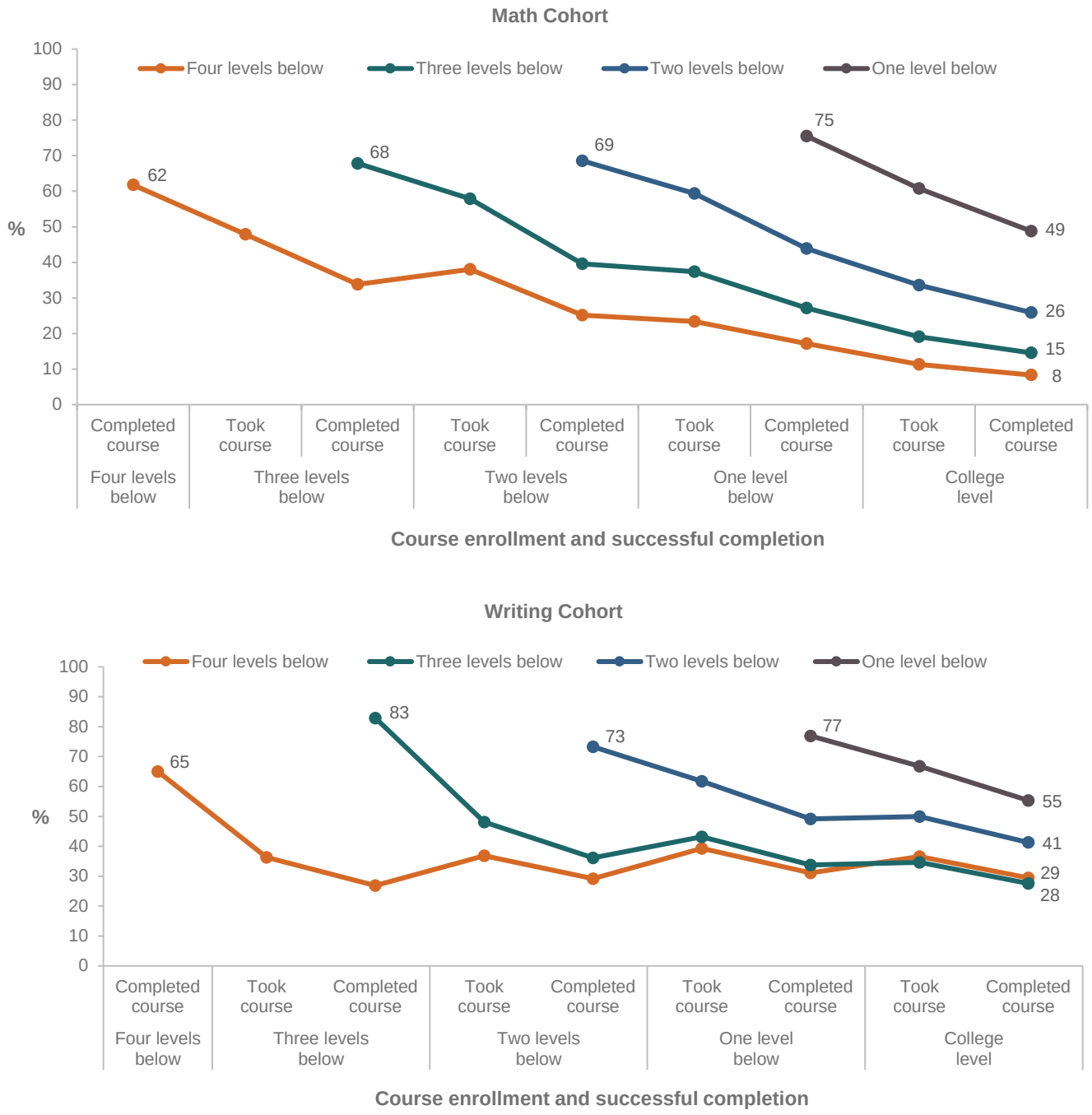
As an example, let's take developmental math students who started three levels below college level—these students represented 26 percent of all developmental math students (Figure 2). Out of the 53,300 students who started at this level, 68 percent successfully completed their first developmental course, 58 percent took the next course in the sequence (two levels below), 40 percent successfully completed this level, 37 percent enrolled in the next course in sequence (one level below), and 27 percent completed the developmental sequence. Only 19 percent ended up enrolling in a college-level course, and 15 percent (about 7,200 students) passed that course.

The majority of students successfully complete a developmental course, if they actually enroll—though it may take them more than one try. But many students never take the next course in the sequence: this seems to be a key factor behind the poor academic track record of developmental education students. For example, we find that 16 percent of developmental math students who started three or four levels below college level do not return to college for the last course in the sequence (intermediate algebra), even though they were successful in the developmental courses that preceded it (not shown). Placement errors, de-motivation due to lack of rigor and relevance to the demands of subsequent college-level work, and the power of external factors such as employment or child care responsibilities are often cited in the literature as the main underlying reasons behind poor progression through developmental sequences (Jaggars et al. 2015).

The severity of attrition in developmental education (as shown in Figure 5) highlights the importance of implementing practices that improve placement accuracy, shorten time in developmental education, align developmental education content with programs of study, and provide necessary non-academic supports such as student success courses, learning communities, and academic, career, and financial aid advising.

FIGURE 5

Attrition is high in developmental education sequences[13]



SOURCE: Authors' calculations based on CCCCO MIS data.

NOTE: See Technical Appendix A for more details. In this chart, completion refers to "successful completion" (i.e., earning a grade of C or better). The lower figure focuses on the developmental writing sequence. We cannot track student progress through developmental reading sequences because not all colleges offer a separate or complete developmental reading sequence. Integrated reading and writing courses are considered to be part of each college's writing sequence and therefore are represented in this figure (Perry et al. 2010).

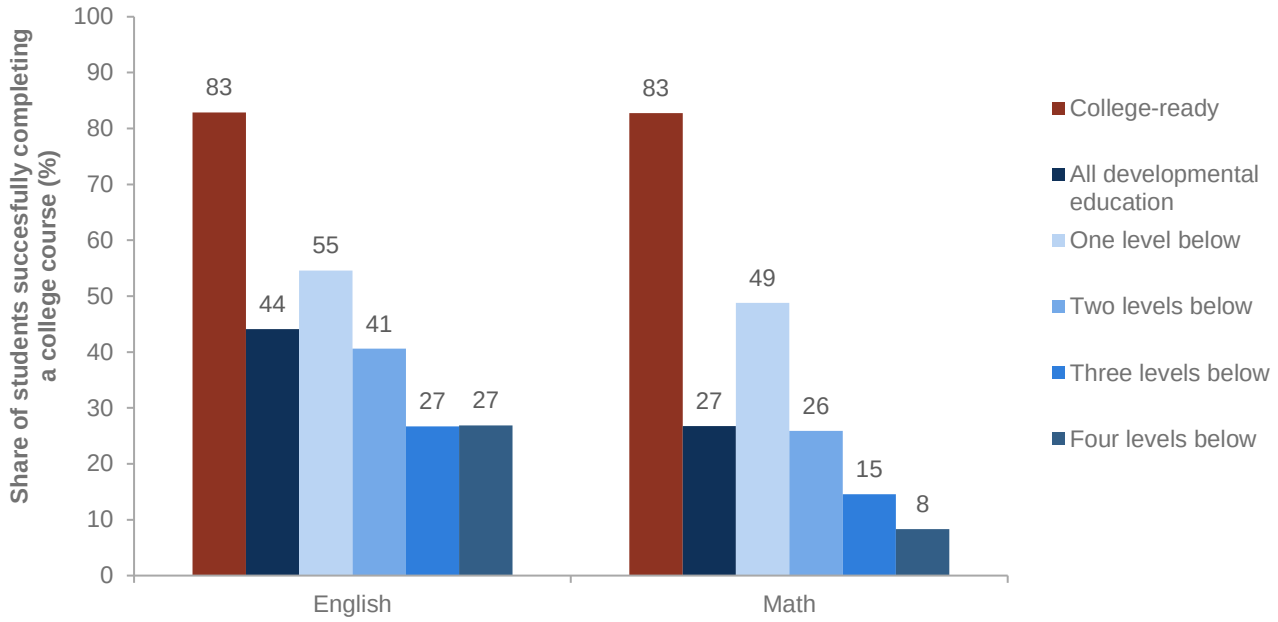
[13] Lines in Figure 5 are not monotonically decreasing because in reality not all the students who started four levels below college level will end up taking four levels of developmental coursework before taking their first transfer-level course because they decided to skip levels, retest, or enroll in accelerated courses. This seems to happen more often in the progression through the writing developmental sequence than through the math developmental sequence. One contributing factor to this trend is the availability of integrated reading and writing courses in some levels of the sequence.

Short- and Long-Term Outcomes Are Poor

Most developmental education students do not successfully complete college-level coursework. Only 27 percent of students who took a developmental math course eventually passed a college-level math course, that is, a degree-applicable or transferable course. Of the students who started at the highest level of the sequence (intermediate algebra), 49 percent passed a college-level math course, compared to 8 percent among those who started at the lowest level (arithmetic). Outcomes of developmental English students were better: 44 percent of students who took a developmental English course eventually passed a college-level course. Again, of the students who started at the highest level of the sequence, 55 percent passed a college-level English course, compared to 27 percent of those who started at the lowest level (Figure 6). In contrast, 83 percent of college-ready students successfully completed at least one college-level math or English course.

FIGURE 6

Most developmental education students never successfully complete a college-level course in the same subject



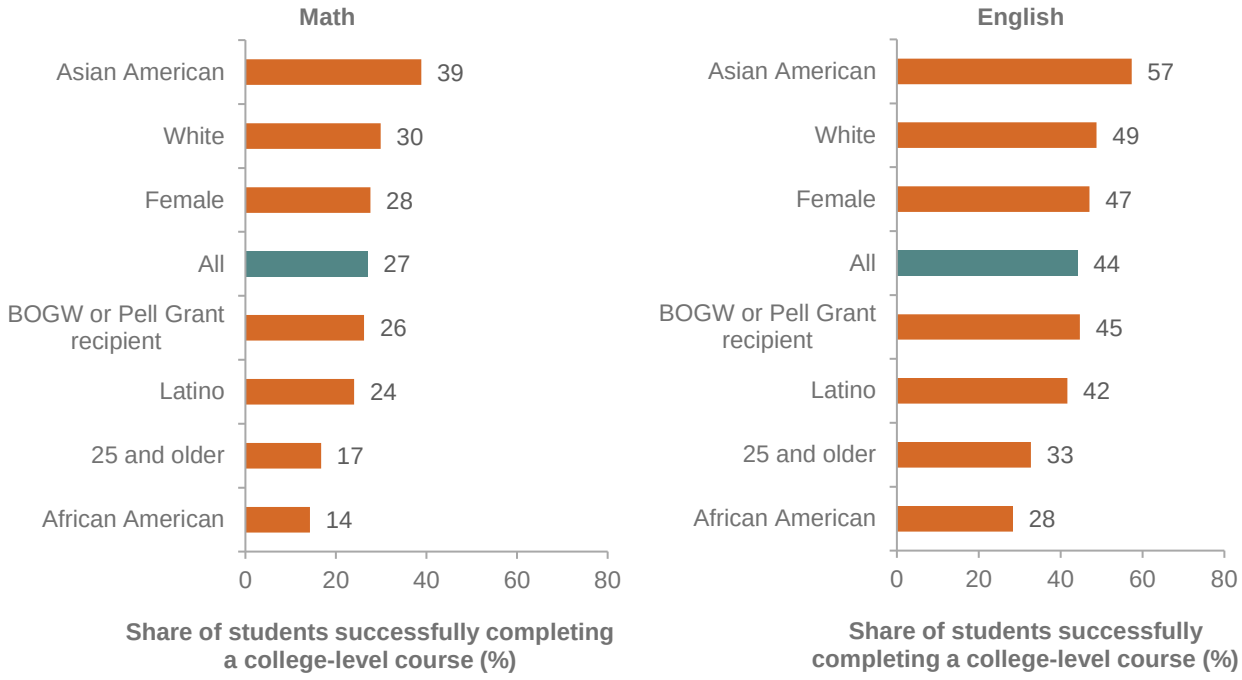
SOURCE: Authors calculations based on CCCCO MIS data.

NOTE: See Technical Appendix A for more details.

Equity issues are apparent not only in students' participation in developmental education, but also in their outcomes (Figure 7). For example, 39 percent of Asian American and 30 percent of white students in developmental math passed a college-level math course, compared to 24 percent of Latino and 14 percent of African American students. The same pattern holds true in developmental English, where 59 percent of Asian American and 49 percent of white students successfully completed a college-level English course, compared to 42 percent of Latino and 28 percent of African American students. Passage rates among older students are about 10 percentage points lower than the overall rate in both math and English. The differences in passage rates across racial/ethnic student groups deemed college ready are slightly less pronounced.

FIGURE 7

Achievement gaps are significant among developmental education students



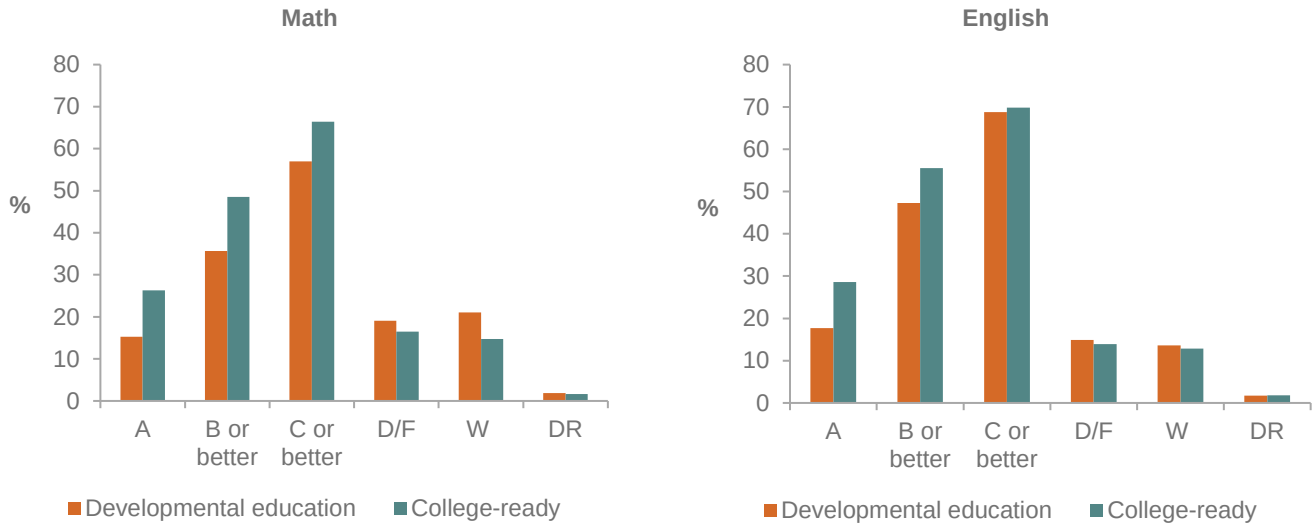
SOURCE: Authors' calculations based on CCCCO MIS data.

NOTE: See Technical Appendix A for more details.

How well do students who complete their developmental sequence perform on subsequent college-level coursework? Developmental English students who completed the sequence performed almost as well in their first college-level English course as students who never took a developmental English course. As shown in Figure 8, 69 percent of developmental English students who successfully completed their developmental sequence (i.e., completed a course one level below college level with a passing grade) earned a C or better in their first college-level English course. This performance was only slightly lower than that of students deemed college ready in English, 70 percent of whom earned a C or better. However, college-ready students were more likely to earn an A. The performance gap between developmental math students and non-developmental math students for earning a C or better in their first college-level math course was wider—a 9 percentage point difference. Again, college-ready students were more likely to earn an A, and in this case were also less likely to withdraw from the course.

FIGURE 8

Developmental English students passed their first college course at a similar rate as college-ready students



SOURCE: Authors' calculations based on CCCO MIS data.

NOTE: College-ready math (or English) students may have enrolled in developmental English (or math) coursework. Sample restricted to students who completed their developmental education sequence. "W" refers to withdrawing from the course after the last day to drop and "DR" refers to dropping the course.

Transfer Rates and Credential Attainment Are Low

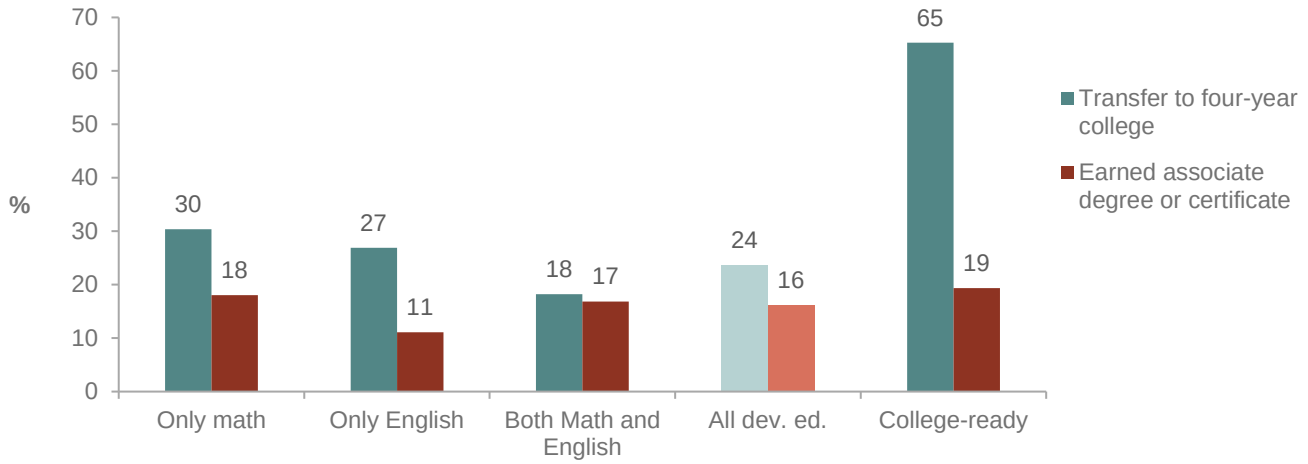
Many developmental education students never achieve their long-term academic goals. Only 24 percent of developmental education students transferred to a four-year institution within six years of initial enrollment, compared to 65 percent of students who did not take a developmental course (Figure 9). Transfer rates were somewhat higher among students who took developmental math but did not require remediation in English (30%). Among students enrolled in at least one developmental English course but not in developmental math, 27 percent ended up enrolling at a four-year college. Students who took at least one developmental course in each subject were less likely to transfer to a four-year institution (18%).

Overall, regardless of remediation status, associate degree and certificate attainment is low. Only 19 percent of college-ready students earned an associate degree or certificate within six years. Among developmental education students, degree/certificate completion was slightly lower (16%). College-ready students are more likely to attend community college with the end goal of transferring to a four-year college, so it makes sense that we see a much bigger gap between developmental education students and college-ready students in transfers than in degree and certificate attainment.

Similar to our findings on college-level course completion rates, transfer rates were significantly better among those students who were placed into the highest level of the developmental sequence. Among students who started one level below college level, 46 percent of students who only took developmental math and 39 percent of students who only took developmental English made their way into a four-year institution, compared to 15 percent and 10 percent, respectively, among those who started three or four levels below college level.

FIGURE 9

A large proportion of developmental education students never achieve their academic goals



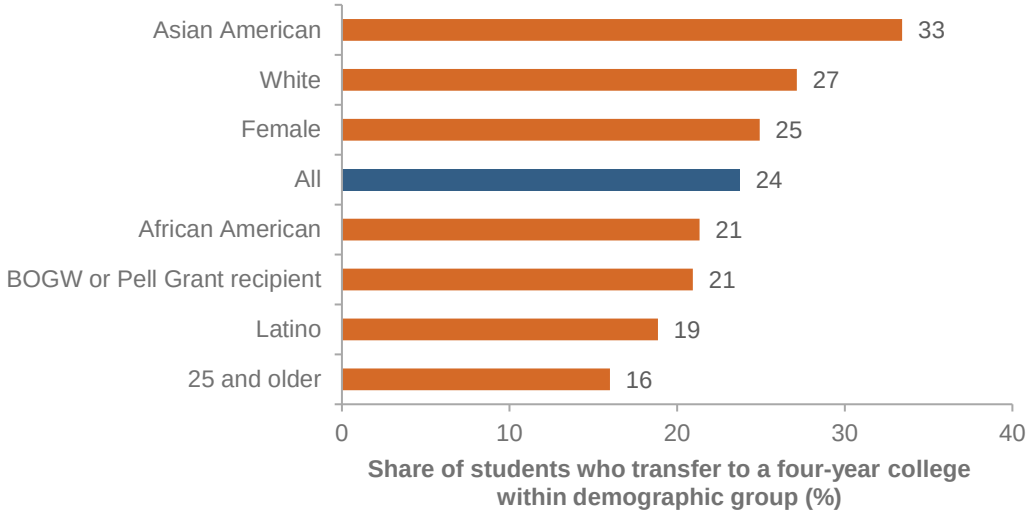
SOURCE: Authors' calculations based on CCCO MIS data.

NOTE Includes associate of arts/associate of science (AA/AS) and Chancellor's Office approved credit certificates (i.e., those requiring more than 18 semester credits). See Technical Appendix A for more details.

There are also differences in transfer rates across student subgroups, but these differences are less pronounced than in the completion rates of college-level coursework (Figure 10). Moreover, achievement gaps for developmental education students are very similar to achievement gaps among college-ready students. For example, the white–Latino achievement gap for transfer rates is 8 percentage points among developmental education students and 7 percentage points among college-ready students. The white–African American achievement gap shows a similar pattern. Older students transfer at the lowest rates—only 16 percent of students age 25 and older transfer to a four-year college.

FIGURE 10

Long-term transfer outcomes for developmental education students vary across student subgroups



SOURCE: Authors' calculations based on CCCCO MIS data.

NOTE: See Technical Appendix A for more details.

Among those who transfer, developmental education students were more likely to transfer into the CSU system and less likely to transfer into a UC campus than students deemed college ready (Table 3). Among developmental education students who transferred to a four-year institution, half went to the CSU system, one-fifth went to an out-of-state institution, 16 percent enrolled in an in-state private college, and only 13 percent went to a UC campus. In contrast, 24 percent of college-ready students transferred to a UC campus. Students who took at least one developmental English course, but not developmental math, were more likely to transfer to a UC campus (26%) than those who took only developmental math (12%) and those who took developmental courses in both subjects (7%).

TABLE 3

Developmental education students are more likely to transfer to CSU than UC

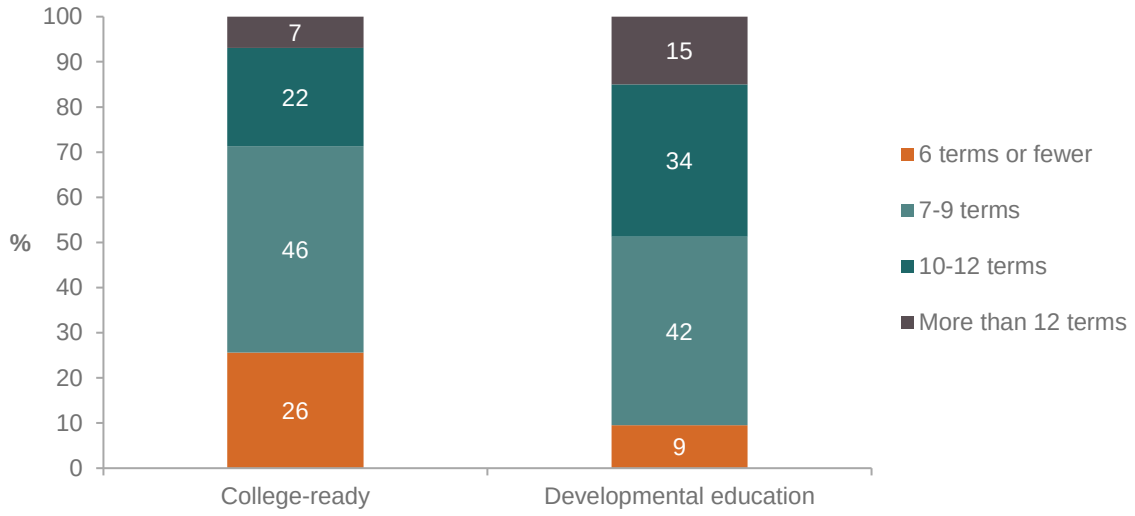
	Share of students (%)				
	College-ready	All dev. education	Only math	Only English	Both math & English
California State University	44	50	48	45	56
University of California	24	13	12	26	7
Out-of-state college	20	20	24	16	19
In-state private college	12	16	16	13	18
Total transfers	100	100	100	100	100

SOURCES: Authors' calculations based on CCCCO MIS data.

NOTES: Sample restricted to students who transferred to a four-year institution. See Technical Appendix A for more details.

CSU and UC campuses require that students complete 60 transferable units in order to be eligible for upper-division transfer. Many private and out-of-state colleges will accept transfer students with fewer units, typically 24–30 transfer units. About 70 percent of developmental education students who transfer to a four-year public institution have met the 60-unit requirement. Among upper-division transfers, 70 percent of college-ready students attend full-time, compared to 64 percent of developmental education students. Also, college-ready students who qualify for upper-division transfer are more likely to have higher GPAs in community college. The typical college-ready student has a GPA of 3.4, compared to a GPA of 3.1 for the typical developmental education student. As expected, the biggest difference between these two student groups is the number of terms they were enrolled in CCC. As Figure 11 shows, 26 percent of college-ready students who met the 60-unit requirement were only enrolled for six or fewer terms, compared to only 9 percent of developmental education students.

FIGURE 11
Developmental education students take longer to transfer



SOURCE: Authors' calculations based on CCCO MIS data.
NOTE: Sample restricted to transfer students who met the 60-unit requirement. See Technical Appendix A for more details.

Promising Reforms Affect a Small Share of Students

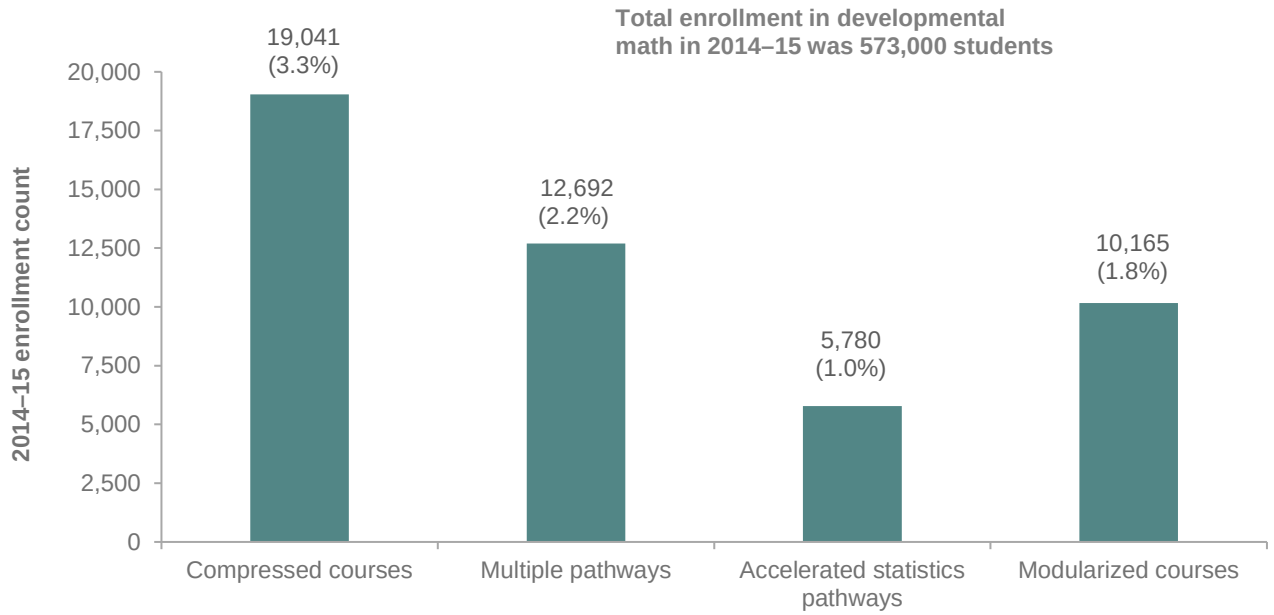
In light of poor outcomes for developmental education students, colleges are implementing numerous reforms to improve student success. Below, we describe overall implementation and enrollment for common reforms to developmental education based on an exhaustive college-level scan of developmental math courses currently offered within the CCC system.[14] We focus on one discipline, developmental math, in order to provide greater detail about the various reforms. In addition, more students are placed into developmental math than developmental English, and there is greater similarity across colleges in traditional developmental math sequences, providing a more similar baseline for reforms. However, many parallel reforms are taking place in developmental English as well.

Our research identified 75 colleges (65%, out of 113 in the CCC system) that offer a redesigned developmental math course, in addition to the traditional sequence. However, enrollment in redesigned developmental courses represented only 8.3 percent of total enrollment in developmental math courses in 2014–15 (Figure 13).[15] There are at least a dozen new courses that either started during fall 2015 or spring 2016, or are scheduled to start in fall 2016, so we expect to see a considerable increase in enrollment in academic years 2015–16 and 2016–17.

[14] Based on catalogs for the academic year 2015–16 and college websites.
[15] In our count of colleges, we are including courses that started during fall 2015 or spring 2016, or are scheduled to start in fall 2016, while our enrollment counts are limited to the 2014–15 academic year due to data availability.

FIGURE 12

Fewer than 10 percent of all developmental math students enrolled in redesigned courses



SOURCE: Authors' calculations based on CCCO MIS data.

NOTE: Parentheses show the share of enrollment in redesigned courses out of total developmental math enrollment.

The scope and intensity of the reforms vary a great deal across colleges. In at least 20 colleges, enrollment in redesigned courses represented over 15 percent of total enrollment in developmental math courses. For example, in Rio Hondo College, enrollment in modularized courses represented 37 percent of total enrollment in developmental math courses; in Grossmont College, enrollment in multiple pathways courses constituted 28 percent of developmental math enrollment; in Bakersfield College, enrollment in compressed courses made up 20 percent of total enrollment in developmental math courses; and in Los Angeles Pierce College, enrollment in accelerated statistics pathways represented 14 percent of developmental math enrollment. Some colleges, like American River and Foothill, offered multiple non-traditional approaches, letting students choose the best fit.

However, the share of students affected by new approaches to developmental education is still low. One-third of colleges only offer the traditional algebra-based, four-level developmental math sequence. There is still a lot of work to be done to reach all developmental education students and provide them with approaches that are conducive to improving student success.

How Are Colleges Reforming Developmental Education?

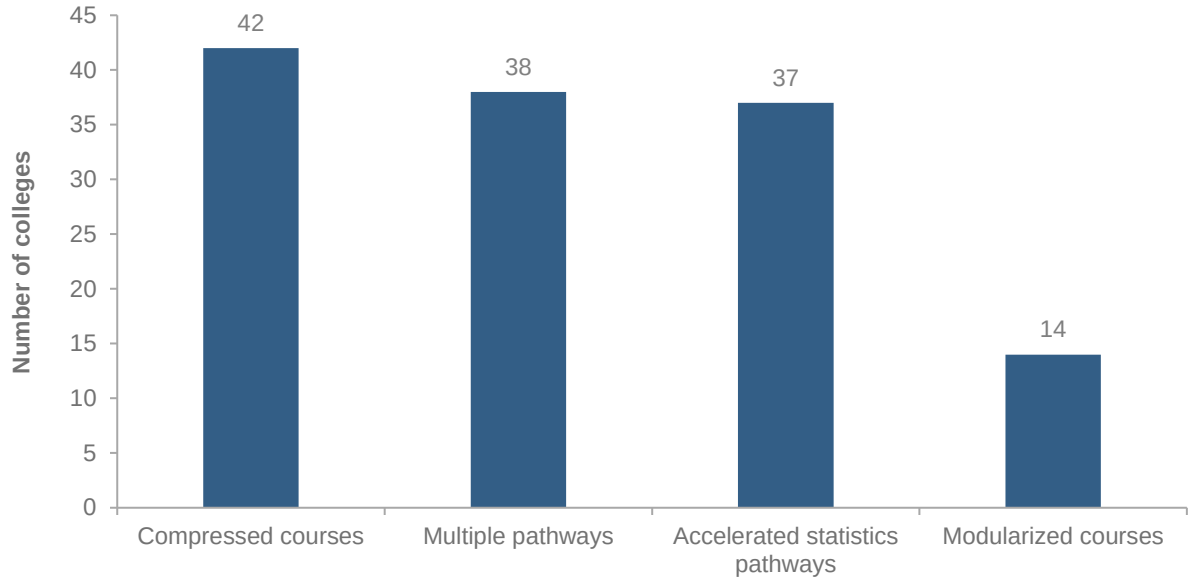
Reforms aim to redesign the traditional semester-long developmental math sequences in numerous ways. Yet most reforms focus on two broad areas:

- Accelerating student progress by reducing as many exits points as possible.
- Better aligning developmental coursework with students' programs of study.

Our review found that compressed courses were the most prevalent approach to redesigning developmental math sequences (42 colleges), followed by multiple pathways (38), accelerated statistics pathways (37), and modularization (14) (Figure 13).

FIGURE 13

Compressed courses are the most prevalent non-traditional developmental education approach in math



SOURCE: Authors' estimates based on an exhaustive scan of CCC catalogs and websites for courses offered in 2015–16.

Below, we define the most common new approaches to developmental math education in California's community colleges, present examples of what specific colleges are doing, and summarize the literature on the effectiveness of these approaches.

Compression. Compression shortens the developmental sequence by combining two sequential developmental courses into a single one-semester course. Compressed courses seek to streamline content, for example, by reducing the amount of time spent on review and eliminating redundancies. According to our scan of catalogs, a total of 42 community colleges offer at least one compressed course; 24 colleges offer arithmetic and pre-algebra compressed into a single course, while 19 colleges combine elementary and intermediate algebra into a single course.

Multiple pathways. A growing number of colleges offer multiple math pathways at the developmental level that align with students' academic or vocational programs of study: intermediate algebra for statistics, intermediate algebra for STEM majors, intermediate algebra for social sciences and business majors, applied intermediate algebra, and intermediate algebra for the associate degree. Although the length of the developmental sequence remains the same, students can focus on the concepts and skills they will need to succeed in their subsequent college-level coursework. This intervention takes a standard practice at the college level—students fulfilling different quantitative requirements based on their intended majors—and extends it to developmental education. We identified at least 38 colleges offering multiple pathways.[16]

[16] Pre-statistics courses are one way in which colleges implement multiple pathways. We count colleges offering pre-statistics courses as a separate category, so we do not count colleges offering pre-statistics courses in our tabulation of colleges offering multiple pathways.

Developmental Math at Los Medanos College

Los Medanos College offers two different math pathways with differentiated placement levels. These pathways offer three accelerated math options that students can select based on their academic goals: a pre-statistics course, a co-requisite model, and a compressed course.

1. Statistics pathway for students in programs that are not math intensive:
    - Pre-statistics: this four-unit course prepares students for statistics in one semester. Does not have any prerequisites. Does not meet associate of arts/associate of science (AA/AS) requirement.
    - Statistics + support co-requisite: students without an intermediate algebra background can take statistics and a two-unit support class together in order to complete their transfer math requirement. Meets AA/AS requirement.
2. STEM/Business pathway for students who need more intensive algebra preparation:
    - Accelerated elementary and intermediate algebra: this seven-unit course combines material from elementary and intermediate algebra. Meets AA/AS requirement and is a prerequisite for transfer-level math.

Diablo Valley, American River, and Foothill colleges also offer different math pathways in conjunction with multiple forms of acceleration.

Accelerated statistics pathways. The principle behind curriculum redesign of pre-statistics courses is to create an accelerated developmental math pathway that is more closely aligned with the skills students need to be successful in college statistics, the college math course most liberal arts students take.

The California Acceleration Project

The California Acceleration Project (CAP) is a statewide faculty-led development network that supports California's community colleges in transforming their developmental education. CAP's end goal is to help colleges increase the number of students who go on to complete transferable gateway courses in English and math. To do so, CAP promotes three strategies:

- Changing placement policies
- Implementing co-requisite models
- Expanding accelerated pathways that are well aligned with students' chosen programs of study

Between 2010 and 2015, 61 colleges began offering redesigned English and math developmental pathways with support from CAP.

We find 37 colleges offer accelerated pre-statistics courses. A third of these are new courses that started either during fall 2015 or spring 2016, or are scheduled to start in fall 2016. Some of these colleges are participating in the Carnegie Statway program, established by a network of researchers and faculty through the Carnegie

Foundation for the Advancement of Teaching. Others are using similar approaches, such as the statistics pathways developed by the California Acceleration Project (see textbox).[17] Even though each one of these courses is designed to prepare students for transfer-level statistics in an accelerated way, there is considerable variation across colleges in terms of prerequisites, course units, class hours per term, required lab hours, degree-applicable status, the number of levels below college level, etc. Most of these courses have arithmetic or pre-algebra prerequisites, roughly half are degree-applicable courses, and at least one-third require a specific number of lab hours.

Previously, both UC and CSU required a prerequisite of intermediate algebra for statistics courses. But both systems have now cleared the way for community colleges to offer alternative statistics pathways (CSU Office of the Chancellor 2015). For example, UC no longer requires intermediate algebra as a prerequisite for awarding transfer credit for statistics. And on a trial basis through fall 2019, CSU is granting quantitative reasoning general education credit for statistics courses that have prerequisites other than intermediate algebra. Fourteen of the pre-statistics courses that we identified are statistics pathways coursework approved by CSU to meet quantitative reasoning requirements for transfer admission and lower-division general education through fall 2019 (CSU Chancellor's General Education Advisory Committee 2016).

Modularization. Modularization divides the developmental curriculum into modules that represent discrete math learning outcomes or competencies. Modules are often offered at one credit each. The assumption behind modularization is that students will focus only on their areas of weakness and skip the modules where they have shown proficiency, ideally resulting in accelerated progress to college-level math (Bickerstaff et al. 2016). While some modularized courses are instructor-led, in others, students move from one module to the next at their own pace. Modularized courses can be implemented a number of different ways, but are frequently delivered, totally or partially, using computer-mediated instruction (Rutschow and Schneider 2011). In our scan of courses, we find that at least 14 colleges offer some kind of modularized coursework.

Co-requisite model. In this newer approach, students simultaneously enroll in a college-level course and supplementary remediation. Though the form of supplemental remediation varies, it can take the form of a companion course, lab time, supplemental instruction, etc. Current UC and CSU policy only allows co-requisite models for statistics. This may change in the next few years as CSU implements new quantitative reasoning requirements.

Co-Requisite Reforms at Cuyamaca College

Beginning in fall 2016, Cuyamaca College will no longer offer math courses at two or more levels below transfer. Instead, developmental education students will enroll directly in intermediate algebra, while concurrently enrolling in a support course or the single-semester preparatory course, which leads directly to transfer-level statistics (Stats Academy).

[17] Currently 10 of California's community colleges are participating in the Carnegie Statway program.

Placement reform. The reforms to developmental education course sequences described above are one way in which colleges work to reduce exit points and increase student success. Placement reform is another component of many colleges' strategies to achieve this goal. Placement reform aims to broaden access to transfer-level courses and make access more equitable by adjusting cut scores, using robust multiple measures, and requiring algebra-based testing and remediation only for access to courses that require substantial algebra.

New Placement Policies at College of the Canyons

College of the Canyons changed its math assessment procedures to a disjunctive and mixed model that will allow 75 percent of entering students access to transfer-level statistics.

- For non-STEM and non-business majors, the college expanded the use of multiple measures so that a student qualifies for introductory statistics by: (1) placement test score, (2) a self-reported overall high school GPA of 3.0 or higher, (3) high school GPA of at least 2.7 and Algebra 2 completion with a C, or (4) high school GPA of at least 2.7 and Algebra 1 completion with a B- or higher.
- For STEM majors, the college reviewed and revised Accuplacer cut scores, as well as created minimum placement levels based on students' last successfully completed high school math course to increase placement for at least 40 percent of incoming STEM students.

Will Reforms to Developmental Education Succeed?

Overall, evidence for the efficacy of developmental education reforms in California and elsewhere is limited but promising (Hodara 2013). While more research is needed to evaluate the effectiveness of specific approaches, the existing literature suggests that the reforms undertaken by California's community colleges are headed in the right direction.

For example, there is promising evidence to support developmental math reforms in California from a group of colleges participating in the California Acceleration Project (CAP) (Hayward and Willett 2014). The study examined the impact of developmental math curricular redesign at nine pilot colleges, which implemented pre-statistics accelerated pathways that feed into college-level statistics courses, as opposed to the standard algebra-based curriculum that feeds into pre-calculus. The analysis drew on data from 653 pre-statistics students and 23,607 traditional math students enrolled at nine colleges during the 2011–2012 academic year and tracked outcomes for two years. Overall, the results suggested that English and math acceleration had a strong and positive association with completion of the transfer-level gatekeeper course. Students in accelerated pathways completed transfer-level coursework at higher rates than did students in traditional developmental pathways. The acceleration effect was found even after controlling for a host of potentially confounding variables, including GPA in non-related courses, place in the sequence, gender, and ethnicity. Additionally, the study found that the accelerated pre-statistics approach helped narrow achievement gaps for minority students. This research is the most promising evidence of developmental math reform available in the state of California and has led to a surge in colleges adopting this reform.

One landmark study examined the causal impact of developmental math reforms at three institutions in the state of Tennessee (Boatman 2012). All three colleges in the study redesigned developmental math courses by

integrating learning technology that enabled students to work at their own pace and focus on particular skill deficiencies. The two community colleges in the study also modularized the developmental curriculum, while the state university eliminated developmental courses and replaced them with co-requisite college-level courses linked to special tutoring and supports. Using a regression-discontinuity approach, the study compared early persistence and credits completed within two years of students just above and just below the test-score cutoffs for assignment to developmental math. This study analyzed data from over 8,500 students who first enrolled full-time in one of the three Tennessee colleges between fall 2006 and fall 2009. The study found that developmental math reforms had positive and significant effects on early college persistence as well as on the number of credits attempted, but not completed in the first semester. But findings also indicate that the positive effects tended to fade over two years. This study provides encouraging evidence for modularization and co-requisite reforms—it also highlights the importance of examining longer-term outcomes, as the findings suggest that early positive effects may not lead to significant changes in longer-term outcomes.

Initial research on compressed developmental coursework is also encouraging. FastStart at the Community College of Denver combines two sequential developmental math courses that would traditionally take two semesters to complete into a single-semester course, but maintains the same number of contact hours and provides students with various in- and out-of-class supports. Evaluations of this program found that, controlling for a wide range of student-level characteristics, program students were more likely to enroll and successfully complete college-level math within three years. However, there was no difference in persistence rates or credit accrual between FastStart and non-FastStart developmental math students, and most of the positive completion outcomes were driven by higher college-level course enrollments (Jaggars et al. 2015; Edgecombe et al. 2013).

National initiatives implementing alternative pathways to college math and statistics also appear to help improve students' short-term academic outcomes. The Carnegie Foundation for the Advancement of Teaching is leading national efforts with two approaches known as Statway and Quantway. Statway allows students to complete pre-statistics and college-level statistics within one year. Quantway is a one-semester developmental math course that emphasizes the quantitative reasoning skills needed to be successful in college-level math. As with statistics pathways developed by the California Acceleration Project, Quantway and Statway are intended to better align developmental course content with students' programs of study, targeting students who do not intend to pursue a STEM major. Using a matching strategy, a recent study of these initiatives analyzed data from 33 colleges and found that students in one of these two math pathways were more likely to successfully complete college math or statistics than students in the traditional developmental math sequence (Sowers and Yamada 2015).

The use of co-requisites as a developmental math reform is being touted as a "game changer" by Complete College America, an organization pioneering reforms intended to promote improved completion rates across the country. Descriptive evidence from five states that have begun to implement co-requisites suggests that students who enroll in college-level math courses and receive academic support via a linked developmental math course are more than doubling completion rates of college-level math courses in half the time or better, with college-level math completion rates hovering at over 60 percent within one semester and one year, compared to a completion rate of 22 percent nationally within two years (Complete College America 2016). These apparent large improvements are generating much enthusiasm among developmental education reformers across the nation and in California. However, more data and research are needed to substantiate causal impacts at a larger scale.

Finally, descriptive evidence of the Charles A. Dana Center's New Math Pathways, which align developmental math with students' career interests, also suggests reforms may have a positive impact (Rutschow and Diamond 2015). We will know with more certainty if these alternative math pathways are indeed effective and efficient in

helping students progress through college as MDRC is currently conducting a random assignment evaluation of this initiative in the state of Texas.

While the existing research is encouraging, the short timeframe—one term to two years—in most of the studies means that it is unclear if positive effects persist over time. A longer follow-up period—up to four or six years—would allow researchers to examine the impact of reforms on degree completion and transfer. Additionally, the research on developmental math reforms has for the most part examined reforms at one college or a small number of colleges, and has not evaluated multiple and simultaneous interventions at a large scale. As reforms are scaled up, researcher must examine if positive impacts persist, and importantly, whether impacts hold true for different groups of students.

Conclusions

Most students entering California's community colleges—especially Latino, African American, and low-income students—are identified as underprepared and start their college journey in developmental courses in math, English, or both. But developmental education in the state's community colleges is lengthy, attrition is high, and outcomes are poor. Relatively few students emerge from traditional developmental sequences and successfully complete college-level math or English. Even fewer earn a degree or certificate, or transfer to a four-year college.

Ineffective developmental education comes at a high cost to students—not only in tuition and fees for coursework that does not count toward a degree, but also in time and foregone income. And for a state that relies heavily on community colleges as an entry point into higher education, poor outcomes in developmental education threaten California's ability to supply the college-educated workers needed to meet the demands of a changing economy.

The good news is that two-thirds of colleges have started to implement promising reforms, including redesigning developmental course sequences. These reforms focus on accelerating students' progress through the developmental sequences so there are fewer exit points for students to drop out and better aligning developmental coursework with students' preferred programs of study. For example, accelerated statistics pathways aim to shorten the math sequence and provide math instruction that will be more relevant for students in non-STEM majors.

Moving forward, two big challenges will be evaluating the effectiveness of these reforms and scaling up successful efforts to reach more students. While there has been a surge of new interventions intended to improve developmental math in community colleges, little is known about what actually works. Qualitative and descriptive research suggests that acceleration models show promise in improving students' progression through developmental education and into college-level coursework. But the few quasi-experimental studies examining the impact of these interventions on student outcomes have had limitations. As reforms are scaled up, additional research is necessary to determine if positive impacts persist and whether they hold for different student groups.

The state legislature has been a key actor in improving developmental education. Many of the ongoing reforms at community colleges have been implemented with state funding to support improvements to developmental education instruction. Most recently, the Student Outcomes Transformation Program encourages California's community colleges to develop and experiment with innovative approaches to developmental education. Policies and institutional efforts that focus on addressing the needs of developmental education students and getting them college ready should be evaluated rigorously—especially considering the size and characteristics of the affected student population and the amount of resources invested. To this end, PPIC is currently conducting research to

determine whether and to what extent new interventions in developmental education improve student outcomes and help close achievement gaps for low-income and underrepresented groups.

Improvements in developmental education hold promise for allowing more students to reach their academic and career goals, an outcome that is good for them and good for the state. Given the persistent racial and ethnic gaps in remediation and graduation rates, strategies to increase economic opportunity and social mobility for underserved students should focus on how to get them college ready in a shorter amount of time—giving them the skills they need to succeed in their college career and in the labor market.

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