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STEPS TO SUCCESS:

Analyzing Milestone Achievement to Improve Community College Student Outcomes

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Executive Summary

The Obama Administration has brought increased attention to community colleges as institutions that will help the nation once again become a world leader in postsecondary degree attainment. Billions of dollars in new funding are being proposed as a means to improve graduation rates and other student outcomes across the nation's community colleges.

But there is widespread recognition that the current means of measuring and accounting for outcomes in community colleges is deficient. Among the weaknesses of current systems is an under-emphasis on the reporting of intermediate outcomes that students achieve along the way to completion. Understanding the patterns by which students make, or fail to make, progress toward completion is vital to the national mobilization to improve student outcomes. The more that is understood about what helps students make forward progress and where that progress typically stalls, the greater the chances of reaching these lofty but essential national goals.

This report offers a framework for guiding educators in using available knowledge and tools to improve student outcomes. It shows how better use of available data can help diagnose why students fail to make progress toward a degree and can better demonstrate the progress students make along the pathway to a degree. The framework consists of two factors: *milestones*, or intermediate educational achievements that students reach along the path to degree completion, and *indicators of success*, or academic patterns students follow including remediation, gateway courses, and credit accumulation, that have been demonstrated in research studies to correlate with forward progress and completion.

Data to demonstrate the value of the framework are from the California Community Colleges (CCC). These 110 colleges are key to the future social and economic health of California as well as to the success of national efforts to restore America's position among nations. The demand for college-educated workers in California is projected to greatly exceed the supply. The state's community colleges play a vital role in meeting the demand for workers as they are the primary producers of postsecondary certificates and associate degrees and help produce bachelor's degrees through the transfer process.

We show how the framework can be applied to:

- analyze student achievement of various milestones, by subgroup
- identify where student progress gets stalled on the path toward a degree
- analyze enrollment patterns to diagnose why students fail to make progress
- draw connections between campus or system policies and the patterns revealed by the analyses, in order to suggest changes that would foster better student outcomes.

The framework also provides a means of improving accountability by including measures that demonstrate the progress students are making along the pathway to college completion. This is important given the challenges of identifying students' goals and the many obstacles that community college students face on the road to completion of an academic program.

Our analysis shows that too few students reach each of the milestones along the path to degree completion, especially older students, part-time students, and black and Latino students. Data also show that students who complete college-level math and English within the first two years of enrollment, complete at least 20 credits in the first year of enrollment, take summer courses, complete at least 80% of the courses in which they enroll, register for courses on time, and/or attend full time are more likely to complete than students who do not follow these patterns.

See Table A-1 in the appendix for a complete listing of how following each "success indicator" pattern affects the achievement of each milestone. For example, 83% of students passing college-level math within two years of initial enrollment complete 30 or more college credits within seven years, compared to just 33% of students not passing college-level math within two years. As another example, 27% of students who attend full time in their first term complete a transfer curriculum compared to just 9% of students who do not attend full time in their first term.

The analyses in the report point to several broad findings about the utility of the proposed framework and the two

key components of milestones and indicators of success.

The framework is a useful addition to existing analytic approaches:

- It provides policy makers and college leaders a means for diagnosing where and why students fall off the path to success, allowing changes to be targeted to improve student outcomes.
- It provides a means of improving accountability by including measures that demonstrate progress students make on the way to earning a degree.

Data systems should be improved to make best use of the framework:

- Information on which students need remediation would allow for monitoring the progress of this important segment of community college students.
- Data that identify the specific programs students intend to complete or the support services they receive would aid colleges in monitoring the effectiveness of these programs and services.
- Data on student academic preparation upon enrollment would allow for better understanding of the relative impact of preparation and enrollment patterns on college success.

Results can guide policy changes:

- We show in Table 5 examples of specific actions that could be taken in response to identified problems in student progress using the milestone and success indicator framework.

Increasing Educational Attainment: A Framework for Success

The Obama Administration has made it a national priority to increase educational attainment and to recognize and bolster the role that the nation's community colleges play in achieving that goal. Billions of dollars in new funding are being proposed as a means to improve graduation rates and other student outcomes across the nation's community colleges.

As educators, government officials, and foundations have begun to address this national priority, they have recognized a major deficiency in the way that student outcomes are tracked in community colleges. With students enrolling for many different reasons and facing myriad obstacles to completion, the traditional measure of graduation rates does not tell the full story or provide guidance about how to increase student success. Much more information is needed about the intermediate outcomes that students reach along the way to completion. Understanding the patterns by which students make, or fail to make, progress toward completion is vital to the national mobilization to improve student outcomes. The more that is understood about what helps students make forward progress and where that progress typically stalls, the greater the chances of reaching these lofty but essential national goals.

Fortunately, the research literature on college success offers extensive information about the factors that lead to student progress and degree completion,[1] providing useful information to policy makers and education leaders for developing policies and practices to increase rates of certificate and degree completion.[2] Some research has begun to address the need for better information than is provided by traditional measures of student outcomes,[3] which:

- are generally limited to retention and graduation rates
- ignore the intermediate outcomes that students must achieve on the path to degree completion
- provide no information on students' patterns of enrollment and success, which can indicate whether or not students are gaining momentum on the path to a college degree
- offer no guidance on diagnosing where and why students fall off the pathway to graduation, or how changes in policy and practice might be used to increase degree completion.

This report extends that literature by proposing a framework for using available knowledge and tools to improve student outcomes. The framework consists of two components:

1. **Milestones** – measurable, intermediate educational achievements that students reach along the path to degree completion
2. **Indicators of Success** – measurable academic patterns that students follow (in addition to continued progression along milestones) that predict the likelihood they will reach milestones and ultimately earn a degree.

The framework is intended to help colleges diagnose the reasons students fail to make progress toward a degree and target their responses accordingly. It also addresses the call to provide greater accountability by giving colleges a systematic way to describe the progress students make along the pathway to a degree.

We demonstrate the value of the framework by applying it to the California Community Colleges (CCC). Nowhere is the national priority of improving community college outcomes more important than in California. Nearly one-fourth of the nation's community college students are enrolled in California's community colleges.[4] These 110 colleges are key to the future social and economic health of California, as well as to the success of national efforts to restore America's position among nations. The demand for college-educated workers in California is projected to greatly exceed the supply.[5] The economic downturn has hit California particularly hard and threatens to exacerbate the ongoing decline in California's position relative to other states (see Table 1).

Table 1
California is Becoming Less Educated than Other States

Age Group	Rank among States in Share of Population with Associate Degree or Higher
65 and older	3rd
45 to 64	14th
35 to 44	26th
25 to 34	31st

Source: NCHEMS Information Center for Higher Education Policymaking and Analysis (www.higheredinfo.org) based on data from the US Census Bureau, 2007 American Community Survey

As we show in the subsequent analyses of data from the CCC system, the framework can be applied to:

- analyze student achievement of various milestones to identify places where forward progress gets stalled and how that may vary by subgroup
- analyze indicators of success to see where students, and which students, are not following successful enrollment patterns
- draw connections between current policies and practices and the patterns that have been revealed in the analyses
- change current policies and practices to foster better student outcomes.

Table 2 displays the two key components of the framework, based on the research literature on student success. The success indicators are grouped into three categories of student enrollment patterns:

1. **Remediation** – the importance of addressing any remedial needs immediately on enrollment
2. **Gateway courses** – the benefit of early enrollment in and completion of certain gateway courses
3. **Credit accumulation and related academic behaviors** – the importance of building academic momentum through behaviors that lead to the timely earning of college credits.

The remainder of this report describes our findings that CCC patterns of student progress and success conform to those noted in the research literature and demonstrates the value of the framework for diagnosing problems and working to increase student success. We focus on students identified as enrolling in community college for the purpose of earning a certificate or degree or transferring to a university (see Data and Methods box on page 6).

Table 2
Milestones and Indicators of Success

Milestones	Success Indicators

■ Retention
■ Complete needed remediation
■ Transition to college-level coursework
■ Earn one year of college-level credits
■ Complete general education (GE) coursework
■ Complete a community college transfer curriculum
■ Transfer from community college to a university
  • After completing transfer curriculum
  • Without completing transfer curriculum
■ Complete a certificate or degree
	Remediation:
	■ Begin remedial coursework in first term, if needed
	
	Gateway Courses:
	■ Complete college-level math / English within the first two years
	■ Complete a college success course or other first year experience program
	
	Credit Accumulation and Related Academic Behaviors:
	■ High ratio of course completion *(low rate of course dropping and failure)*
	■ Complete 20-30 credits in the first year
	■ Earn summer credits
	■ Enroll full time
	■ Enroll continuously, without stop-outs
	■ On-time registration for courses
	■ Maintain adequate academic performance

Too Few Students Reach Milestones on the Road to Degree Completion

Figure 1 shows the percent of degree seekers in a cohort of students in the CCC that achieved different milestones within seven years. While many students enter the CCC needing remediation, the Chancellor's Office does not collect data on assessment test results or placement recommendations. These data would be necessary to measure the share of students who complete remediation and transition to college-level coursework, which are important milestones included in Table 2. As an alternative, Figure 1 shows the percent of degree seekers who completed 12 college-level (CL) units, a measure that has been used in other research to indicate achievement of "college pathway status."[6] As shown in the figure, 62% of degree seekers reach this milestone. The milestone marked "any completion" refers to completing a certificate or degree or transferring to a university.[7]

Among degree seekers in the CCC:

- almost 42% earned one year of college-level credits (30 semester credits), the level often cited as the point associated with increased earnings[8]
- about one in six completed a transfer curriculum, defined as 60 transferable units, including at least one course in both English and math
- just over 3% completed a certificate and about 8% completed an associate degree
- about half (54%) of those who transferred to a university completed a transfer curriculum prior to transfer (not shown), indicating that large numbers of community college transfers in California are not entering universities as upper-division students
- about 29% completed a certificate or degree or transferred to a university within seven years of enrolling in the CCC.

Given the large number of non-traditional students in community colleges, it is important to examine outcomes by age and attendance status. Full-time students and those of traditional college age (17-24) are more likely to reach each of the milestones (Figure 2).

Racial/ethnic disparities in outcomes are important to consider given the growing populations of underrepresented minority students in the CCC. White and Asian[9] students were more likely to reach each of the milestones than black and Latino students (Figure 3). Latino students were about as likely as white students to persist to the second term and the second year (not shown), but they were less likely to reach the other milestones.

Figure 4 shows the percent of degree seekers completing a certificate or degree or transferring to a university by year. The largest numbers of completions occurred in the third and fourth years after initial enrollment.

Figure 1:
Milestone Achievement Among Degree Seekers
(within 7 years)

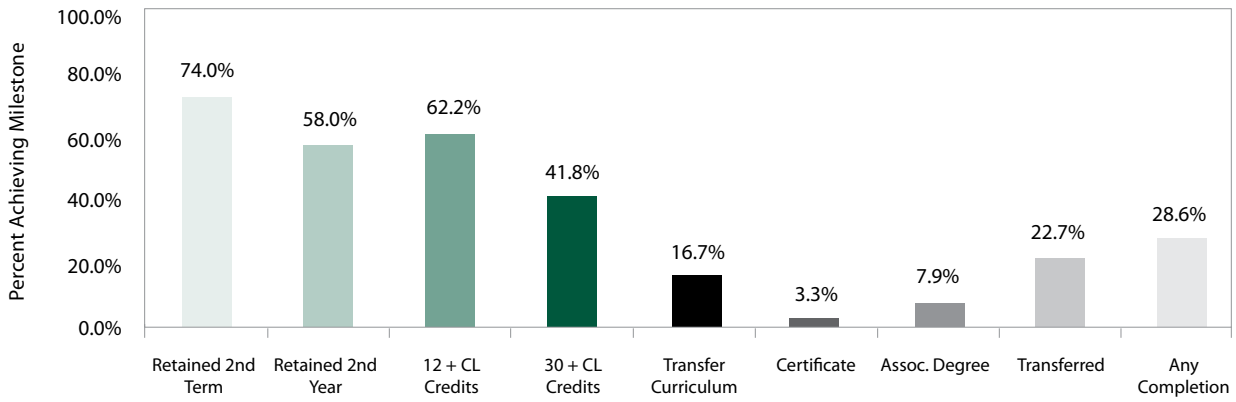


Figure 2:
Milestone Achievement Among Degree Seekers by Age and Enrollment Status
(within 7 years)

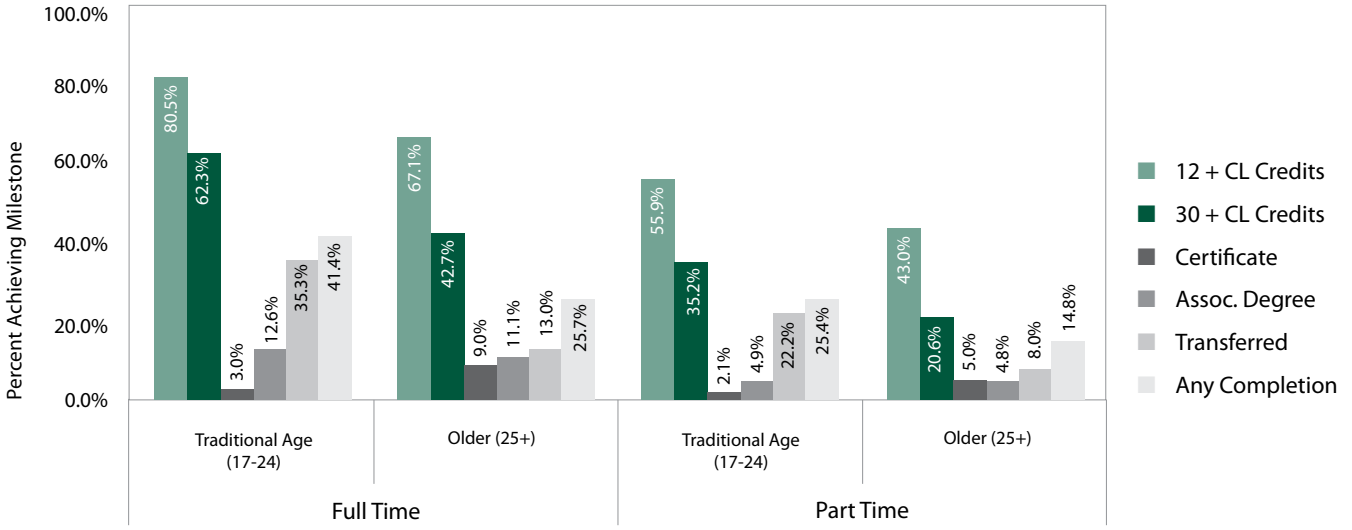
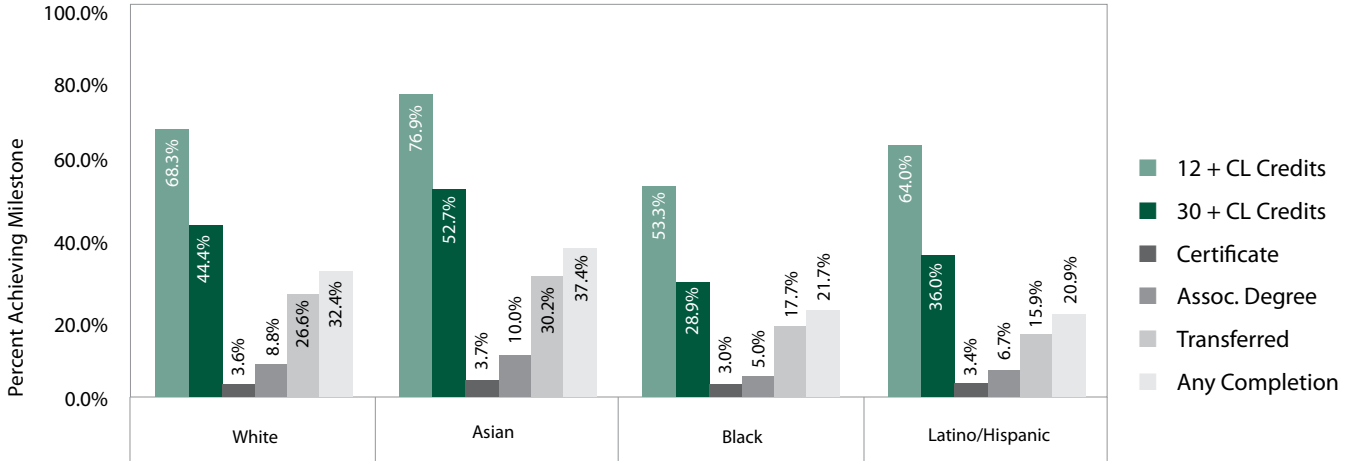
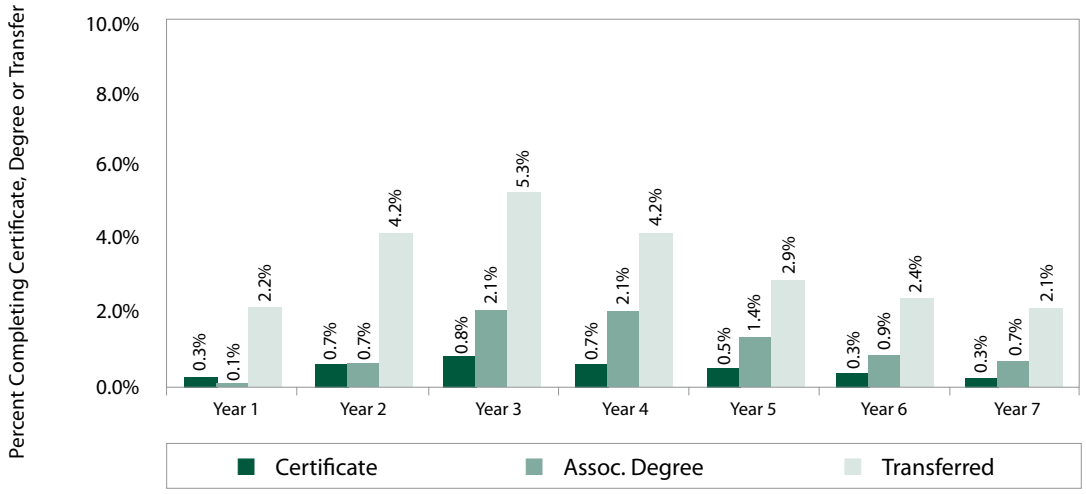


Figure 3:
Milestone Achievement Among Degree Seekers by Race/Ethnicity
(within 7 years)



Too Few Students Reach Milestones on the Road to Degree Completion

Figure 4:
Percent of Degree Seekers Completing a Certificate, Degree or Transfer in Each Year



The next section of the report shows the relationship between the likelihood of reaching the ultimate milestone of "completion" and the success indicators shown earlier in Table 2 (or at least those indicators we were able to measure given data limitations). While the discussion will focus on completion, the data suggest similar relationships between the success indicators and the other milestones. Table A-1 in the appendix shows the complete set of relationships between success indicators and milestone achievement.

Data and Methods

Data Source: California Community Colleges Chancellor's Office

The student unit record (SUR) data from the Chancellor's Office Management Information System (COMIS) include demographic information, course-taking records, and records of degrees/certificates earned and transfers to 4-year universities (based on matches to the California State University, the University of California, and the National Student Clearinghouse). We analyzed data for the entering cohort of first-time CCC students who enrolled in one or more credit courses during the 2000-01 academic year. Non-credit students and high school students concurrently enrolled in community college were excluded. We tracked the students over a 7-year period, through 2006-07. The primary limitations of the data include a lack of information about students' income or other indicators of socioeconomic status and about assessment test scores, placement recommendations, or other indicators of academic preparation for college-level study.

Methods

The analyses focus on a subset of students identified as "degree seekers" (a term we use to include both degrees and certificates) based on having enrolled in more than six units during the first year. This definition is based on a recent suggestion by Dr. Clifford Adelman as part of national discussions about revising the federal methodology for calculating graduation rates.[10] Using Adelman's suggested criterion, 63% of students in the cohort were identified as degree seekers (N= 247,493). Degree seekers were somewhat younger, with an average age of 24 compared to 26 for the entire cohort of students. Fifty-three percent of degree seekers were under age 20 and 10% were age 40 or older, compared to 45% and 17%, respectively, for the entire cohort. The gender and racial/ethnic distributions were about the same.

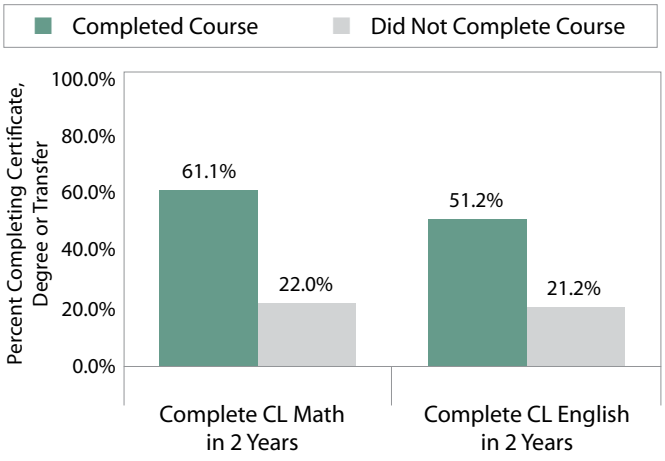
We calculated the percent of students who reached milestones, and the rates of milestone achievement for different groups of students. We examined the probability of degree completion by whether or not students met the success indicators. We used regression analysis to test whether the success indicators predicted completion after controlling for other factors, and whether the relationships held across all groups of students (e.g., racial/ethnic groups, age groups). More details about the statistical analyses are described in the appendix, along with a complete listing of the relationships between success indicators and milestone achievement.

Indicators of Success: Students Should Take Gateway Courses Early

College-Level Math and English

Degree-seeking students were more likely to complete (i.e., earn a certificate, degree, or transfer) if they completed college-level math and English, with a grade of C or better, early in their enrollment (Figure 5). Students who completed a college-level math course within two years of initial enrollment were nearly three times as likely to complete as students who did not finish college-level math in that time period. Students who completed a college-level English course within the first two years were more than twice as likely to complete as those who did not.

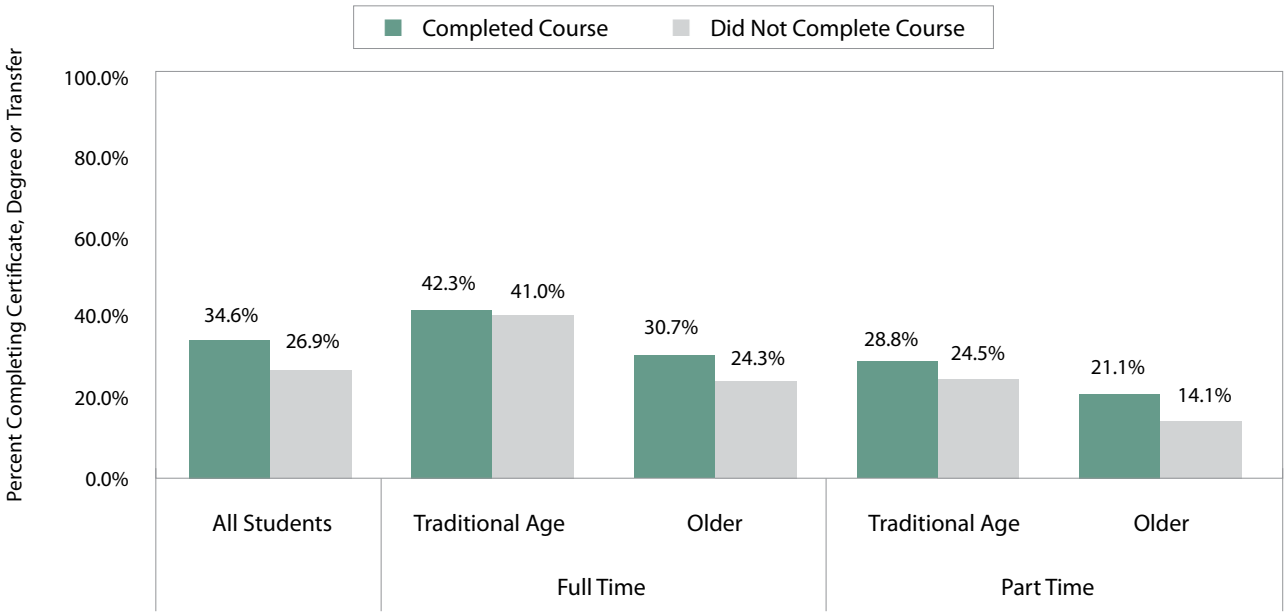
Figure 5:
Probability of Completion Based on Early Completion of College Level Math and English



Success Courses

Many colleges offer courses designed to help students succeed in college and in their careers. These courses are often called college orientation or college success courses. Completing such a course appears to help some students earn a degree or certificate or to transfer. Older students and traditional-age, part-time students who completed a success course had higher completion rates (Figure 6). Completing a success course did not appear to make a difference for full-time, traditional-age students. Interestingly, we found that black students in the CCC who finished a success course were less likely to complete than black students who did not take such a course, and that taking a success course was unrelated to completion for Asian students (not shown). It may be the case that success courses in the CCC are aimed at students with more risk factors rather than being more widely available to all students, complicating the relationship of taking a success course and completion.[11]

Figure 6:
Probability of Completion Based on Completing a Success Course in the CCC by Attendance Status and Age Group



Indicators of Success: Credit Accumulation Provides Momentum

First-Year Credits Earned

The probability of completion rises with the number of credits earned in the first year, with a fairly linear relationship between the two measures (Figure 7). We found a similar relationship with the probability of completion if we limited the credits earned to only college-level (non-remedial) credits rather than all credits, although the percentage of degree seekers who completed was somewhat higher at each level of college-level credits earned in the first year. Given the large number of CCC students who enroll in college with remedial needs, we chose to include all credits, and selected 20 credits in the first year as a reasonable threshold indicator of success (other research has used a range of first-year credits, generally from 20 to 30). Fifty-eight percent of degree seekers who earned at least 20 credits in the first year completed – three times as many as those who did not earn that threshold level of credits (Figure 8).

Figure 7:
Probability of Completion by First Year Credits Earned

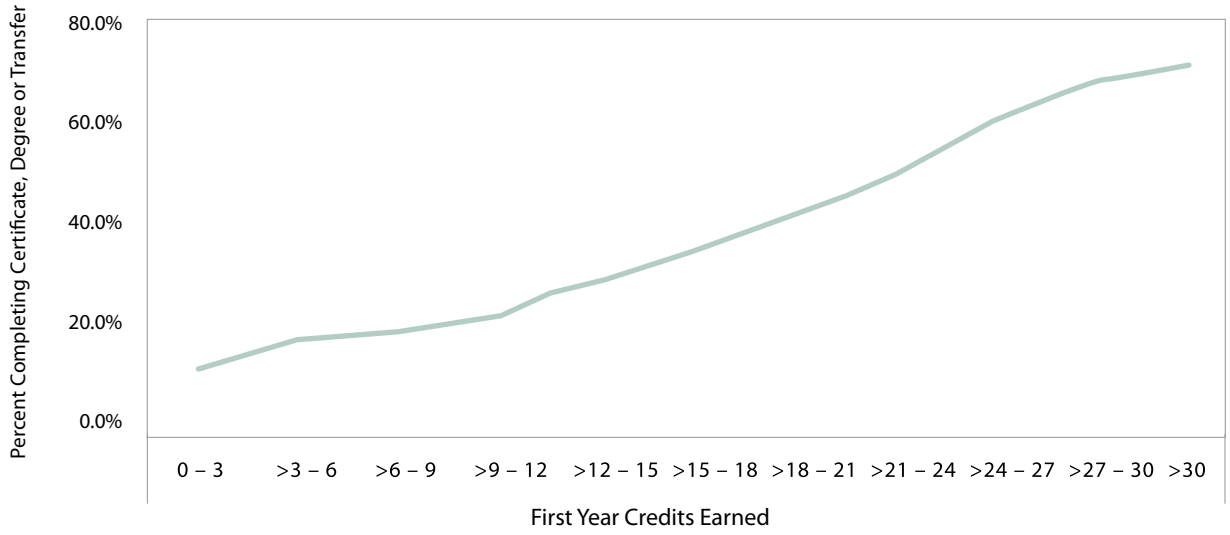
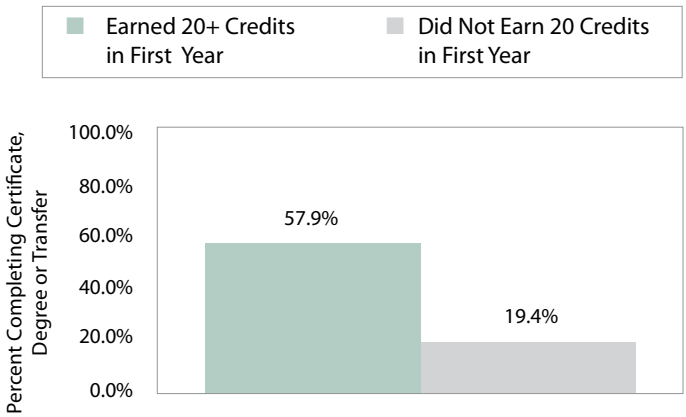


Figure 8:
Probability of Completion Based on Early Credit Accumulation



Summer Credits

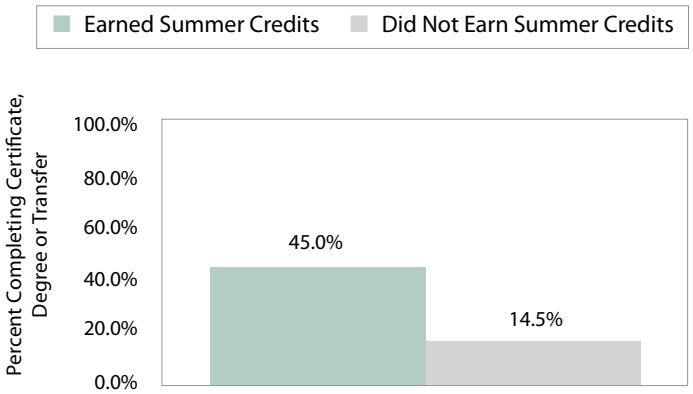
Students who earned summer credits[12] were three times as likely to complete (Figure 9). The strong relationship between earning summer credits and completion may not mean that it is summer attendance per se that helps students complete a certificate, degree or transfer. Students who attend regularly and persist over a number of years are likely as well to take summer classes. Therefore, summer attendance is in part an indicator that students are being retained and taking a continuous progression of coursework. However, summer terms also afford students an opportunity to build momentum and sustain progress by earning additional credits or re-taking courses not completed during other terms.[13]

Indicators of Success: Credit Accumulation Provides Momentum

Credit Completion Ratio

To accumulate credits and build momentum toward completion, students need to complete the courses in which they enroll. We calculated the first-year credit completion ratio as the number of credits earned divided by the number of credits attempted, so that either failing or withdrawing from a course led to non-completion of credits.[14] We found that the rate of earning a certificate or degree or transferring was 24 percentage points higher among students who completed at least 80% of the credits they enrolled in during the first year compared to those who completed a smaller percentage of first-year credits (Figure 10).

Figure 9:
Probability of Completion Based on Earning Summer Credits



Attendance Patterns

Students who attend full time and enroll continuously can accumulate credits faster than students who enroll part time and stop out. Students who enrolled full time in their first term were almost twice as likely to complete as students who began as part-time students (Figure 11). Continuously enrolled students had a completion rate that was 7 percentage points higher than students who stopped out. Continuous enrollment did not correlate with completion for older students (age 25+), who may be better able to use periods of stopping out to manage job and family responsibilities without getting off track in their pursuit of a college credential.

Late registration for courses also affected the probability of completion, with the likelihood of completion declining as the share of courses in which students enroll in late increased. "Late" registration was defined as enrolling in a course after the start date of the term. Among students who registered late for no more than one in five of their courses, the completion rate was 32%, compared to 24% for students who registered late more often. Late registration affected completion for all student groups. Nearly half (47%) of degree seekers registered late for at least one in five of their courses.

Figure 10:
Probability of Completion Based on First-Year Credit Completion Ratios

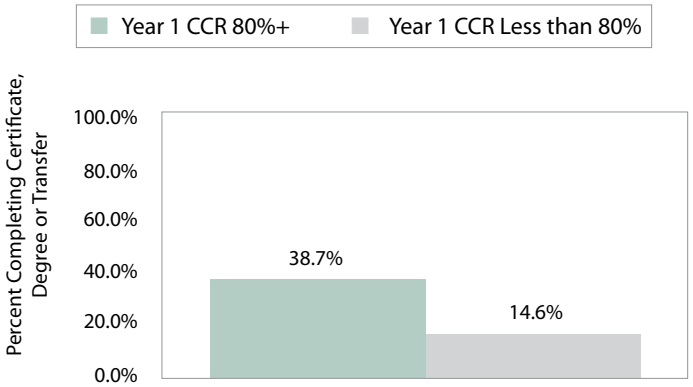
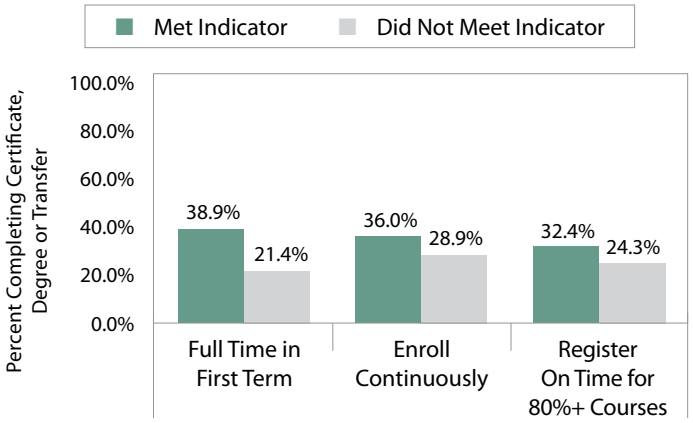


Figure 11:
Probability of Completion Based on Attendance Patterns



Using Milestones and Success Indicators to Improve Student Outcomes – Some Examples

Using the framework of milestones and indicators of success outlined on pages 1-2, we have presented analyses of (1) student progress in reaching various milestones on the pathway to earning a college credential and (2) patterns of student behavior with respect to the indicators of success. We now illustrate how these analyses can be used to identify problems and design policy interventions or changes in practice to improve student outcomes.

Understanding Transfer

Transferring to a university is a typical outcome measure for community colleges, and is generally assumed to signify a student having earned two years of credit toward a bachelor's degree. Under the typical understanding of transfer, a student completes at least 60 semester credits of lower-division coursework at a community college and then moves to a university to complete an additional 60 credits of upper-division coursework for the typical bachelor's degree requiring a total of 120 credits. However, few CCC students follow this ideal transfer path to the baccalaureate, and research that measures "transfer" (including this report) typically counts as a transfer any instance where a student enrolled in a community college then enrolled in a four-year university at some later point during the time period students are tracked (in this case, 7 years). Published transfer rates based on this method overstate transfer success as it is typically understood because many students move on to a university after accumulating far fewer than 60 credits.

As shown in Table 3, among the students in the 2000-01 CCC cohort who transferred, nearly half (46%) did so without having completed a transfer curriculum (60 transferable credits, including at least one math and one English course).[15] On average, such students had completed only 31 units at a community college and one-third of them had completed fewer than 15 units (not shown). Older transfer students and black transfer students were far less likely to have completed a transfer curriculum, with about 70% of both groups moving on to a university without having completed the curriculum. Even fewer transfer students complete an associate degree at the CCC.[16] Clearly, "transfer" does not always represent two years of progress toward a bachelor's degree.

The majority of students who transferred without completing a transfer curriculum enrolled in in-state private or out-of-state institutions, since the University of California (UC) and California State University (CSU) have taken relatively few lower-division transfers in recent years.[17] Related to their lower likelihood of completing a transfer

Table 3
Transfer among Degree Seekers

		Among Transfers					
	Transferred to University	**Completed Transfer Curriculum**	***Did Not* Complete Transfer Curriculum**	**Completed AA/AS Degree**	***Did Not* Complete AA/AS Degree**	**Transferred to UC/CSU**	**Transferred to *Other* University**
All Degree Seekers	23.0%	53.8%	46.2%	19.5%	80.5%	68.1%	31.9%
Age at Enrollment:							
Traditional, 17-24	28.3%	56.6%	43.4%	18.8%	81.2%	70.1%	29.9%
Age 25+	9.2%	31.0%	69.0%	24.8%	75.2%	52.0%	48.0%
Race/Ethnicity:							
White	26.6%	51.6%	48.4%	19.8%	80.2%	66.2%	33.8%
Asian/Pacific Islander	30.2%	64.7%	35.3%	15.8%	84.2%	79.8%	20.2%
Black	17.7%	29.6%	70.4%	16.1%	83.9%	43.8%	56.2%
Latino(a)	15.9%	55.9%	44.1%	24.2%	75.8%	68.3%	31.7%

Using Milestones and Success Indicators to Improve Student Outcomes – Some Examples

curriculum, older students and black students were far less likely to transfer to UC or CSU. Only 52% of older transfer students went to UC/CSU compared to 70% of younger transfer students. An even smaller portion (44%) of black transfer students went to UC/CSU compared to about two-thirds of white and Latino transfer students and 80% of Asian transfer students. Latino transfer students are more likely than white transfer students to complete a transfer curriculum and to complete an associate degree, and a slightly larger share of them transfer to the public universities.

In listing milestones in Table 1, we made a distinction between transferring with or without having completed a transfer curriculum because, as demonstrated here, "transfer" itself does not provide adequate information about the degree of progress students have made toward a degree. There are benefits associated with completing a full transfer curriculum (and, ideally, an associate degree) before transferring to a public university:[18]

- Attending the CCC for all lower-division coursework is more cost-effective for students and the state, given the lower cost of attendance.
- Following a prescribed pathway to transfer into a major at a university with upper-division status increases efficiency in the state's higher education system, by minimizing the need to repeat courses or take additional courses because some CCC coursework does not apply to the intended university campus or major.
- Reducing such "excess" units not only lowers the cost per degree, it increases access by freeing up enrollment slots in courses for additional students.
- Earning an associate degree before transfer is associated with a higher likelihood of completing the baccalaureate,[19] and students who do not finish a bachelor's degree at least end up with an associate degree for their (and the state's) investment.

Tracking student completion of a transfer curriculum would also improve accountability reporting for the CCC. The system's accountability reporting system includes a Student Progress and Achievement Rate (SPAR) that subsumes two partial measures of transfer curriculum completion under a broader set of outcomes.[20] Reporting the share of students that complete a transfer curriculum would allow the system to demonstrate the extent to which it accomplishes the part of the transfer mission for which it is most responsible. Factors like limited enrollment capacity at universities and students' finances can impede transfer even when community colleges have succeeded with the transfer preparation mission, making completion of a transfer curriculum a more valid indicator of community college performance than actual transfer rates.

We can use the success indicators in our framework to examine differences in enrollment patterns between transfer students who completed a full transfer curriculum and those who enrolled in a university without meeting that milestone, in an effort to identify areas where changes in policy and practice might increase the number of transfer students taking the preferred transfer path. Table 4 summarizes the findings for all transfer students, and separately for black students and older students because of their greater likelihood of transfer without completing a transfer curriculum.

As shown in the table, transfer students who did not complete a transfer curriculum were less likely to have completed the important gateway courses in English and math within two years of enrolling in the CCC. They may have entered college with lower levels of academic preparation, requiring enrollment in remedial coursework in these subjects. Policies requiring early enrollment in English and math for degree-seeking students, and effective practices for getting under-prepared students through developmental coursework expeditiously, would likely get more transfer-oriented students on the pathway to completing a full transfer curriculum. The students not completing a transfer curriculum were also less likely to have taken a college success course, giving them less opportunity to gain an understanding of the transfer process through the curriculum in those courses.

A primary factor distinguishing students who did complete a transfer curriculum from those who did not was completing at least 20 credits in the first year. Students who did not complete a transfer curriculum had a substantially lower credit completion ratio in the first year, likely contributing to their lesser likelihood of accumulating 20 credits. Examples of interventions in response to this finding include integrating supplemental instruction into courses with high drop/failure rates, instituting "early alert" systems to identify students having trouble in courses, and implementing policies that limit the number of course withdrawals.

Table 4
Percent of Transfer Students Meeting Selected Success Indicators

	All Transfer Students		Black Transfer Students		Older Transfer Students	
Success Indicators	**Completed Transfer Curriculum**	***Did Not* Complete Transfer Curriculum**	**Completed Transfer Curriculum**	***Did Not* Complete Transfer Curriculum**	**Completed Transfer Curriculum**	***Did Not* Complete Transfer Curriculum**
Gateway Courses:						
CL Math	51.5%	24.3%	42.2%	14.3%	43.6%	18.5%
CL English	57.2%	35.1%	53.0%	27.2%	50.1%	29.8%
College Success	33.5%	19.0%	37.2%	24.2%	31.4%	12.0%
Credit Accumulation:						
Enroll Continuously	49.4%	42.2%	46.0%	40.4%	39.4%	39.9%
Year 1 CCR 80% or higher	69.7%	52.3%	61.9%	38.7%	82.5%	62.8%
Earn 20+ Credits Year 1	63.8%	29.8%	57.9%	21.9%	61.6%	23.3%
Timely Registration for 80% or More of Courses	64.4%	55.0%	50.7%	43.6%	63.2%	57.8%

Targeting Institutional Change to Address Unsuccessful Patterns

As shown earlier in Table 1, our review of the research literature yielded three sets of academic patterns that correlate with degree completion and therefore serve as "indicators of success." Data limitations prevented us from analyzing issues related to one set of indicators – remediation. But the analyses we were able to do confirmed the importance of:

- early enrollment in and completion of college-level gateway courses in math and English, and completion of a college success course for some groups of students (see Figures 5 and 6)
- early accumulation of credits through enrollment in an adequate number of courses (full time is ideal), completion of those courses, and use of summer terms and continuous enrollment to increase momentum (see Figures 8-11).

System and college leaders in the CCC can use indicators to monitor student patterns and to intervene with effective policies and practices to increase the number of students completing certificates and degrees and transferring to a university. When a success indicator signals a problem, further analysis can help point to the types of changes in policy and practice that would best address the problem and increase student success. As examples, we analyzed patterns related to two important success indicators – early completion of college-level math and credit accumulation during the first year of enrollment.

As shown in Figure 12, a large percentage of degree-seeking students in the CCC did not complete college-level math within two years of entry. About half of those students did not enroll in any math courses within two years (further analysis could reveal more about these students, including whether they remained enrolled for the two years or dropped/stopped out). The other half enrolled in math, with some students taking only remedial courses, and others attempting but not successfully completing college-level math. Different kinds of changes in policies and practice could be used to increase the share of students completing college-level math, depending on the reason students are not doing so (as noted in green type).

Figure 13 shows a similar analysis of patterns related to early credit accumulation. Three-quarters of degree-seeking students in the CCC did not complete at least 20 credits in

Using Milestones and Success Indicators to Improve Student Outcomes – Some Examples

the first year (any credits, including credits in non-degree applicable and basic skills courses). Most (76.5%) of those students did not even enroll in 20 credits during the first year, an issue that could be addressed through financial aid policy and practices to encourage more full-time attendance. Policies limiting course drops and repeats, along with more comprehensive academic support programs, could increase course completion and credit accumulation.

Figure 12:
Patterns Related to Early Completion of College-Level Math

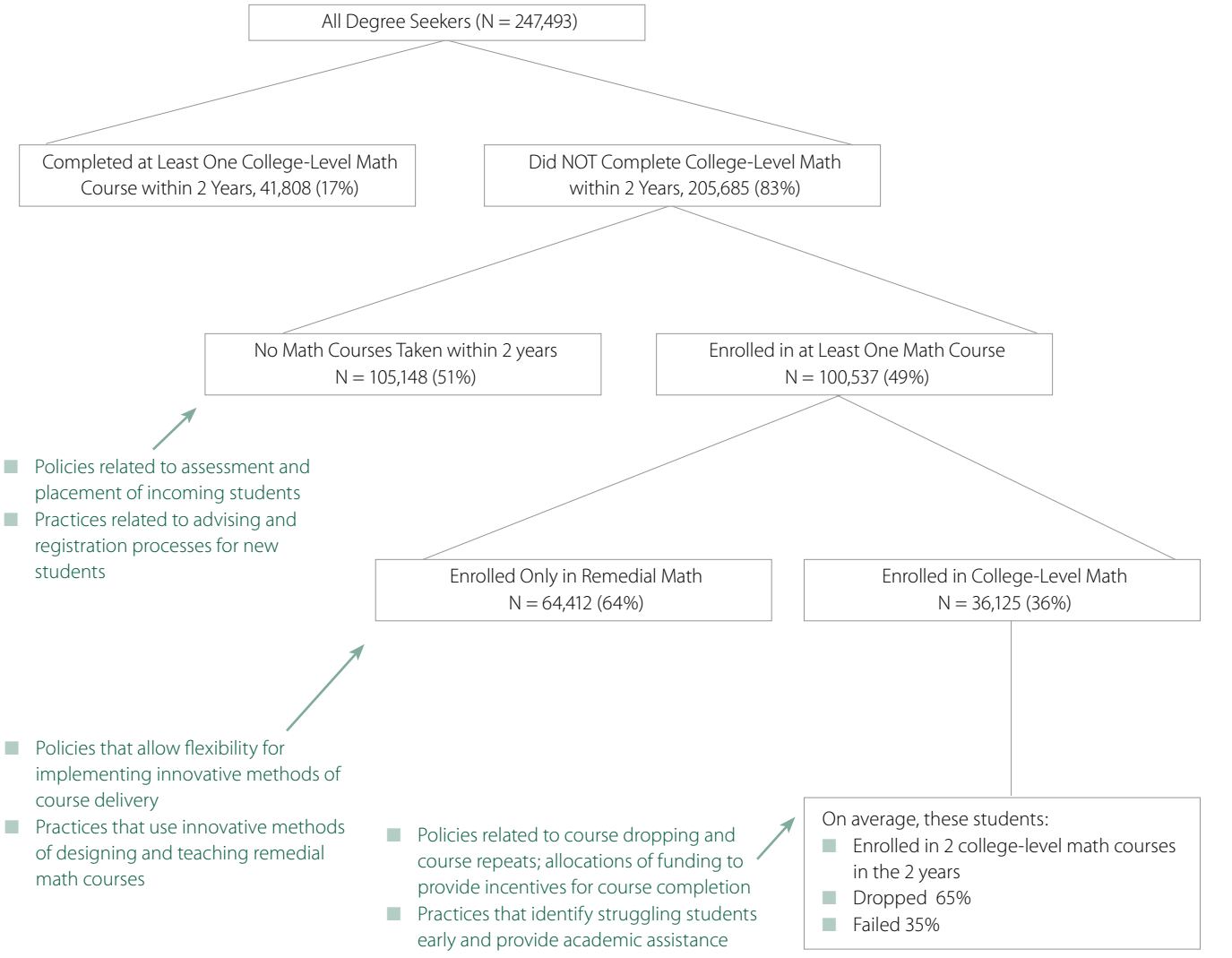
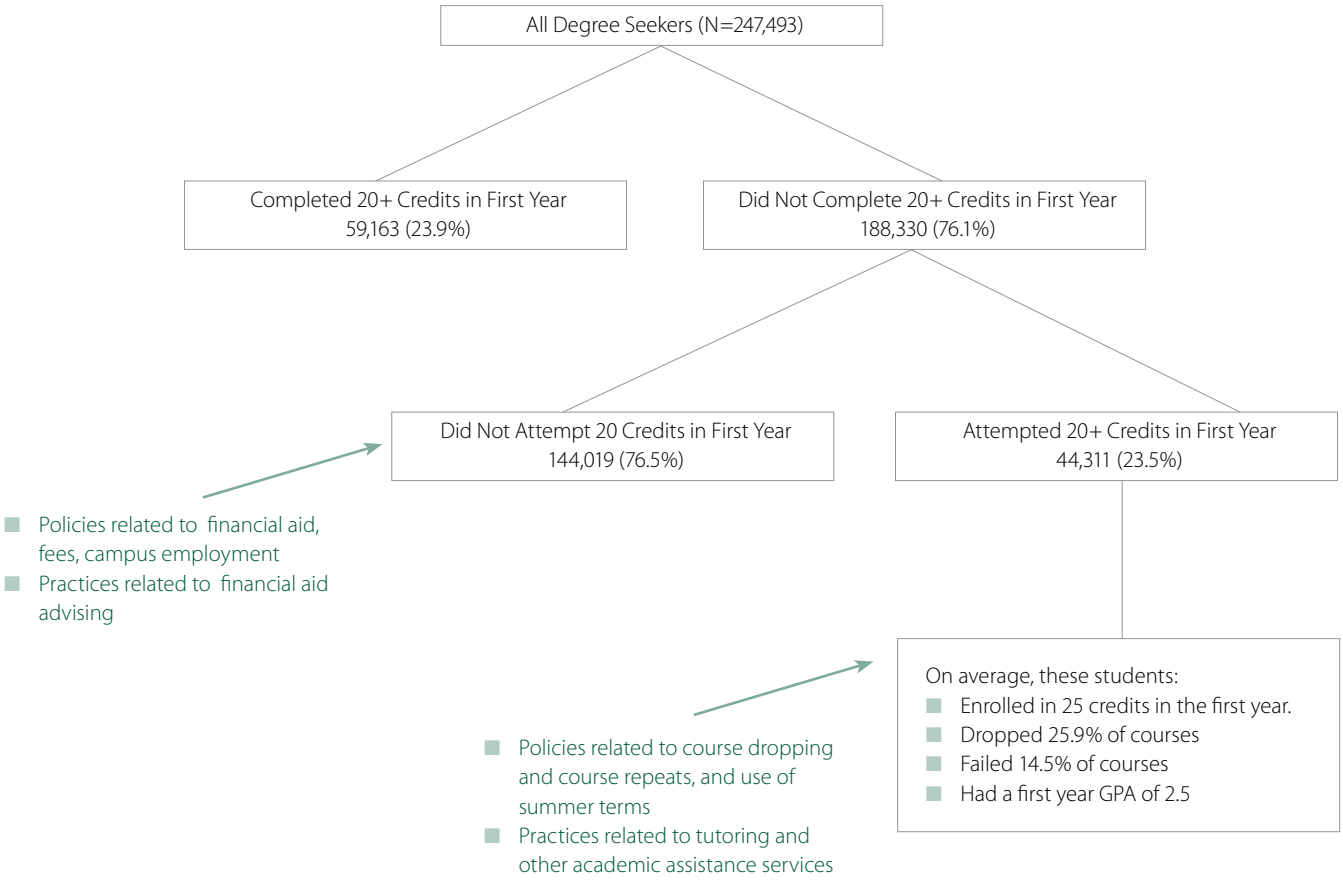


Figure 13:
Patterns Related to Early Credit Accumulation



Summary of Findings

The analyses described in this report point to several broad findings about the proposed framework and the two key components of milestones and indicators of success.

The Framework is a Useful Addition to Existing Analytical Approaches

Monitoring the intermediate outcomes of degree-seeking students in the CCC, and the degree to which they are following the academic patterns that correlate with success, is useful in two respects:

1. It offers policy makers and college leaders a means of diagnosing where and why students fall off the pathway to college completion, allowing them to target changes in policy and practice to improve student outcomes.

2. It provides a means of improving accountability for the CCC by including measures that demonstrate the progress students are making along the pathway to college completion, an important addition that would recognize the challenges of precisely identifying students' goals and of getting them through to completion given the many barriers faced by community college students.

Data Systems Should be Improved to Make Best Use of the Framework

In order to maximize the value of the framework, the CCC Chancellor's Office (CO), and individual colleges, need to collect additional data and improve the quality and use of data currently collected. In one sense, the CCC is ahead of many higher education systems – the CO collects course enrollment data for every student in every term, allowing for the creation of some of the measures we used in this report (e.g., completion of gateway courses within a particular period of time). Such term-by-term information on individual course enrollments adds a level of detail about students' patterns of enrollment that is very useful for diagnosing where students are falling off-track. However, the CO does not collect, or collects but does not report, some information that is important for monitoring and improving student success:

- No data are available at the CCC system level to identify students who need remediation of basic skills, so outcomes for such students cannot be monitored.

- The central data system does not identify the academic program a student is intending to complete, or the student support services they receive, making it impossible to evaluate the effectiveness of various programs and services at helping students succeed.

- The system does not collect information about students' level of academic preparation in high school, such as GPA or whether particular college-preparation courses were taken, that would be valuable in attributing student outcomes to the impact of enrollment patterns and experiences in college rather than to academic preparation.

- There is no code that allows for identifying college success courses or courses that are grouped into learning communities, making it difficult to evaluate their impact on student outcomes.

- The CCC accountability reporting system does not report on any measures of student progress or success for sub-populations of students (e.g., by race/ethnicity or age group).

Results Can Guide Policy Changes

The results of applying the framework can guide college, system, and state leaders in making changes to policy and practice to improve student outcomes in the CCC. Table 5 lists some examples of specific actions that could be considered in response to the findings that emerged from our analyses or, in the case of remediation, in response to problems that are widely recognized across the system.[21] Most of the changes suggested in the table would be within the purview of the CCC system or individual colleges, although several of the possible changes would require legislative action.

Table 5
Using Indicators of Success to Make Changes in Policies and Practices

Problem Identified	Possible Changes to Policy/Practice
Not all new degree-seeking students who need remediation enroll in basic skills courses and many who do enroll do not enroll in the first term[22]	■ Adopt system-wide definitions of college readiness, and standardized procedures for assessment and placement across the colleges ■ Ensure that all degree-seeking students are assessed for college readiness and directed to appropriate courses ■ Use results of the Early Assessment Program to give students the senior year to remedy identified deficiencies in college readiness ■ Require early enrollment and completion of basic skills course work
Low percentage of basic skills students complete needed remediation	■ Ensure that policies support innovative practices such as intensive summer orientation programs for new developmental students ■ Contextualize basic skills instruction into content courses ■ Implement learning communities for developmental students ■ Incorporate incentives for colleges to increase success in basic skills courses ■ Redesign developmental courses into modules so students only repeat needed sections ■ Provide brief brush-up courses for students who test near proficiency levels ■ Enroll students in college-level courses and provide supplementary instruction/summer sessions for nearly-proficient students
Gateway Courses:	
Low percentage of students completing college-level math in first two years	■ Better align curriculum and assessment with high schools to improve college readiness, and use the Early Assessment Program to send early signals about college readiness to high school students ■ Ensure early advising that focuses on the importance of taking math early in college career
Low percentage of students completing college success course	■ Ensure adequate course offerings and flexible scheduling ■ Improve advising for new students about advantages of such courses ■ Require degree-seeking, non-traditional students to enroll in a success course
Credit Accumulation:	
Low percentage of first-year degree-seeking students reaching a threshold of credit accumulation	■ Increase use of college success courses, early advising, etc. ■ Improve financial aid counseling to emphasize benefits of full-time enrollment ■ Consider lower per-credit fees for enrolling in a full-time credit load (state action required) ■ Encourage full-time attendance through provision of financial aid and other incentives (state action required) ■ Provide financial aid for enrollment in summer terms (state action required) ■ Offer on-line summer courses
Low credit completion ratio in first year	■ Use early alert systems and improved tutoring services to provide more academic assistance ■ Limit course drops and repeats or impose extra fee for course withdrawal past a certain date or for repeating a course (state action required to allow campus-based fees)
High percentage of course enrollments for which students registered late	■ Limit late registration or impose extra fee for registering late (state action required to allow campus-based fees) ■ Use college success courses to teach students about more effective enrollment patterns

Appendix

Table A-1
Milestone Achievement by Indicator Attainment

Success Indicators	Retention to 2nd term (74%)	Retention to 2nd year (58%)	Earned 12+ college-level Credits (62%)	Earned 30+ college-level Credits (42%)	Completed transfer curriculum (17%)	Earned certificate (3.3%)	Earned associate degree (8%)	Transferred (23%)	Any completion (29%)
College-Level Math									
Completed within 2 Years (21%)	92.8%	86.7%	95.9%	83.4%	50.4%	3.2%	20.6%	53.1%	61.1%
Did Not Complete within 2 Years (79%)	70.1%	52.2%	55.4%	33.3%	9.9%	3.4%	5.3%	16.9%	22.0%
College-Level English									
Completed within 2 Years 28%)	91.4%	84.0%	92.4%	76.1%	37.9%	3.5%	17.0%	43.7%	51.2%
Did Not Complete within 2 Years (72%)	68.2%	49.5%	52.3%	30.4%	9.7%	3.3%	4.9%	16.2%	21.2%
Success Course									
Completed (22%)	83.7%	72.6%	76.6%	58.6%	26.1%	3.4%	11.8%	26.9%	34.5%
Did Not Complete (78%)	71.2%	53.8%	58.1%	36.9%	14.0%	3.3%	6.8%	21.4%	26.8%
First-Year Credits									
Earn 20+ Credits (ANY) (24%)	99.3%	89.0%	97.7%	86.5%	44.2%	6.2%	20.6%	46.4%	57.9%
Did not earn 20 Credits (ANY) (76%)	66.0%	48.3%	51.1%	27.7%	8.1%	2.4%	3.9%	15.7%	19.4%
Summer Credits									
Completed Any (46%)	84.5%	75.4%	85.9%	67.6%	30.7%	4.9%	13.9%	36.5%	45.0%
Did Not Complete Any (54%)	64.9%	43.1%	41.9%	19.6%	4.7%	2.0%	2.8%	10.8%	14.5%
First-Year Credit Completion Ratio									
Completion Ratio 80%+ (62%)	80.5%	66.6%	73.8%	52.0%	21.9%	4.5%	10.9%	27.8%	38.7%
Completion Ratio < 80% (38%)	63.4%	44.1%	43.3%	25.1%	8.2%	1.5%	3.0%	15.2%	14.6%
Full-Time Attendance									
Full Time in First Term (41%)	81.6%	69.2%	78.3%	59.1%	27.3%	3.8%	12.3%	31.8%	38.9%
First Term Part Time (59%)	68.6%	50.3%	51.0%	29.7%	9.3%	3.0%	4.8%	16.9%	21.4%
On-Time Course Registration									
On Time for 80%+ of Courses (53%)	75.1%	60.3%	65.3%	46.3%	20.0%	3.8%	9.9%	26.1%	32.4%
On Time for < 80% of Courses (47%)	72.6%	55.4%	58.8%	36.6%	13.0%	2.8%	5.6%	19.6%	24.3%
Continuous Enrollment*									
Continuously Enrolled (40%)	100.0%	68.8%	68.2%	48.7%	23.3%	3.9%	12.1%	29.1%	36.0%
Not Continuously Enrolled (60%)	77.3%	67.5%	73.8%	49.1%	17.1%	3.7%	7.3%	22.9%	28.9%

* Excludes students enrolled for only one term.

Regression Results

We ran two logistic regression models for all degree seekers and for each of several subgroups. Each model included demographic variables, and the first model added first-year success indicators while the second model included indicators from the second year as well as indicators based on the students' full enrollment period. Dummy variables were used in all models to control for institutional effects. For simplicity, we have summarized the findings to use a "+" to indicate a statistically significant positive relationship and a "-" to indicate a statistically significant negative relationship with completion.

Table A-2
Regression Models on the Likelihood of Completing a Certificate/Degree/Transfer

	All Degree Seekers	Full-Time Traditional Age	Part-Time Traditional Age	Full-Time Older	Part-Time Older	White	Asian	Black	Latino
First Year Indicator Models									
Demographic and Attendance Characteristics									
Female	+	+	+	+	+	+	+	+	+
Age 25+	-					-	-	-	-
Asian	+	-	+	ns	ns				
Black	ns	ns	-	+	-				
Hispanic	-	-	-	-	-				
Other/Unknown Race/Ethnicity	ns	ns	ns	ns	ns				
Ever Received BOG Waiver	+	+	+	ns	+	+	+	ns	+
Success Indicators									
Full Time (based on first term)	+					+	+	+	+
Year 1 Credits Earned	+	+	+	+	+	+	+	+	+
First Year GPA	+	+	+	+	+	+	+	+	+
Complete Success Course	+	ns	+	+	+	+	ns	-	+
First Year Credit Completion Ratio	+	+	+	+	+	+	+	+	+
Completed College-Level Math in Year 1	+	+	+	+	+	+	+	+	+
Completed College-Level English in Year 1	+	+	+	+	+	+	+	+	+
Second Year and Beyond Indicator Models									
Demographic and Attendance Characteristics									
Female	+	+	+	+	ns	+	+	+	+
Age 25+	-					-	-	-	-
Asian	-	-	ns	ns	-				
Black	ns	ns	ns	-	+				
Hispanic	-	-	-	-	-				
Other/Unknown Race/Ethnicity	ns	ns	ns	ns	ns				
Ever Received BOG Waiver	+	ns	+	-	+	ns	+	-	ns
Success Indicators									
Full Time (based on first term)	+					+	+	+	+
Year 2 Credits Earned	+	+	+	+	+	+	+	+	+
Second Year GPA	+	+	+	+	+	+	+	+	+
Complete Success Course	+	+	+	+	+	+	+	+	+
Percent of Courses Registered Late	-	-	-	-	-	-	-	-	-
Summer Credits (yes/no)	+	+	+	+	+	+	+	+	+
Continuous Enrollment	+	+	+	ns	ns	+	ns	+	+

\+ indicates a statistically significant (.05 level or better) positive correlation between the indicator and the likelihood of completion
\- indicates a statistically significant (.05 level or better) negative correlation between the indicator and the likelihood of completion
ns indicates no statistically significant relationship | Shaded cells are not applicable to the student group

Endnotes

[1] When we refer to "degree completion" in this report, we include completion of postsecondary certificates as well as associate and bachelor's degrees.

[2] For a review of the research literature on factors related to student success and graduation, see Moore, C. & Shulock, N. (2009). *Student progress toward degree completion: Lessons from the research literature.* Sacramento, CA: Institute for Higher Education Leadership & Policy.

[3] See, for example: Leinbach, D.T. & Jenkins, D. (2008). *Using longitudinal data to increase community college student success: A guide to measuring milestone and momentum point attainment.* New York: Community College Research Center; Achieving the Dream Cross-State Data Workgroup (2008). *Test drive: Six states pilot better ways to measure and compare community college performance.* Boston, MA: Jobs for the Future.

[4] U.S. Department of Education, *Digest of Education Statistics 2008* (Table 215).

[5] Johnson, H. & Sengupta, R. (2009). *Closing the gap: Meeting California's need for college graduates.* San Francisco: Public Policy Institute of California; Reed, D. (2008). *California's future workforce: Will there be enough college graduates?* San Francisco: Public Policy Institute of California

[6] Horn, L. & Lew, S. (2007). *California community college transfer rates: Who is counted makes a difference.* Berkeley, CA: MPR Associates, Inc.

[7] We recognize that transferring to a university is not really "completion" given that the goal of transfer students is a bachelor's degree, and many students do not complete an associate degree before transferring (81% of transfers in the CCC cohort did not earn an associate's degree). However, transfer is commonly used as a completion measure for community colleges. We were not able to track student outcomes after transfer, but we recognize that the majority of students who transfer to universities do ultimately earn a baccalaureate.

[8] For example, see Marcotte, D.E. (2006). *The earnings effect of education at community colleges*. Baltimore, MD: University of Maryland.

[9] Although this report combines all persons of Asian or Pacific Islander descent into one category, we recognize that there may be substantial differences across Asian sub-populations in measures related to college success that are masked by using one category. CCC collects data for 13 categories of Asian/Pacific populations but it is not feasible or practical to analyze all 13 categories separately, in part because the validity of findings would be compromised by small group sizes. Perhaps when more research has been conducted to help determine meaningful subgroupings among those 13 categories, it will be possible to refine the analysis of the Asian/Pacific Islander population.

[10] Adelman, C. *Proposed amendment for the Student-Right-to-Know and Campus Security Act of 1990 (P.L. 101-542) to produce a full and honest account of college completion rates*. Obtained through personal communication on June 2, 2008.

[11] Also, the CCC does not have a code to identify success courses, so we relied on a combination of Taxonomy of Programs (TOP) code and course title. We could have misclassified some courses, affecting the results. Better data are needed to accurately identify these courses.

[12] We counted a student as completing summer credits if they earned any number of credits during any summer term over the tracking period.

[13] Adelman, C. (2006). *The toolbox revisited: Paths to degree completion from high school through college.* Washington, DC: National Center for Education Statistics.

[14] There are a number of other possible measures that could be used related to course completion, including the percent of courses dropped, the percent of courses failed, or the percent of courses that were "successfully" completed (i.e., completed with a grade of C or better). Also, different levels of credit completion could be selected as the cut-off point for a success indicator, other than the 80% we use here. We tried several other measures and several other threshold levels, and found similar relationships to the probability of completion.

[15] This only approximates, and likely overestimates, the share of students who actually complete a full transfer curriculum. It does not account for whether they have completed specific course requirements across the various categories of general education, or whether they have completed the lower-division major prerequisites that would make them eligible for enrollment in a specific university program. It is not feasible to create a measure of the exact number of students who are actually eligible for transfer, given the wide variation in curriculum across the community colleges and the variation in requirements for transfer into specific majors across all the campuses of the UC and CSU.

[16] Completing an associate degree is generally considered a milestone on the path to transfer, representing completion of the first two years of a bachelor's degree (at least for "academic" associate degrees rather than those in vocational or technical fields). That is not the case in California because the requirements for an associate degree do not match the requirements for transfer, even in the more "academic" subjects. Associate degrees are considered terminal degrees in California, and while there is some overlap in coursework, the degrees are not intended as transfer preparation or designed to meet transfer requirements.

[17] In fall 2002, which would have been year 3 of the studied cohort (the most common year for transfer), only 5.5% of transfers from CCC to UC, and 15.1% of transfers to CSU, were freshmen or sophomores (based on CPEC custom data reports, Enrollments – Fall Term Transfers to Public Institutions for 2002). The share of transfers at the lower-division level has declined since then, to 3.4% of transfers to UC and 5.8% of transfers to CSU in fall 2008.

[18] For more information, see Moore, C., Shulock, N., & Jensen, C. (2009). *Crafting a student-centered transfer process in California: Lessons from other states.* Sacramento, CA: Institute for Higher Education Leadership & Policy.

[19] Wellman, J. (2002). *State policy and community college – baccalaureate transfer.* Washington, DC: Institute for Higher Education Policy; McCormick, A. & Carroll, C.D. (1997). *Transfer behavior among beginning postsecondary students: 1989-1994.* Washington, DC: National Center for Education Statistics; Grubb, W.N. (1991). The decline of community college transfer rates. *Journal of Higher Education 62*(2), 194-222.

[20] Students who become "transfer prepared" (complete 60+ transferable units) or "transfer directed" (complete transfer-level English and math, regardless of total units completed) are currently included in the Student Progress and Achievement Rate (SPAR) in the system's annual accountability report, which also includes the completion of certificates and degrees and actual transfer to a university. Transfer outcomes are also reported separately, but completion of a transfer curriculum is not reported.

[21] Moore, C. & Shulock, N. (2007). *Beyond the open door: Increasing student success in the California community colleges*. Sacramento, CA: Institute

for Higher Education Leadership & Policy; Center for Student Success (2007). *Basic skills as a foundation for student success in California community colleges*. Sacramento, CA: Research and Planning Group for California Community Colleges; Academic Senate for California Community Colleges (2004). *Issues in basic skills assessment and placement in the California community colleges*. Sacramento, CA: Author

[22] About one-third of students who enrolled in a basic skills course at some point did not do so in the first term.

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