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Stackable Credentials in Career Education at California Community Colleges



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Technical appendices to this report are available on the PPIC website.

Career education programs designed to provide students with industry-related training continue to be a focus for state and federal efforts to improve employment outcomes and promote economic mobility. California’s community college system is the state’s primary provider of postsecondary career education and plays a critical role in meeting state workforce needs.

Community colleges serve a wide range of students pursuing career education: recent high school graduates, stranded workers, workers in need of retraining, and more. Connecting these students to career pathways that offer opportunities for advancement is an important policy goal that can be furthered by stackable credentials. Stackable credential pathways consist of multiple, sequential awards that either allow students to earn successively higher-level credentials (“progressive” programs) or build a “lattice” of interconnected credentials. However, little is known about how many career education programs include stackable credentials or how many students successfully stack credentials. In this report, we aim to quantify both.

We focus on students in five of the largest career education disciplines offered in the community college system who obtain a short-term certificate (requiring 6–29 units) as their first community college award, examining their odds of stacking additional credentials (certificates or associate degrees). We also identify features of stackable credential sequences across colleges and estimate whether programs with more well-defined stackable designs facilitate stacking. Key findings include:

- Nearly 200,000 students earned a short-term certificate as their first community college credential between school years 2000–01 and 2013–14. Nearly half of these students are age 30 or older, and the vast majority (80%) started with a high school education or less.
- About one in four short-term certificate earners go on to obtain another credential within three years—even though a majority return and complete additional coursework. Few end up transferring to four-year colleges.
- Career education programs vary widely across colleges when it comes to stackable credentials, even within the same discipline. Only about 15 percent of existing programs make explicit connections between credentials. Many others offer multiple, related credentials but have not clearly defined their pathways. Still others offer no clear pathways.
- After controlling for multiple program-, student-, and college-related factors, we find that students in career education programs with well-defined stackable credentials are 5 percentage points more likely to stack

credentials compared to those in all other programs, and 16 percentage points more likely compared to students in programs with no defined stackable sequence.

- We also find some evidence that well-defined stackable credential pathways improve the likelihood of Latino students stacking credentials—this suggests that explicit pathways could help narrow achievement gaps and high poverty rates among working Latino adults.

As the community college system strives to rebrand and strengthen its career education programs, it is essential to understand how these programs can be structured to promote career pathways and connect students to the career opportunities they seek. Well-designed stackable credential pathways can also help the state train workers for the middle-skills jobs essential to a robust economy.

Introduction

Two-year colleges are key providers of postsecondary career education (also referred to as vocational education and career technical education or CTE), particularly for students who do not pursue a four-year college degree. California’s community college system is the primary provider of career education in the state; across 114 colleges statewide, nearly 50,000 career education credentials have been awarded annually in recent years.

The state has made several investments to support and expand career education programs in the community colleges. The Career Pathways Trust and CTE incentive grants have provided more than \$1 billion in funding for career education programs since 2014. The Strong Workforce program allocates \$200 million in annual funding for the advancement of career education programs across the California Community College system. Given this funding, as well as the importance of career education in meeting the state’s workforce needs, it is critical to evaluate how community college programs can best support career pathways and promote student success.

Career pathways have a wide range of features intended to enable individuals to develop industry-related skills and achieve their career goals (CLASP 2014). Stackable credentials, which lay out a sequence of career education awards that allow students to build qualifications over time, are an important component of successful pathway programs. Many career education credentials in the community college system are designed to be earned relatively quickly—in particular, short-term certificates require as few as 6 units. Stackable short-term credentials offer students the clearest opportunities to return to the community college system for additional training and advance along a career pathway.

Stackable credentials also figure into current initiatives in the community college system that focus on helping students connect their educational plans to careers. In particular, stackable credentials could be an important component of the guided pathways framework being developed and implemented systemwide to “create clear curricular pathways to employment and further education” (Mortrude 2018; Van Noy et al. 2016). In addition, the online community college that is currently under development will initially offer short-term certificates that connect students to jobs but also put them on a path of educational opportunities to improve their career trajectories.

Finally, stackable credentials can provide benefits in terms of economic mobility. While the community college system offers a number of career education credentials that confer sizable labor market returns, many students who enter career education programs earn certificates that confer lower economic returns or fail to obtain any credential at all (Bohn, McConville, and Gibson 2016a; Minaya and Scott-Clayton 2017; Bahr 2016; Stevens et al. 2015).¹ One way to improve labor market outcomes among students who obtain less-valuable career education certificates is to design stackable credential programs that move them up a career ladder to higher-paying jobs within an industry.

While there is strong interest in the potential of stackable credentials, there is little empirical evidence about career education programs that promote them or about how the structure of programs influence student outcomes. In prior work, we analyzed stackable credentials in health programs at California’s community colleges (Bohn, McConville, and Gibson 2016b). The results were promising: over the long term, students who stacked progressively more intensive health credentials saw similar wage returns as those who initially obtained a single, high-value associate degree.

¹ Only 54 percent of students who start career education programs earn credentials within six years, and many earn certificates with lower labor market values (38% short-term, 15% long-term). Completion rates for students pursuing career education credentials are taken from the California Community Colleges Chancellor’s office (CCCCO) Student Success Scorecard, starting with the 2010–11 cohort (data accessed 10/24/17). The share of career education credentials that are short-term and long-term are based on awards conferred in the six largest career education disciplines averaged across school years 2014–16, according to the CCCC Datamart (accessed 10/24/17).

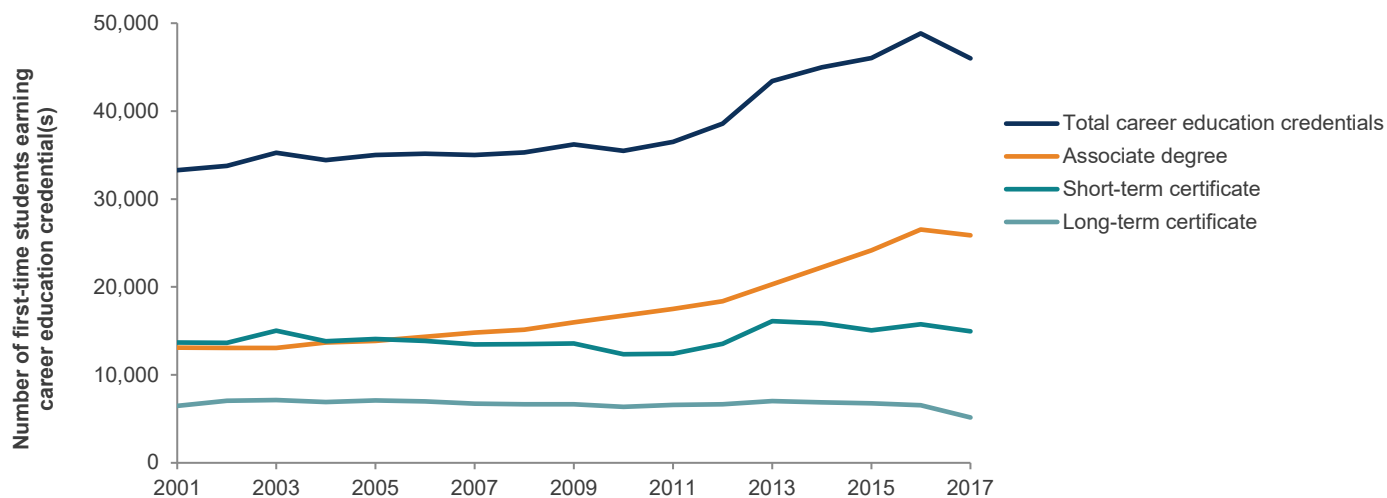
In this report, we broaden our scope to assess stackable credentials across several career education disciplines and examine how pathway design features affect student success. First, we provide an overview of students who have earned career education credentials over the past 15 years, with a focus on those who initially earn a short-term certificate. We then identify two major types of stackable credential pathways—the “progressive/ladder” and the “lattice”—and trace their design features across different programs and colleges. Finally, we draw on student-level data to examine which groups of students actually obtain multiple, related credentials along a career pathway.

Career Education Students in California’s Community Colleges

Career education programs at California’s community colleges serve a wide range of students, from older workers in need of retraining to recent high school graduates seeking career-focused postsecondary education. Over the past decade, about 300,000 students have enrolled in career education courses across the state’s 114 community colleges each year.² While enrollment has held steady, the number of students who start their college career by earning career education credentials has increased from about 35,000 in school year 2000–01 to nearly 50,000 in 2016–17 (Figure 1).³

FIGURE 1

More first-time students are earning career education certificates and associate degrees



SOURCE: California Community College Chancellor’s Office Management Information System.

NOTES: Only career education credentials are shown. Identification of career education awards is based on a designation of vocational education in the California Community Colleges Taxonomy of Programs, 6th Edition. Students are assigned and counted only in the year they earned their first community college credential and are restricted to those age 18 to 54 at the time they complete their first award. We define short-term certificates as those that take less than one year to complete and require between 6 and 29 units; long-term certificates take more than one year, but less than two years and require between 30 and 59 units to complete. Associate degrees are two-year programs that typically require at least 60 units or more to complete. In cases where a student earns more than one career education credential in the same academic year, we use the level of the highest award completed.

² Based on annual full-time equivalent (FTE) student enrollment counts for vocational education accessed from Datamart. Counts of career education students based on Perkins data are higher than these full-time equivalent student counts produced by the Chancellor’s office.

³ Students are counted in the year we observe them completing their first career education credential in the community college system. We excluded 111,105 credentials including career education and non-career education credentials because they did not have a unique student identifier (scrambled SSN) that could be linked across colleges throughout the system. See [Technical Appendix A](#) for more information on the sample construction.

Much of this growth has been driven by associate degrees—meaning that the first award we observe a student earning is an associate degree.⁴ This is a positive development, given that associate degrees tend to confer larger wage returns than certificates.

There has also been an increase of about 10 percent in students who initially earn short-term career education certificates over the past five years. In all, nearly 40 percent of the more than 650,000 students who completed a career education program over this time period earned a short-term credential as their first community college award.⁵ Stackable credential pathways also often start with a short-term credential, so it is critically important to understand the trajectories of students who start there.

For-profit colleges and career education

Student enrollment and the number of certificates awarded by for-profit, two-year colleges in California reached a peak in the 2010–11 school year but have since declined by nearly 50 percent. State scrutiny and federal regulations related to the cost of for-profit programs relative to the employment opportunities they confer is responsible for much of this decline. Lawsuits filed by the state attorney general over aggressive and misleading tactics led to the closure of a large chain of for-profit colleges in California.

Even with reduced marketing in the for-profit space, student demand for career education—and short-term certificates—remains strong. As private for-profit enrollment has fallen, career education in the community college system has grown. Offering lower-cost programs for students who pursue short-term certificates is a motivation for California’s community colleges to offer these awards.

While short-term certificates can serve as a tool to connect students quickly to job opportunities, there are concerns that they sidetrack students—particularly those from disadvantaged backgrounds—from completing longer-term credentials that offer better economic returns and/or opportunities to transfer to four-year colleges (Giani and Fox 2016). The evidence on returns to career education indicates that short-term certificates often confer lower employment and earnings levels than other credentials (Bohn et al. 2016; Stevens et al. 2016; Dadgar and Trimble 2014; Jepsen et al., 2014).⁶ That said, it is important to recognize that short-term certificates may be more attractive and accessible to older students with families and jobs who find it difficult to commit to longer career education programs. Short-term credentials can also help individuals move into a different industry sector that offers pathways to better-paying jobs over time and/or with additional training (Austin et al. 2012; Bohn et al. 2016).

Our previous work illustrated the potential of these kinds of career pathways in health care. Students who initially completed a short-term certificate and returned to earn a higher-level health credential saw increased earnings that

⁴ Some of the observed growth in Associate degrees is the result of a state policy effort—the Nurse Education Initiative—which launched in 2005 and increased the number of students enrolled in nursing programs by 75 percent and created 35 new nursing programs throughout the system.

⁵ The share of career education students initially earning a short-term certificate varies across areas of study. In certain career education disciplines including family/consumer sciences and public/protective services—the shares of students who initially obtain a short-term credential are larger: 56 percent and 47 percent, respectively. This is in contrast to other large career education disciplines, including business and health, where only about 30 percent of students initially receive short-term credentials and more than 60 percent initially earn an associate degree.

⁶ Exceptions include short-term certificates in public/protective services, which do confer wage gains.

eventually “caught them up” with students who initially obtained a high-value health credential. Most of these pathways, however, led in a single direction: to registered nursing, one of the highest-value credentials within the community college system. With large numbers of students initially earning short-term credentials across a wide range of programs and disciplines, we need to know how they can benefit from stackable credential programs.

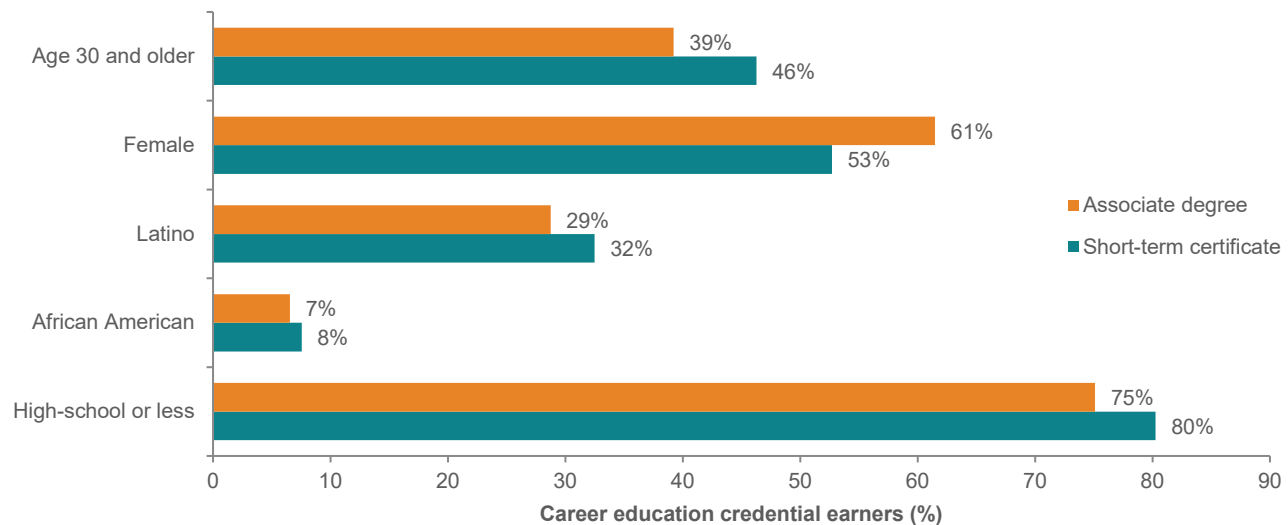
Who Earns Short-Term Credentials?

To better understand the students who start their college career with short-term certificates, we can compare those who earn a short-term certificate as their first award to those who earn an associate degree. Short-term certificate earners are older; nearly half (46%) are age 30 or over when they complete their first career education credential, compared to 39 percent of students who earn associate degrees. Slightly more than half (53%) of short-term credential earners are female, while 61 percent of those who earn an associate degree are women.

Overall, more than four in ten short-term certificate earners are white. The share of Latino students (32%) who earn short-term certificates as their first award is slightly larger than the share who initially earn associate degrees (29%). Fewer than one in ten students who earn career education credentials of any type are African American. Eight in ten short-term certificate earners enter a career education program with a high school degree or less, compared to three out of four of those who earn an associate degree.

FIGURE 2

Short-term certificate earners tend to be older, male, and have no more than a high school education



SOURCE: California Community College Chancellor’s Office Management Information System.

NOTES: Based on sample of 194,931 students initially earning short-term certificates and 222,241 students earning an associate degree. Restricted to students who were age 18 to 54 and earned their first career education credential between 2001 and 2014. Age indicates the age of the student in the term they earn their first career education credential. Education level is measured in the term prior to the student earning their first career education credential in the community college system. See the [Technical Appendix A](#) for more comparisons of student characteristics across different levels of credentials.

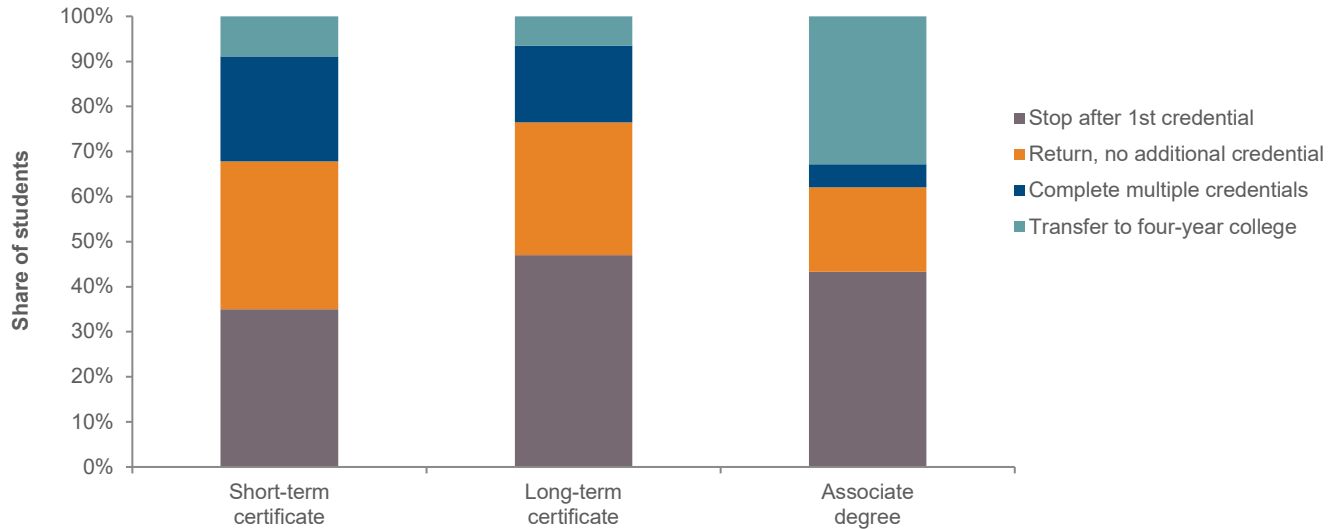
Short-term certificate earners are more likely to earn additional credentials

Examining the three-year trajectories of students after they earn their first career education credential, we find that students who initially obtain a short-term certificate are more likely to return and earn another credential. Nearly one in four (23%) short-term certificate earners go on to earn another credential in the community college system—a share that is considerably larger than that of students who initially earn long-term certificates (17%) or

associate degrees (5%) (Figure 3).⁷ Another one-third of short-term certificate holders return and take additional courses but do not obtain another credential within three years—indicating that only about 40 percent of short-term certificate earners who return to the community college system earn another award.

Almost 10 percent of short-term certificate earners transfer to a four-year college within three years of obtaining a career education credential, a share that is slightly larger than the share of students who earn a long-term certificate but much smaller than the share of associate degree holders who transfer to a four-year institution (33%).

FIGURE 3
Students who earn short-term certificates are more likely to obtain multiple credentials



SOURCE: California Community College Chancellor’s Office Management Information System.

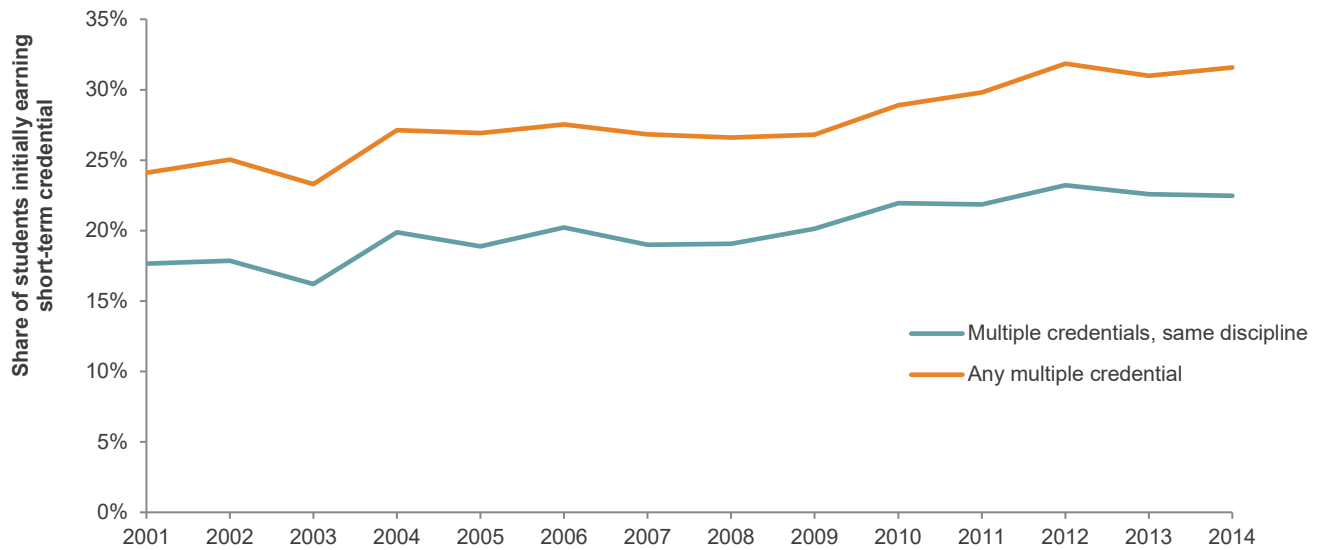
NOTES: Outcome categories are based on a three year window after a student obtains an initial career education credential. Categories are mutually exclusive and hierarchical: transfer is the highest outcome, followed by multiple credentials and returning to complete additional units. Multiple credentials are defined as all other awards, including those that are not in career education.

Clearly, even among students who initially earn a short-term certificate, obtaining multiple credentials is not the norm—despite the fact that many of these students return to the community college system and complete additional coursework. And the growth in the number of students earning multiple credentials has been relatively modest. The share of short-term credential earners obtaining another credential in the same area of study has increased by about 5 percentage points over the past two decades (from 18% to 23%), while the share earning another credential in any field increased by 8 percentage points (from 24% to 32%). (Figure 4).

⁷ A three-year window is common in measures of completion—but the conclusions here are similar if we allow a six-year window instead. We do not count concurrent awards—or awards conferred on the same date—as multiple credentials.

FIGURE 4

There has been little growth in the share of short-term credential earners who complete multiple credentials



SOURCE: California Community College Chancellor’s Office Management Information System.

NOTE: Figure shows the share of students who initially earn a short-term career education credential in a given year and go on to complete another community college credential within three years of the first. Students who earn another degree in the same career education discipline received a subsequent credential in the same two-digit TOP code as their first degree. Students included in the ‘Any multiple credential’ could earn a subsequent credential in another career education discipline or a non-career education field.

Earning multiple awards, moreover, does not necessarily mean that students are stacking credentials along a career pathway. In order for students to realize potential gains, additional credentials need to add or expand competencies in ways that employers find valuable (Bailey and Belfield 2017b). This is the goal of most career education programs, but, as we have seen, few students appear to be earning multiple credentials in the same field of study. To better understand how stackable credentials can improve student success, we need to examine programs in more detail and identify the most effective design features of stackable sequences.

Designing Stackable Credential Programs

Toolkits and other technical resources have been developed in recent years to help state and local education and workforce agencies create career education programs. Design elements identified as important components of successful career pathway models include clear, non-duplicative course sequences, modularization of curricula, and distinct mapping of credentials (US Department of Labor 2012; Kazis, 2016). Other resources describe occupation and industry-specific educational maps, provide examples from community college systems across the country, and discuss challenges and barriers to development and implementation (Austin et al. 2012; Ganzglass 2014; Audant 2016). There are a few empirical investigations that provide insights on different types of stackable credentials, program designs, and employment outcomes (Bailey and Belfield 2017a, 2017b; Giani and Fox, 2016).

Our focus is on two types of stackable credential pathways: progressive (or ladder) and lattice (or launchpad). The endpoint studied here is an associate degree. This is in part necessitated by data constraints—we cannot link student-level data across two- and four-year higher education institutions to understand how programs might lead

to transfer. But it is also because we are most interested in understanding how, or if, stackable credentials can meaningfully improve the outcomes of individuals who never go on to pursue a four-year degree.

While available resources can help us conceptualize stackable credential programs, we also need to link their features to student outcomes. Because we want to investigate how program designs might affect a student's ability to stack credentials, we have developed a systematic and consistent way of identifying stackable credential programs across different career education disciplines and colleges. We assembled a database of characteristics that includes information on more than 550 career education programs across more than 64 community colleges.⁸ We focused on five of the largest career education disciplines: business, information technology, engineering, family and consumer sciences, and public and protective services. We did not include health because we examined stackable health credentials in a previous report.

Building our career education program database

We compiled a database of credentials offered in programs across five large career education disciplines and colleges by conducting a detailed scan of community college websites and course catalogs (for the 2016–17 academic year). We aimed to cover about half of all credentials awarded in each of our five focal career education disciplines and to capture variation in programs across the state. This resulted in our scanning between 23 and 32 colleges in each discipline.

First, we identified programs, which are typically like departments (e.g. early childhood education, automotive technology, etc.) and offer related coursework and credentials. These programs are well defined in course catalogs but not easily tracked in system-wide data.

We then created a series of flags indicating whether a given program had features that are consistent with progressive and/or lattice pathways. We were looking for an alignment of course requirements across credentials within each career education program. We developed a set of three criteria for each type.

Progressive pathway criteria:

- Short-term certificates can be upgraded to higher-level credentials with additional coursework in the same field
- There are credential sequences that include only certificates
- Levels or stages are explicitly identified (i.e. intermediate, advanced)

Lattice pathway criteria:

- Three or more credentials share a group of core courses
- The core group of courses is explicitly identified and tied to multiple credentials
- Completion of the “launchpad” course(s) alone results in a certificate

For more information on how we assembled information on programs and stackable credentials, refer to [Technical Appendix A](#).

⁸ The count of 550 career education programs comes from a unique identifier that is specific to every college (so that all programs at a different college count separately) and can combine multiple specific fields (6-digit TOP codes) within a discipline as necessary to connect related credentials.

Progressive Pathways

The progressive pathway—the most common model—features a sequence of courses that lead to higher-level awards. Each credential signifies another step (or rung) up a career “ladder.” One example of progressive pathways in the community college system is in IT programs (Figure 5). Students can earn a series of certificates in management information systems that signal higher levels of proficiency with various software applications. An application specialist certificate requires only 11 units, or one semester of coursework; to obtain an application expert credential, a student needs to complete a few additional courses, and once a student completes 40 units, s/he earns a long-term application master certificate.

FIGURE 5

The management information systems (MIS) sequence in information technology is a progressive pathway



SOURCE: Adapted from the 2016 Consumnes Rivers Community College course catalog.

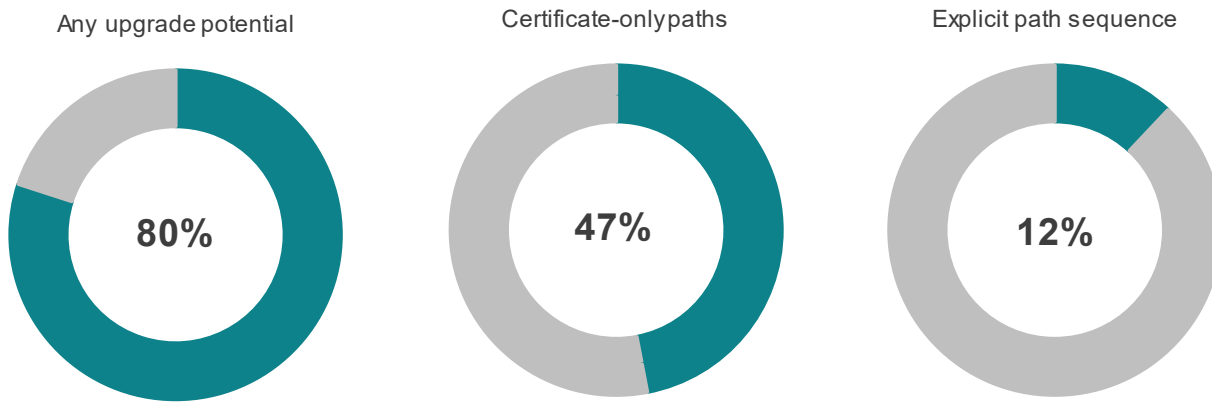
This progressive pathway allows students who earn only a short-term credential to enter the labor market with the option to return to school and build on their initial awards. It also features credentials linked to industry certifications available in the IT sector that can be built into a program. Similar strategies are used across other disciplines. For example, in family and consumer sciences, programs are designed to meet state licensing requirements for early childcare education professionals. It should also be noted that a program could be considered progressive even if the next credential along the path requires significantly more credits; one such example is the progression from a licensed vocational nursing certificate to an associate degree in nursing.

Across the five career education disciplines we examined, most programs (80%) displayed characteristics broadly associated with a progressive program structure, meaning that there are opportunities to upgrade either to higher-level certificates or to associate degrees with the completion of additional coursework. Many programs with broadly progressive features offer certificates that can be upgraded to an associate degree upon completion of general education requirements—a less obviously progressive structure in terms of building career-specific skills.

We find that roughly half (47%) of career education programs offer progressive pathways toward higher-level certificates. However, only 12 percent of programs make the option to upgrade credentials explicit with a well-defined sequence of credentials and coursework or by making linkages obvious with credential names such as intermediate and advanced.

FIGURE 6

Prevalence of progressive features in career education programs



SOURCE: Author’s pathway database assembled from college catalog and website scans.

NOTE: Only includes colleges and programs in our database. See [Technical Appendix A](#) for more details.

The prevalence of progressive features differs across disciplines. Business programs and family/consumer science programs more often have explicit progressive sequences that connect multiple credentials than programs in public and protective services and engineering. Information technology programs in our scan have relatively few explicit progressive features, but stackable credential pathways in IT have recently been developed.⁹

Lattice Pathways

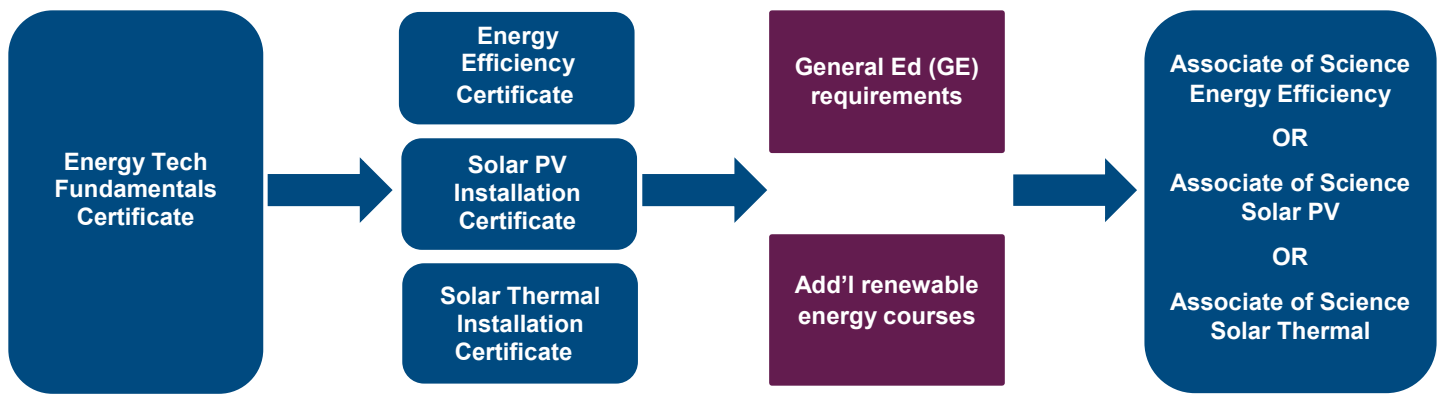
The lattice pathway starts with a set of core courses intended to serve as a launchpad to other credentials or to entry-level employment that could lead to specialization within the industry. Lattice pathways are characterized by both vertical and horizontal components (Ganzglass 2014; [O*NET Resource Center](#))—additional credentials or jobs along the sequence may be at the same level or a higher level. This design closely resembles the structure of guided pathways (Bailey, Jaggars, and Jenkins 2015), which offer broad overview courses that build skills in a field of study that can be further developed in a number of related, but distinct, subfields.

Los Angeles Trade Tech community college provides a good example of a lattice pathway with a well-defined launchpad leading to multiple credentials (Figure 7). The first short-term certificate is for energy technology fundamentals; students can then move into energy efficiency or solar installation certificates, which can, in turn, be upgraded to associate degrees.

⁹ The information and communications technology sector in the Chancellor’s office workforce development section has developed two “branded pathways”—one for business information workers and the other an IT Technician pathway—that provide a roadmap for colleges to implement stackable credential pathways for these areas including coursework mapping and alignment with industry certifications.

FIGURE 7

Los Angeles Trade Tech’s renewable energy course sequence is a lattice pathway



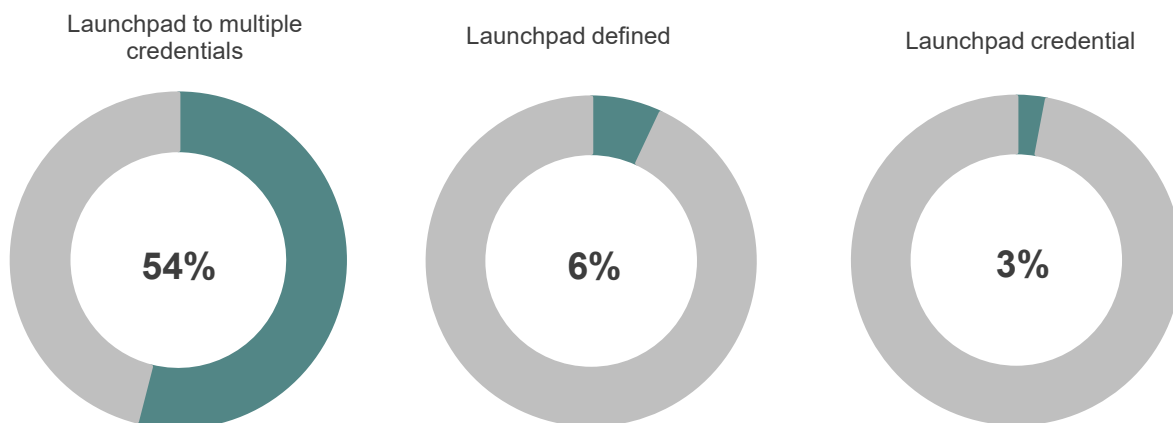
SOURCE: Adapted from the 2014–2016 course catalog for Los Angeles Trade Tech Community College.

In this example, a student who completes the launchpad coursework receives a certificate in energy technology fundamentals, but that does not have to be the case. (In fact, very few of the programs we examined had a launchpad that conferred a credential.) Whether or not it awards a credential, the launchpad prepares a student for additional subfields that do confer certificates. A student might obtain multiple credentials that stack both laterally and progressively.

Our scan of programs revealed that even though more than half (54%) of career education programs had at least three credentials with overlapping coursework, only 6 percent explicitly called out a set of core courses. Business programs and, to a lesser degree, public and protective services had relatively high shares of core courses leading to multiple credentials. But across all disciplines, there are very few well-defined lattice pathways.

FIGURE 8

Prevalence of lattice pathway features



SOURCE: Author’s pathway database assembled from college catalog and website scans.

NOTE: Only includes colleges and programs in our database. See [Technical Appendix A](#) for more details.

Having identified the program design features across career education disciplines, we now turn to an examination of how design characteristics are associated with student’s completing stackable credentials and whether the impact differs across groups of students.

Program Features That Foster Student Success

To examine the relationship between stackable program characteristics and student completion, we linked our database with administrative data from the California Community College Chancellor’s Office. The Chancellor’s Office Management Information System (COMIS) tracks individual student enrollment, award completion, and socioeconomic characteristics, as well as data about courses offered at all 114 college campuses. For this part of our analysis, we focus on students whose first credential in the system was a short-term career education certificate completed between school years 2009–10 and 2013–14, and we track their subsequent enrollment and credentials earned through school year 2016–17.¹⁰ We examined only the students who earned credentials in the colleges and programs included in our program database. We also limited our analysis to students who were between the ages of 18 to 54 when they obtained their first certificate and did not transfer to a four-year college within three years.¹¹

As discussed, career education students have varying backgrounds and probably have a range of motivations for enrolling in courses and earning credentials. To account for this variation, we use statistical models that control for program of study and for demographic characteristics such as age, gender, race/ethnicity, immigration status and English proficiency, disability, prior educational achievement, average GPA, use of Pell grants for financial aid, enrollment in developmental courses, and economic disadvantage (e.g., CalWORKs enrollment). Figure 9 shows differences in the share of students who stack credentials across key demographic and program characteristics (see [Technical Appendix B](#) for more details). Unless otherwise noted, the baseline likelihood of stacking is linked to the average or most common characteristics across the sample: female, age 30, white, high school graduate, US citizen, with a 2.0 GPA, academically disadvantaged, and first award in family/consumer sciences.

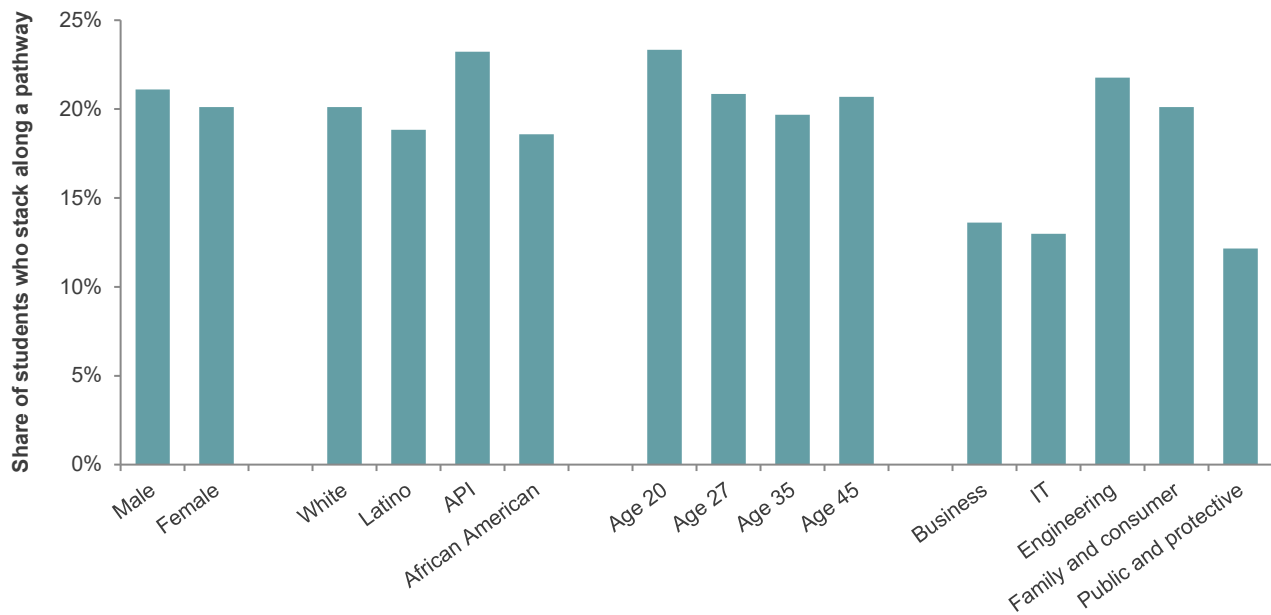
We find no striking differences in stacking by gender; about one in five of both men and women whose first credential is a short-term certificate goes on to stack a credential within three years. But differences emerge across other demographic characteristics. Latino and African American students are slightly less likely to stack credentials than are white students, and all three groups are less likely to do so than Asian students (though the difference is rather small—only 3 to 4 percentage points). Younger students are more likely to stack, while students around age 35 are least likely to stack. Those with a high school education (no more, no less) are more likely to stack than those with any other prior educational level, including students with associate or bachelor’s degrees. Those differences are on the order of 2 to 4 percentage points.

¹⁰ We also test students who earned credentials earlier than 2010, but because our program database looks at more recent course requirements, students earning awards in earlier periods might have been subject to different requirements.

¹¹ Restricting the sample to students age 18 to 54 excludes about 4 percent of students who completed a short-term certificate during the analytic period and about 10 percent of students who transfer to a four-year college.

FIGURE 9

Asian and younger students are more likely to stack credentials



SOURCE: California Community College Chancellor’s Office Management Information System.

NOTES: Estimates are regression adjusted. Reference group throughout is US citizen, prior high school education only, academically disadvantaged, 2.0 GPA (sample average), and not categorized as any of the following: disabled, limited English proficient, economically disadvantaged (Pell and CalWORKs receipt), or enrolled at some point in developmental or remedial education courses. Male, white, 31 year old (sample average) are the additional reference categories used as appropriate in the bars above.

Overall, the differences in stacking among students with varying backgrounds is rather small. This is somewhat surprising, given the large and persistent differences in overall student outcomes across these same characteristics. It could be that earning an initial credential on a career pathway is a spark that leads to additional progress; it is also possible that students who obtain credentials have an underlying motivation that is unobservable in these data. Either way, these findings suggest that stackable credentials may be a mechanism for addressing achievement gaps in long-term outcomes.

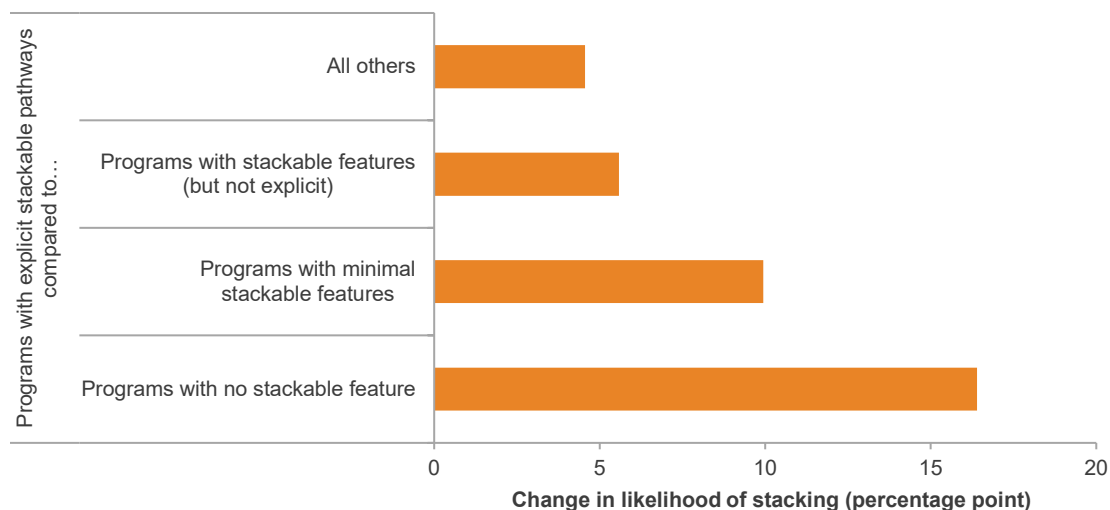
Stacking credentials after earning a short-term certificate is most common in engineering and family/consumer sciences, even when we control for the demographic characteristics described above. Students in business, IT, and public/protective services are roughly 8 to 9 percentage points less likely to stack than those in engineering or family/consumer sciences. It is clear that the choice of study is a factor in student access to—and completion of—stackable credential pathways.

To understand how programs may help students stack credentials, we add additional variables to the model—most importantly, the program characteristics in our database. The model also controls for broad influences like the time period of enrollment, the college attended, the availability of evening and online courses, the specific discipline (business, IT, engineering, family/consumer sciences, and public/protective services), and the typical wage return for the first credential. Students in programs that offer more evening courses seem more likely to stack—but the opposite is true for programs with more online courses. (Full results are available in [Technical Appendix B](#).)

After controlling for multiple program, student, and college factors, we find convincing relationships between programs explicitly designed to be stackable and the odds that students actually stack credentials. In other words, it appears that the design features work as intended—a conclusion that is typically difficult to quantify. Career

education programs with well-defined sequences for stacking credentials, such as an explicit ladder for higher credentials (progressive) or a defined launchpad connecting multiple credentials (lattice), are more likely to lead to stacking (Figure 10). Specifically, students in those programs are 4.5 percentage points more likely to add a credential to an initial short-term certificate within three years compared to similar programs and similar students. Keep in mind that we observe typically small differences in stacking across demographic groups (Figure 9); the difference due to program design features is larger than the biggest age group difference or the biggest difference in stacking across race/ethnic groups.

FIGURE 10
Stackable program designs increase the odds of student completion



SOURCE: California Community College Chancellor’s Office Management Information System.

NOTES: Estimates from a fixed effects model including student characteristics, program characteristics, and college, discipline, and year fixed effects. All main estimates are statistically significant at the .01 level. Programs with well-defined stackable pathways include those that have explicit progressive paths or a defined core or launchpad. Programs with a pathway feature (but not explicit) refer to progressive pathways that offer certificate-only paths or lattice pathways that have at least 3 credentials that share a common core (2+) of courses but are not defined as such. Programs with minimal stackable features are those that only have certificates that can be upgraded to associate degrees, often with just the completion of general education requirements or in the case of lattice pathways, no feature. See [Technical Appendix B](#) for details.

It is reasonable to think that this initial estimate is on the low side since it compares the handful of programs with explicit stackable sequences to all other programs, many of which offer courses and credentials that students can meaningfully combine. If we compare programs with explicit pathways to those with some stackable features but not explicit ones, we still estimate an improvement in completion (5.6 percentage points). Refining the comparison further, we observe that explicit stackable pathways are even more likely to lead to stacking compared to programs with minimal pathway features (9.9 points) or no designated sequence of credentials (16.4 points). In sum, a student in a program with an explicitly stackable pathway is 10 to 16 percentage points more likely to stack credentials than a student in a similar field with minimal or no pathway features.¹² We find similar results regardless of whether the program has a progressive or lattice design (see [Technical Appendix B](#)).

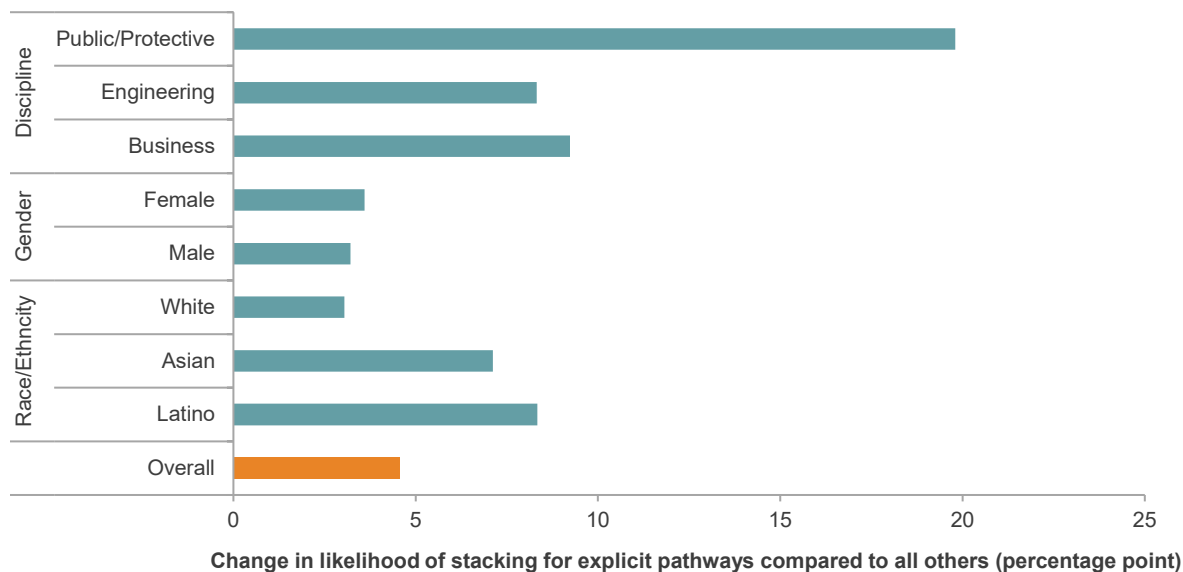
The evidence also suggests that program design is particularly important for some student groups and areas of study (Figure 11). Explicit, well-defined stackable programs are more strongly correlated with stacking for Latino

¹² Although these results pertain to students who start with a short-term certificate, we find that our overall conclusions hold for other student pathways. We find similar relationships between explicit stackable pathways and completion for those who start with a long-term certificate.

and for Asian students. These estimates suggest that the design of the course and credential sequence may be more determinant of career education program completion for traditionally underrepresented student groups.¹³ Note that these estimates account for the possibility that particular students are more or less likely to enroll in certain colleges and programs of study, and to have systematically different socioeconomic backgrounds—all of these factors could contribute to or impede their overall success.

FIGURE 11

The effectiveness of career education program features varies across a number of dimensions



SOURCE: California Community College Chancellor’s Office Management Information System.

NOTES: Each bar is an estimate from a separate fixed effects model that includes only students with the listed characteristic or in the given discipline. All models include student characteristics, program characteristics, and college, discipline, and year fixed effects. Results from interacted models are similar, but less flexible. Only statistically significant results above the .10 level are shown. See [Technical Appendix B](#) for details.

Lastly, explicit stackable features in business, engineering, and public/protective services programs make it more likely that students will complete a second, related credential compared to students in otherwise similar programs without clear stacking options. That is not to say that program features in other fields are unrelated to success. In IT, for example, we find positive associations between stackable pathways and completion, but there are so few programs with these features that we cannot reach a definitive conclusion, statistically speaking. In family and consumer sciences, it appears that explicit stackable design is impactful for students, but so are programs with less-articulated pathways. As mentioned, a large share of programs in this discipline have some stackable design features—so the most notable difference is between students in programs with explicit stackable designs and those in programs with none. (These detailed results are available in [Technical Appendix B](#).)

Incorporating well-defined stackable credential sequences into program design seems to be one way to improve pathway completion. The data suggest that most students intend to continue their career education following their initial short-term certificate. Sixty-two percent of students in our analytic sample (comprised of students who earned a short-term certificate from 2009–10 through 2013–14 and did not transfer) re-enrolled in the community

¹³ While we hoped to assess similar relationships for all race/ethnic groups and to identify more detailed distinctions, we do not have enough data to estimate them reliably; only statistically significant correlations are shown.

college system within three years of obtaining their first certificate. Though we cannot know if they re-enrolled for the purpose of stacking, this high rate of re-engagement suggests an intention to pursue additional credentials. Nonetheless, some students who acquire a short-term certificate have no intention of completing a pathway; they may seek only to gain a specific skill or a standalone certification. These students do not seem to impact our analysis; when we exclude students who never re-enrolled, our results are virtually identical.¹⁴ We also find that explicit stackable pathways are not inconsistent with student plans that include working toward a bachelor's degree—in fact, students in well-defined pathways are more likely to stack higher-level credentials (long-term certificates or associate degrees) on top of short-term certificates. Including or excluding students who eventually transfer does not alter our conclusions. Well-defined career education programs seem to facilitate student progress toward a number of educational goals.

Conclusion

In this report, we have offered new evidence on career education programs and the trajectories of the students they serve. We have also provided evidence on how colleges can design stackable credential programs to support more students earning stackable credentials that can expand their career options.

Because a large share of career education students start by earning short-term certificates and soon return to pursue additional training, it is critical to understand how institutions can best help these students advance along a career path. Given the multiple goals of career education and the diverse group of students served, this is a challenging task. We find that about half of students who start on a postsecondary career education pathway by earning a short-term certificate are age 30 or older; a majority are non-white and almost all (80%) have no prior postsecondary credential. Improving career pathway completion for these students could go a long way toward enhancing economic mobility for disadvantaged Californians.

Our findings suggest that one way to strengthen career pathways is to design programs with explicit sequences for combining credentials. Students are 10 to 16 percentage points more likely to stack credentials in programs with dedicated sequences than in otherwise similar programs without these kinds of sequences. Expanding the number of programs with stackable features could go a long way in improving completion. We also find promising evidence that explicit stackable sequences improve the likelihood of Latino students stacking credentials—an important equity goal, given achievement gaps and high poverty rates among working Latino adults.

Improving the chances that students enroll in high-demand career education programs and earn one—or more than one—credential are important goals. But accumulating credentials is valuable only if it expands career opportunities in tangible ways. The next report in this series will examine how the completion of stackable credential programs can improve students' labor market outcomes. This information is key to unlocking student and workforce potential.

¹⁴ We choose not to use these as our main results because re-enrollment itself may be an outcome of programs with strong pathway features—students may be more likely to remain engaged and to complete a pathway that is well defined.

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