SRI INTERNATIONAL

Taking Stock of the California Linked Learning District Initiative

Fifth-Year Evaluation Report

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PREPARED FOR THE JAMES IRVINE FOUNDATION

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Prepared by:
SRI International
Center for Education Policy

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Executive Summary

Since 2006, The James Irvine Foundation has invested more than $100 million in Linked Learning, a promising approach to transforming education in California. In 2009, the Foundation launched the California Linked Learning District Initiative ("the initiative) to demonstrate this approach in nine districts. The multiyear evaluation for this large initiative has a two-fold purpose: to document the work, results, and lessons from districts that are applying Linked Learning systemically; and to measure the effect of this comprehensive implementation on student outcomes.

SRI International's fifth annual evaluation report on the progress of the initiative comes at a time when Linked Learning is gaining momentum among K–12 and postsecondary educators, policymakers, and business leaders as a promising approach for preparing all students for college, career, and life. In early 2013, 63 districts and county offices of education were selected to participate in the California Linked Learning Pilot Program, which serves as a test of how Linked Learning can be expanded across the state. In June 2014, 39 partnerships received a total of $250 million through the California Career Pathways Trust, a competitive grant designed to develop work-based learning infrastructure, create regional partnerships, and improve and expand career pathway programs statewide. In 2015, a second round of grants will provide an additional $250 million to district and community college partnerships across the state.

About Linked Learning

Linked Learning integrates rigorous academics with real-world experiences. This approach aims to transform education into a personally relevant, wholly engaging experience—and open students to career and college opportunities they never imagined. Linked Learning builds on more than four decades of experience gained by California schools that combine academic and technical content to raise student achievement. It seeks to improve high school graduation rates and increase successful transitions to a full range of postsecondary education opportunities, particularly for low-income and disadvantaged youth. Linked Learning is delivered through career pathways, comprehensive programs of study that connect learning in the classroom with real-world applications outside of school.

It is within this context of increased funding and policy support for Linked Learning that we present this fifth-year evaluation report. Previous evaluation reports have focused on the development of district systems and structures to support new and existing Linked Learning pathways. As we close out the fifth year of our evaluation, we turn our primary attention to the students who participate in these pathways to ask the following questions: Who enrolls in pathways? Who stays? How do students feel about their experiences? What are their perceptions of the skills they are gaining? What effect does participation in a Linked Learning pathway have on students' high school outcomes?

To answer these and other questions, this report offers updated findings on student engagement and achievement outcomes from the nine districts participating in the initiative. Additionally, for the first time, our report takes an in-depth look at the issue of student equity and access to pathways through an analysis of student enrollment patterns across pathway career themes and of pathway retention among student subgroup populations. Finally, it assesses pathway students' experiences with academic and technical curricula and work-based learning, their perceptions of the skills they are gaining as a result of their pathway experiences, and their plans for the future.

Lessons from the experiences of the nine initiative districts are highly instructive for those that are just beginning to engage with or scale up Linked Learning. As context for understanding students' experiences in pathways and their outcomes, this report provides an update on the nine districts' efforts to develop and improve systems and structures to support Linked Learning and their initial plans to use new funding sources and regional partnerships to sustain Linked Learning.

Student Equity and Access

A central goal of the initiative is to provide all students with equitable access and opportunities for full participation in a variety of high-quality career-themed pathways. Evidence of such choice and access includes the percentage of students participating in pathways, as well as how representative these students are of each district's high school student population (in terms of prior achievement, socioeconomic status, gender, race/ethnicity, etc.); the absence of "tracking by pathway" (clustering students with low prior achievement in one set of pathways and students with high prior achievement in others); and retention in pathways, particularly for students with special learning needs, such as special education students and English learners.

In the nine districts, district- and site-level leaders have been working to increase the numbers and variety of open-access pathways available to students. Through efforts to communicate information about pathway options to students and their parents, as well as targeted recruitment and outreach, district leaders have made progress in opening access to pathways to all students, including English learners, special education students, and students with low prior academic achievement. However, some districts have had more success than others in making pathways accessible to all student subgroups. Our findings suggest that:

- Patterns of student subgroup enrollment in certified pathways vary from district to district and by career theme. The only consistent patterns are disproportionately low female enrollment in certified pathways with an engineering career theme and disproportionately high female enrollment in certified pathways with a health sciences career theme.
- Within any given certified pathway, student course-taking patterns can differ greatly from student to student. Through an in-depth analysis of course-taking in two pathways, we found that diminishing percentages of pathway students enroll in the same core classes in each successive year of the pathway. Students in the same pathway tend to take different math and science courses, especially in the upper grades.
- Nearly 80 percent of students who start out in a certified pathway in its lowest grade level were still in the same pathway by the time they reached 11th grade, but students with special learning needs have lower than average rates of retention in certified pathways.

Student Outcomes

For the third consecutive year, we examined indicators of pathway students' engagement in school, their progress toward high school graduation and college eligibility, and their gains in knowledge, statistically adjusting for their background characteristics and prior achievement.[1] These results are estimated across districts, rather than provided separately for each individual district, and compare outcomes for Linked Learning students to similar peers enrolled in traditional high school programs in each district. This single cross-district estimate is conceptually appropriate given that Linked Learning is an approach, not a series of individual initiatives implemented separately in each district.[2]

Students in certified pathways are more likely than similar peers to remain in the district through the 12th grade and outperform them in in credit accumulation in the 9th–11th grades.

[1] Student outcomes findings are based on data available from eight of the nine districts involved in the initiative. One district did not have any certified pathways at the time of analysis.

[2] To examine student enrollment and retention patterns within pathways, as well as outcomes for students in certified pathways compared with similar peers in traditional high school programs, we used student-level demographic and achievement data from the districts. For the analysis of student outcomes, we assigned students their pathway status based on the academic program in which they enrolled in the 9th or 10th grade, whichever was the lowest grade level served by the pathway. This is in contrast to pathway outcomes reported from the student survey, which represent all 12th graders enrolled in certified pathways across the districts in spring 2014, regardless of the grade level in which the students first enrolled in the pathway.

Our results reinforce the strongest and most consistent findings from our earlier reports: students in certified pathways are more likely than similar peers to remain in the district through the 12th grade and outperform their peers in credit accumulation in the 9th–11th grades. Findings around completion of the suggested a–g college preparatory coursework by pathway students are also promising, though equivocal. Students in certified pathways are as likely as their peers to be on track to complete the a–g coursework even though these students also have the demands of completing a career technical course sequence in high school, and they are more likely to be on track to complete these requirements at the end of 10th grade.

Student subgroups…who enrolled in certified pathways perform at last as well as (if not better) on credit accumulation and test score outcomes compared with their

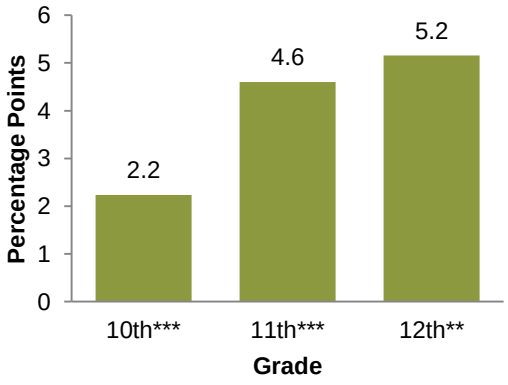
As in previous years, we did not find evidence that Linked Learning leads to higher scores on most standardized achievement tests. We did find, however, that student subgroups most frequently underserved by traditional schools—such as English learners, underachieving students, African American and Latino students—who enrolled in certified pathways perform at least as well as (if not better) on credit accumulation and test score outcomes compared with their peers in the same subgroup in traditional high school programs. Overall, the results from this year's analyses suggest that Linked Learning may be leading to greater student engagement and moderately greater success in school.

Engagement in School

Because Linked Learning aims to make school more relevant for students, the core components of a pathway have the potential to increase students' engagement in school. We used two measures to assess student engagement: attendance and retention within the district (a proxy for dropout prevention). We found:

- In general, average attendance rates for pathway and non-pathway students were high. We did not find evidence that students enrolled in certified pathways had better attendance than similar peers in traditional high school programs.
- On average, students enrolled in certified pathways were 2.2 percentage points more likely to stay within their district from 9th to 10th grade, 4.6 percentage points more likely to stay through 11th grade, and 5.2 percentage points more likely to remain through 12th grade, compared with similar peers in traditional high school programs. These differences likely occur because students continue to attend school instead of dropping out before graduation.

Pathway Students Were More Likely to Remain in the Same District



Source: District-provided student data.
**Statistically significant at $p < .01$.
***Statistically significant at $p < .001$.

These findings indicate that students in certified pathways may be more engaged than similar peers such that they are motivated to remain in school.

Success in School

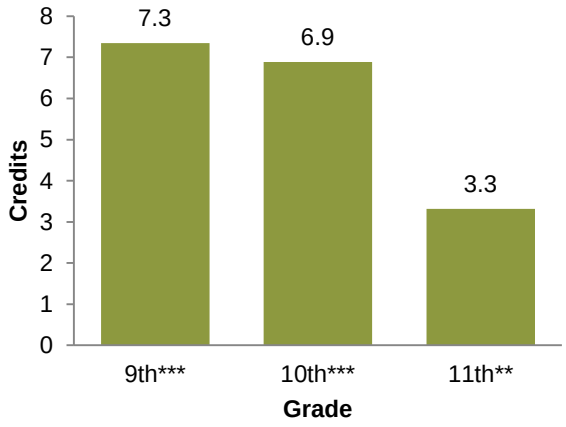
Even students who regularly attend school cannot progress through high school and toward college or career without successfully completing the necessary coursework. We examined students' progress toward high school graduation, as measured by credits accumulated and course failures. We also assessed students' progress toward college eligibility, as measured by completion of the coursework necessary to enter the California State University system. For the first time, we examined Algebra II completion by the end of the 11th grade; research suggests that students who take advanced mathematics courses during high school have better odds of attaining a bachelor's degree (Adelman, 1999; Gamoran & Hannigan, 2000; Horn, Kojaku, & Carroll, 2001).

We found that students in certified pathways are accumulating more credits in the 9th–11th grades than similar peers:

- On average, 9th-grade pathway students earned 7.3 more credits than similar peers in traditional high school programs, while 10th-grade pathway students earned 6.9 more credits and 11th-grade pathway students earned 3.3 more credits.

These differences are meaningful because the average student in each district accumulated about 55 credits (roughly 25% of the credits needed to graduate) in each of these grades. Extra credits in these early grades may provide pathway students with a buffer against later failures. The pathway and non-pathway student groups did not differ on course failures.

Pathway Students Earned More Credits



Source: District-provided student data.
**Statistically significant at $p < .01$.
***Statistically significant at $p < .001$.

In prior evaluation reports, we found that students in the majority of initiative districts were more likely than similar peers to be on track to complete the suggested a–g college preparatory coursework at the end of the 9th and 10th grades. In estimating a single cross-district effect of Linked Learning this year, we found this result in the 10th grade only. Although the results point in the right direction in grades 9 and 11, the differences are not statistically significant in these grades.[3] More specifically, we found:

- On average, students in certified pathways were 7.9 percentage points more likely to be on track to complete the suggested a–g requirements at the end of 10th grade than similar peers in traditional high school programs.

The weaker findings for the 9th and 11th grades may be due in part to our use of an a–g on-track indicator rather than number of a–g credits earned. The on-track indicator does not capture incremental differences in the number of a–g courses taken unless these differences move students from not being on track to complete a–g to being on track. In future years, we will look at the cumulative a–g credits earned by pathway students and similar peers by the end of 12th grade to assess whether pathway students complete more college preparatory requirements throughout high school.

In addition to analyzing course credits, course failures, and progress toward a–g completion, we examined, for the first time, whether pathway students were more likely to complete Algebra II by the end

[3] The results for a–g completion in the 9th and 11th grades have *p*-values of $p > .05$ and $p < .1$. We consider a *p*-value of $< .05$ to be statistically significant.

of 11th grade. This would allow them to take more advanced mathematics while still in high school, a critical determinant of postsecondary preparation and success (Adelman, 2006). However, we found no statistically significant difference between pathway students and similar peers in traditional high school programs in their likelihood of taking Algebra II by the end of 11th grade.

Collectively, our analyses find limited but promising evidence that pathway students are more successful in high school than their peers: pathway students earned a full semester-long course's worth of credits or more above what their peers earned in grades 9 and 10, and pathway students were more likely than similar peers to be on track to complete the a–g coursework at the end of their 10th grade year.

Students' Experiences in Pathways

The Linked Learning approach strives to impact these student outcomes through students' direct experiences with the academic and technical programs and work-based learning. During the 2013–14 school year, districts' work around curriculum and instruction focused largely on implementing the Common Core State Standards; some districts more successful than others in their efforts to align Linked Learning with the rollout of these new standards. According to our survey of twelfth-grade students, early efforts to improve curriculum and instruction in pathways appear to be paying off, as a greater share of pathway students than comparison students reported experiencing rigorous, integrated, and relevant instruction in the following ways:

- At least one teacher challenged them to understand a difficult topic (75% versus 61%), asked difficult questions in class (79% versus 69%), and asked difficult questions on tests (83% versus 74%) about once a month or more.
- A teacher discussed how to apply what they were learning in class to the real world (66% versus 51%), explained how what they learned in class could be applied to what they might do after finishing high school (70% versus 58%), and asked them to use tools or equipment (69% versus 49%) about once a month or more.
- Used ideas or skills learned in class outside of school (68% versus 59%) and saw connections between what they learned in class and the real world (70% versus 60%) about once a month or more.

In addition to offering a challenging academic program integrated with a demanding technical sequence of courses, Linked Learning pathways should provide all students with access to a continuum of high-quality work-based learning opportunities that help them connect classroom learning to the skills and knowledge needed in a particular industry sector. This integration of the academic and technical curricula with work-based learning makes the Linked Learning experience unique. All districts are making progress on expanding the number and variety of work-based learning opportunities at the career exploration level (job shadows and mentoring), but student access to work-based learning experiences at the career preparation (internships and practicum) and training (work experience and certification) levels remains limited. Further, in all but a few exemplary pathways, leaders and teachers still have work to do to integrate work-based learning with classroom learning and pathway outcomes. On our survey of twelfth-grade students, we found:

- The vast majority of pathway students across all districts (ranging from 80% in Antioch to 93% in Oakland) reported participating in at least one work-based learning experience during the 2013–14 school year, with 87% of pathway students participating overall.
- Across the range of experiences, pathway students most frequently reported engaging in activities on the earlier end of the work-based learning continuum (career awareness and career exploration). Only 34% of pathway students reported participating in an internship during the 2013–14 school year.
- When asked to report how often students tie their work-based learning experiences back to the schoolwork, 28% of pathway students reported doing so "most of the time" or "always."

One institutional barrier to developing more robust work-based learning systems is district staff capacity to generate and communicate opportunities for internships to students. Student-level barriers to participation in career preparation and training opportunities include competing demands on students' time, limited transportation options, the need or desire to earn money (very few internships are paid), the need for credit recovery, and students' lack of interest in the internship opportunities offered.

Students' Perceptions of Skills Gained

Today's students need 21st century skills to succeed in any postsecondary endeavor. The *Linked Learning College and Career Readiness Framework* defines these skills as "the range of cross-cutting cognitive processes and applications of knowledge needed to succeed in postsecondary education and future careers" (ConnectEd, 2012, p. 2). We asked 12th-graders to report on the extent to which they felt high school had helped them improve a range of skills and behaviors. On our student survey, pathway students were more likely than comparison students to report that high school has helped them develop the following skills:

- **Collaboration:** Develop the skills necessary to interact effectively with people from different backgrounds (59% versus 49%), with adults outside of their family (40% versus 29%), and in professional settings (54% versus 33%), as well as to collaborate in a group to achieve a shared goal (56% versus 36%).
- **Communication:** Improve their ability to present information to an audience, whether by making a public presentation or performing in front of a group (52% versus 30%), or by speaking in public (43% versus 27%).
- **Judgment:** Develop their ability to use information to make good decisions (55% versus 38%), conduct online searches to answer a question (52% versus 36%), summarize information from multiple sources (45% versus 32%), and judge whether they can trust the results of an online search (42% versus 25%).
- **Perseverance:** Improve their ability to accept responsibility for the quality of their work (63% versus 51%), to believe they can reach their goals through hard work (55% versus 45%), and to believe they can learn something really difficult if they try (44% versus 28%).
- **Organization:** Develop useful self-management skills, such as setting goals for doing well in their classes (35% versus 27%), developing a system for organizing schoolwork (31% versus 25%), and managing their time in order to get all their work done (25% versus 21%).

Students' Postsecondary Plans and Supports

Pathway students are developing productive dispositions and behaviors necessary for success in school and postsecondary endeavors. Ultimately, Linked Learning should foster students' awareness of and readiness for college and career, and support their successful transitions their future undertakings. Our findings suggest that pathway participation has helped students identify career interests and enhanced their understanding of the education and training necessary to prepare for postsecondary opportunities. Greater percentages of twelfth-grade pathway students than of comparison students reported on our survey that they received:

- Opportunities to visit a college or technical school campus (75% versus 59%) and to speak with a college or trade school representative (74% versus 65%).
- A lot of help to understand high school graduation requirements (79% versus 68%), what they wanted to do after they graduated (47% versus 35%), the high school courses needed to get into college (64% versus 51%), how to choose a two- or four-year college (55% versus 44%), how to pay for college or training (49% versus 37%), what kind of education or training is needed to prepare for a possible career (44% versus 32%), and how to choose a career training or trade school (31% versus 23%).

Pathway students were somewhat more likely than comparison students to report that they planned to continue their education full time (74% versus 68%) and work part time (66% versus 63%) after they graduated. Although the magnitude of these differences is small, the differences are statistically significant and unlikely due to chance. Similarly, pathway students were more likely than comparison students to report taking college entrance examples and submitting college applications, including taking the SAT (74% versus 62%) and PSAT (74% versus 66%), and submitting an application to a California State University campus (86% versus 79%) or a University of California campus (60% versus 54%).

Looking Ahead

Three years of student outcome analysis point to the promise of the Linked Learning approach. This year's results reinforce previous findings that Linked Learning participation is related to student engagement and success in school. Students in certified pathways are more likely than similar peers to stay in their district, and they accumulate more credits, putting them on track to graduate from high school. They also are just as likely as their peers to be on track to complete a–g requirements at the end of 9th and 11th grades, and even more likely at the end of 10th grade.

Yet there is still work to be done. Even when students are more engaged in school and complete more course credits, these positive outcomes do not consistently translate into improved achievement outcomes, as measured by standardized test scores. As districts continue to develop and expand pathways, Linked Learning practitioners must be vigilant about improving the quality of instruction and providing all pathway students the supports necessary to ensure that they succeed in their classes. Implementation of the Common Core provides a real opportunity for changes in classroom practice that may lead to improved student achievement results.

As we look ahead to the future of Linked Learning in California and in other states across the country, pathway expansion plans have raised some concerns among Linked Learning administrators and our research team regarding fidelity to the Linked Learning approach—that is, the extent to which a district can adapt the pathway approach before it is no longer appropriate to call the pathway "a Linked Learning pathway." Within the nine districts, there is already a range of such approaches—from districts with academies that do not meet Linked Learning pathway criteria to districts that adhere closely to ConnectEd's definition of a high-quality Linked Learning pathway, supported and sustained through strong centralized control of implementation by the district Linked Learning office.

Beyond the districts in the initiative, a whole new crop of Linked Learning districts, through the California Linked Learning Pilot Program and the California Career Pathways Trust, will not receive the intense technical assistance or encouragement that the original districts received to adhere to the Linked Learning approach. If new Linked Learning pathways developed under these efforts fail to deliver, there is a danger that Linked Learning's positive image could be damaged and, as one district administrator shared, "the whole brand will suffer."

Additionally, the rapid growth of Linked Learning districts could test the scalability of the Linked Learning approach without extensive external supports. An essential element in district implementation of Linked Learning has been knowledge, expertise, prior experience, and other support from external partners. In particular, district leaders have found district-level coaching to be critical in supporting their ability to navigate initial planning and systems-building activities (e.g., support for district staff to understand and spread foundational knowledge of Linked Learning, getting key leaders on board, helping shift educators' and other stakeholders' mindsets to align priorities and supports with Linked Learning). New districts will have a much more limited support system, which could impact their approach to implementing Linked Learning pathways, specifically their focus on systems building.

Moving forward, Linked Learning funders, technical assistance providers, and the broader field will need to continue discussing this critical question of fidelity to the Linked Learning approach in terms of the essential elements of pathways *and* a district's system of support for Linked Learning implementation.

The evaluation of the initiative will continue for two more years. During this time, we will report on the progress of the nine districts as they transition to additional funding sources beyond The James Irvine

Foundation and ConnectEd to support and sustain Linked Learning implementation (districts will receive one final round of grant funding from the Foundation through ConnectEd for the 2014–15 school year). We will look into districts' plans for sustaining and scaling Linked Learning, including the use of funds from the Local Control Funding Formula, the California Career Pathways Trust, and other resources to support Linked Learning. We also will examine the role of new regional partnerships in expanding work-based learning opportunities. Most importantly, during the next two years of the evaluation, we will provide new data on how well Linked Learning graduates fare compare with similar peers as they transition to postsecondary endeavors.

Chapter 1: Introduction

SRI International presents its fifth annual evaluation report on the progress of the California Linked Learning District Initiative ("the initiative"). This report comes at a time when Linked Learning is gaining momentum among K–12 and postsecondary educators, policymakers, and business leaders as a promising approach for preparing all students for college, career, and life. In early 2013, 63 districts and county offices of education were selected to participate in the California Linked Learning Pilot Program, which serves as a test of how Linked Learning can be expanded across the state.[4] In June 2014, 39 partnerships received a total of $250 million through the California Career Pathways Trust, a competitive grant designed to develop work-based learning infrastructure, create regional partnerships, and improve and expand career pathways programs statewide.[5] In 2015, a second round of grants will provide an additional $250 million to district and community college partnerships across the state.

Core Components of the Linked Learning Approach

Linked Learning combines four elements designed to advance student success:

Rigorous academics — An academic core that includes college preparatory English, mathematics, science, history, and foreign language courses for all students.

Career-based learning in the classroom — A challenging career-based component of three or more courses to help students gain the knowledge and skills that can give them a head start on a successful career.

Work-based learning in real-world workplaces — A series of work-based learning opportunities that begin with mentoring and job shadowing and evolve into intensive internships, school-based enterprises, or virtual apprenticeships.

Integrated student supports — Services including counseling and supplemental instruction in reading, writing, and mathematics that help students master academic and technical learning.

It is within this context of increased funding and policy support for Linked Learning that we present this fifth-year report. This report offers updated findings on student engagement and achievement outcomes from the nine districts participating in the initiative. Additionally, for the first time, our report takes an in-depth look at the issue of student equity and access to pathways through an analysis of student enrollment patterns across pathway career themes and of pathway retention among student subgroup populations. Finally, it assesses pathway students' experiences with academic and technical curricula and work-based learning, their perceptions of the skills they are gaining as a result of their pathway experiences, and their plans for the future.

Lessons from the experiences of the nine initiative districts are highly instructive for those that are just beginning to engage with or scale up Linked Learning. As context for understanding students' experiences in pathways and their outcomes, this report provides an update on the nine districts' efforts to develop and improve systems and structures to support Linked Learning and their initial plans to use new funding sources and regional partnerships to sustain Linked Learning.

[4] The Linked Learning Pilot Program was authorized by Assembly Bill 790 (Furutani), passed by the California State Legislature in 2011. The program is managed by the California Department of Education.

[5] The California Career Pathways Trust was authorized by Assembly Bill 86 (Budget Act of 2013), passed by the California Legislature in 2013. The program is managed by the California Department of Education. The 2013–14 California State Budget included $250 million to be allocated by the California Department of Education through a one-time competitive grant process.

About Linked Learning and the District Initiative

Since 2006, The James Irvine Foundation ("the Foundation") has invested more than $100 million in Linked Learning, a promising approach to transforming education in California. Linked Learning integrates rigorous academics with real-world experiences to provide high school students with a personally relevant, wholly engaging experience and open them to college and career opportunities they never imagined.

Districts Participating in the Linked Learning District Initiative

Antioch Unified
Long Beach Unified
Los Angeles Unified
Montebello Unified
Oakland Unified
Pasadena Unified
Porterville Unified
Sacramento City Unified
West Contra Costa Unified

The Linked Learning approach builds on the more than four decades of experience gained by California schools that combine academic and technical content to raise student achievement. The objectives are to improve high school graduation rates and increase successful transitions to a full range of postsecondary education opportunities, particularly for low-income and disadvantaged youth. Linked Learning is delivered through career pathways, comprehensive programs of study that connect learning in the classroom with real-world applications outside school.

In 2009, the Irvine Foundation launched the California Linked Learning District Initiative, a demonstration of Linked Learning in nine California school districts. ConnectEd: The California Center for College and Career, established by the Foundation in 2006, is the primary intermediary and technical assistance provider. Numerous other partners support the initiative, including the Stanford Center for Opportunity Policy in Education, the Center for Powerful Public Schools (formerly the Los Angeles Small Schools Center), the National Academy Foundation, the College & Career Academy Support Network, and The Education Trust—West.

The Foundation is supporting the nine demonstration districts in developing systems of career pathways that are available to all high school students, with students selecting their pathway. The initiative serves as a vehicle for the Foundation and its partners to develop and refine the Linked Learning approach, to determine what makes Linked Learning successful at a systemic level, and to demonstrate the viability of Linked Learning as a comprehensive approach for high school reform.

In this fifth annual evaluation report, we look at districts' progress in developing the core components of Linked Learning pathways, focusing on curriculum, instruction, and work-based learning, and their efforts to sustain Linked Learning beyond their participation in the initiative. We examine students' experiences with the core pathway components, their perceptions of the skills they are gaining as a result of their experiences, and their plans beyond high school. We also assess the factors that influence students' access to and participation in pathways and the impact of pathway participation on student engagement, success, and knowledge gains.

Status of the District Initiative

The nine districts participating in the Linked Learning District Initiative vary in size, from close to 19,000 to more than 650,000 students, and represent a variety of geographic regions across California. All have a high proportion of disadvantaged students. Collectively, the nine districts serve approximately 286,000 high school students, or 15% of the almost 2 million high school students enrolled in California public schools. All have below-average student achievement as measured by California's Academic Performance Index (API), ranging from 715 to 784 compared with a statewide average of 790.[6] More than three-quarters of the high school students in each of these districts are nonwhite, and more than half of the students are socioeconomically disadvantaged, with district poverty rates ranging from 60% to 81%.[7] Exhibit 1-1 summarizes student demographic and achievement data for the nine districts.

[6] 2012 Base API. The source for all demographic and achievement data cited here is the California Department of Education.

[7] Based on the percentage of students who qualified for free or reduced-price meals in 2013–14.

Exhibit 1-1
Demographic and Achievement Profile of Linked Learning Districts, 2013–14

District	High School Enrollment[a]	Minority[b] (%)	English Language Learner (%)	Poverty[c] (%)	Graduation Rate (%)		CAHSEE Pass Rate[d] (%)				Certified Pathways	
					2011–12	2012–13	2013 Math	2013 ELA	2014 Math	2014 ELA	Number	Percentage Enrolled[e]
Antioch Unified	5,890	79	9	63	74	78	78	82	75	78	3	22
Long Beach Unified	26,103	85	15	68	80	81	82	79	85	80	6	5
Los Angeles Unified [f]	198,180	92	16	77	67	68	79	79	80	78	4	1
Montebello Unified	10,122	98	17	86	80	87	75	78	80	78	0	0
Oakland Unified	12,096	92	8	75	59	63	50	42	69	63	3	10
Pasadena Unified	5,588	87	11	69	79	82	77	80	82	78	5	23
Porterville Unified	6,240	81	14	85	81	84	77	74	81	76	7	20
Sacramento City Unified	13,038	83	15	73	80	85	76	73	80	77	5	10
West Contra Costa Unified	8,492	91	21	71	76	80	73	72	72	72	4	15

Source: California Department of Education (CDE).

[a] Includes enrollment at charter and noncharter schools classified by the CDE as high schools (public) and continuation high schools with active/pending status.

[b] Percentage of all students who do not identify as "White, not Hispanic," including students whose ethnic designation is listed as "not reported."

[c] Based on the percentage of students who qualified for free or reduced-price meals in 2013–14 in the whole district (not just high school students).

[d] The California High School Exit Examination (CAHSEE) passing rates are based on the March exam date for 10th-grade students for 2012–13 and 2013–14 for all districts except Long Beach, Oakland, Pasadena, Porterville, and West Contra Costa. CAHSEE passing rates for Porterville, and West Contra Costa are based on a February exam date for 10th-grade students for 2012–13 and 2013–14 and Oakland and Pasadena for 2013–14. CAHSEE passing rates for Long Beach were averaged between the February and March exams. ELA is English language arts.

[e] Percentage of high school students in the district enrolled in certified pathways, as provided by ConnectEd on July 1, 2014.

[f] Profile is for all of LAUSD. The initial Linked Learning grant was made to Local District 4, but the district restructured beginning with the 2012–13 school year, dissolving the local district structures. Linked Learning is now a full districtwide initiative.

In 2010, ConnectEd developed and began using a tool and process to certify the quality of individual career pathways along the dimensions of design, engaged learning, system support, and evaluation and accountability. ConnectEd and the Linked Learning partners are using the certification process to establish and support examples of programs that implement Linked Learning with high quality and fidelity, whether they are part of the district initiative or individual schools or programs outside of the initiative. Exhibit 1-2 lists the 37 pathways ConnectEd had certified as of July 2014 in the nine districts.

Exhibit 1-2
Linked Learning Pathways Meeting Certification Criteria as of 2013–14

District	Certified Pathways	School Types[a]	Certification Year	Pathway Enrollment
Antioch Unified	Dozier-Libbey Medical High School	Small school	2010–11	640
	Engineering and Designing Green Environments (EDGE)	SLC[b]	2012–13	337
	Law & Justice Academy (DVLJA)	SLC[c]	2012–13	292
Long Beach Unified	Architecture, Construction, and Engineering Academy (ACE)	SLC[c]	2009–10	283
	California Academy of Mathematics and Science (CAMS)	Small school[d]	2010–11	670
	Community of Musicians, Performers, Artists, and Social Scientists (COMPASS)	SLC	2010–11	661
	PEACE Academy	SLC	2010–11	742
	Media and Communications (JMAC)	SLC	2012–13	289
	Pacific Rim Business Academy	SLC[c]	2013–14	258
Los Angeles Unified	Los Angeles High School of the Arts (LAHSA)	Small school	2011–12	420
	Los Angeles School of Global Studies	SLC	2011–12	365
	New Media Academy	SLC[c]	2012–13	450
	STEM Academy of Hollywood	Small school[b]	2013–14	328
Oakland Unified	Life Academy of Health and Bioscience	Small school[c]	2010–11	168
	Media College Preparatory	Small school[c]	2010–11	263
	Education Academy	SLC[c]	2011–12	135
Pasadena Unified	Arts, Entertainment, and Media Academy (AEM)	SLC[c]	2010–11	472
	Business and Entrepreneurship Academy (BE)	SLC[c]	2010–11	337
	Creative Arts, Media, and Design Academy (CAMAD)	SLC	2010–11	333
	Engineering and Environmental Science Academy (EESA)	SLC[b]	2012–13	332
	Health Careers Academy (HCA)	SLC[b,c]	2013–14	111

Exhibit 1-2
Linked Learning Pathways Meeting Certification Criteria as of 2013–14 (concluded)

District	Certified Pathways	School Types[a]	Certification Year	Pathway Enrollment
Porterville Unified	Partnership Academy of Business (PAB)	SLC[b,c]	2010–11	235
	Academy of Engineering (AOE)	SLC[b]	2010–11	277
	Multimedia Technology Academy (MTA)	SLC[b,c]	2011–12	187
	Partnership Academy of Health Sciences (PAHS)	SLC[b,c]	2011–12	310
	Academy of Performing Arts (APA)	SLC	2011–12	209
	Academy of Digital Communication and Design (DDC)	SLC[b]	2012–13	128
	AERO Academy	SLC[b,c]	2013–14	100
Sacramento Unified	Health Professions High School	Small school[b,d]	2010–11	467
	New Technology High School	Small school	2010–11	297
	Johnson Corporate Business Academy (JCBA)	SLC[b,c]	2012–13	261
	The MET	Small school	2012–13	255
	School of Engineering and Sciences	Small school[b]	2012–13	184
West Contra Costa Unified	Multimedia Academy	SLC[c]	2010–11	313
	Law Academy	SLC[c]	2010–11	206
	Engineering Partnership Academy	SLC[c]	2011–12	96
	Health Academy	SLC[c]	2012–13	196

Source: Communication from ConnectEd (July 1, 2014). There are no certified pathways in Montebello.

[a] SLC refers to a small learning community within a comprehensive high school, not necessarily supported by a federal Smaller Learning Communities program grant. Small school refers to a small stand-alone school.

[b] Pathway is supported by the National Academy Foundation (NAF).

[c] Pathway is a California Partnership Academy (CPA).

[d] Magnet school.

Fifth-Year Evaluation Activities

In 2009, the Foundation commissioned the Center for Education Policy at SRI to conduct a rigorous multiyear evaluation of the initiative. SRI is assessing the nine districts' implementation of the Linked Learning pathways and analyzing outcomes for students participating in them. SRI is using a multimethod research design that includes qualitative and quantitative data collection and analysis. The following key research questions guide the evaluation:

- What structures, policies, and supports facilitate the implementation and institutionalization of a districtwide system of high-quality pathways, and what challenges do districts face in implementing such systems?
- How do districts support the implementation of pathways, and what challenges do pathways face in implementation?
- What are the educational experiences and outcomes for students participating in pathways?

This evaluation report draws on four sources of data:

1. Telephone interviews with ConnectEd coaches, in-person interviews with key district and school staff, and focus groups with primarily twelfth-grade pathway students from across all nine districts.
2. A student survey administered in spring 2014 to twelfth-grade students in certified pathways and comparison students that provided information on students' experiences in high school as well as their postsecondary plans.[8]
3. A review of documents describing the academic and technical programs of study and the work-based learning opportunities available to pathway students, focusing specifically on pathways certified prior to the end of the 2012–13 academic year.
4. Student demographic and achievement data from the districts that enable us to compare student engagement and achievement outcomes metrics for students in certified pathways with their peers.[9]

The analysis of survey data presented throughout this report and of the demographic and achievement data presented in Chapter 6 provide two different lenses into the experiences and outcomes of students in certified Linked Learning pathways. The survey results represent all 12th graders enrolled in certified pathways across the districts, regardless of the grade level in which they first enrolled in the pathway. In contrast, for the analysis of student administrative data in Chapter 6, we assign pathway enrollment based on the academic program in which students enrolled in the 9th or 10th grade, whichever one is the lowest grade level served by the pathway.[10] The appendix provides detail about the data sources and analyses in this report.

Report Overview

We begin in Chapter 2 by discussing districts' efforts to expand student access to and participation in pathways, a key goal of the initiative. We examine patterns in student enrollment across pathway career themes, discuss student participation in the pathway course of study, and present data on district and pathway retention by student subgroups. In Chapter 3, we assess the progress districts have made in supporting pathways around the development of performance-based assessments, rigorous pathway curriculum, and high-quality instruction, noting efforts to align Common Core implementation with Linked Learning and students' own reports of their experiences with classroom learning and expectations. We then, in Chapter 4, turn to districts' efforts to expand and improve work-based learning systems, including plans to secure additional funding and early efforts to collect work-based learning data; we also detail students' self-reported experiences with work-based learning. In Chapter 5, we describe pathway students' perspectives on their development of a variety of skills and competencies as a result of their pathway experiences, and in Chapter 6, we compare engagement and achievement outcomes for pathway students and their peers. In Chapter 7, we explore whether students' experiences in pathways foster college and career awareness and readiness, the extent to which Linked Learning participation

[8] In spring 2014, we surveyed 12th-graders in all pathways certified as of the 2012–13 school year, as well as comparison students in eight of the nine districts. Because Montebello did not have any certified pathways as of the 2013–14 school year, we surveyed students in the four most advanced pathways there but did not survey comparison students; we do not include the responses of Montebello pathway students with those of students from certified pathways.

[9] Data for all districts except Los Angeles came through a third party, the Institute for Evidence-Based Change. Montebello did not have any certified pathways as of the 2013–14 school year. Providing all the specific data elements needed for the analysis also posed a challenge for the districts, which often house data elements in different systems. Districts are developing systems for flagging and tracking pathway students and for reporting data elements not previously captured, such as pathway enrollment.

[10] For the analysis of student outcomes, we assign pathway status based on initial enrollment to minimize selection bias. Even if these students leave the pathway in later years, they are still classified as a pathway student of the analysis of student outcomes. Without a longitudinal survey design, we could not feasibly mirror this approach in the survey sample. The definition of a pathway student differs for our analyses of the student demographic and achievement data and the survey data for both logistical and methodological reasons.

supports postsecondary transitions, and students' self-reported plans for college and careers. In Chapter 8, we discuss districts' plans to support and sustain Linked Learning, and the final chapter distills the key findings from this fifth year of the study and considers the long-term viability of the approach.

Chapter 2: Student Access and Equity

Key Findings

- Although district leaders are expanding Linked Learning pathway offerings, districts involved in the initiative have only a small number of certified pathways representing a limited range of career themes.
- To improve pathway access, the districts are paying greater attention to middle school outreach than in previous years and engaging in a range of efforts to improve communication with students and families about their pathway options.
- Our initial analysis of patterns of student enrollment in pathways reveals no consistent patterns of "tracking by pathway" based on students' prior achievement, special education, or English learner status. However, females enrolled in certified engineering pathways at disproportionately low rates and in certified health career pathways at disproportionately high rates.
- Nearly 80% of students who initially enrolled in a certified pathway remained in the pathway through the beginning of the 11th grade.
- English learners, special education students, and underachieving students face significant barriers to pathway persistence, though district and school staffs are increasingly aware of the need to ensure that all students can participate in the pathway program of study.
- Looking closely at course-taking patterns in two certified pathways, we see large differences from student to student. Divergence is greatest in math and science courses in the junior and senior years, a possible indication of inequity in the quality and rigor of the pathway learning experience among pathway completers.

Expanded choice and equity of access to a range of pathway options for all students is one of the most important goals of the Linked Learning District Initiative. ConnectEd's "Essential Elements for Pathway Quality" specifies that a Linked Learning pathway is "equitably accessible to and serves well any interested student, regardless of race, ethnicity, gender, sexual orientation, socioeconomic status, special needs, or prior academic achievement" (ConnectEd, n.d.). The goal of providing students with equitable access to pathways can be challenging for districts to achieve because it requires districts to ensure both physical access, in terms of broad geographic availability of different pathways within a district or provision of transportation, and informed choices so that students deliberately select their high school program rather than defaulting to a familiar school or program attended by family or friends. Thus, providing students with equitable access to pathways starts with districts' offering students choice among a variety of high-quality career-themed pathways and implementing policies and practices to help students make choices among pathway options and easily enroll in the pathway they choose. Ideally, all types of students in a district should have relatively unfettered access to a pathway representing a career theme in which they have a strong interest.

Evidence of equity in access includes the absence of "tracking by pathway," or the clustering of students with low prior achievement in one set of pathways and students with high prior achievement in others, and access to multiple pathways for students with special needs, such as special education students and English learners. This year, we take a closer look at evidence of equity in student access to pathways in terms of district pathway recruitment and enrollment practices and also in terms of emerging patterns of student enrollment, retention, and course-taking in certified pathways. In most districts, certification of pathways has proceeded slowly; numbers of certified pathways are small, as is the range of career themes they represent. Our analysis of initial evidence of equity of student access to high-quality pathways is encouraging, but findings presented in this chapter suggest questions about student subgroup equity and access that should be revisited over the next two years of the evaluation.

In the first section of this chapter, we review the number and range of career themes of certified pathways available to students at the start of the 2013–14 school year. We also summarize district efforts to improve pathway recruitment practices that promote equitable access to pathways. In the second section, we look at equitable pathway access as it is reflected in patterns of student enrollment in pathways. According to quality criteria for student recruitment, selection, and placement in pathways defined by ConnectEd, pathway demographics should "reflect those of the school and district." In the third section, we present findings on student retention in certified pathways and in the district through the beginning of 11th grade, both overall and for English learners and special education and underachieving (i.e., low prior achievement) students. Finally, even among students who complete a certified pathway program of study, there may be important differences in the quality and rigor of the learning experience. To examine this question of equity in experiences and learning opportunities within pathways, we take a close look at course-taking patterns in two certified pathways in the fourth section of this chapter.

Student Access to Pathways

In SRI's first-year evaluation report, we observed that in the first cohort of Linked Learning districts, students' access to pathways was influenced by existing school choice policies and practices within each district, traditions of neighborhood school attendance, geographic size of the district, and transportation limitations. Five years into the initiative, these factors continue to influence which pathway, if any, a student enters. For the most part, districts have not changed their existing choice policies to improve student access to pathways, nor have they offered transportation options that allow students, especially low-income students, to attend pathways outside of their neighborhood schools. Rather, districts' primary strategy for ensuring equitable and open access is to develop multiple high-quality programs (though not necessarily certified pathways) throughout the district so that students have attractive, viable options that are geographically close to them; however, few districts have obtained certification for pathways representing a range of career themes. Instead, district leaders have focused on efforts to communicate information about pathway options to students and their parents, as well as targeted recruitment and outreach, and opening access to high-quality pathways representing a variety of career themes to all students, including students with disabilities, English learners, and students with low prior academic achievement.

Although district leaders are expanding Linked Learning pathway offerings, districts involved in the initiative have only a small number of certified pathways representing a limited range of career themes.

Achieving the goal of equitable access to pathways means raising the quality of existing pathways and developing new pathways. As a district leader reflected, "We're looking at this massive geographic area we have and ensuring that we have really robust programs at all the schools so the students in that zone will have access to some high-quality programs." Despite the focus of district leaders on developing a variety of pathways options, growth in the number of pathways certified by NAF or ConnectEd has been slow, and therefore the range of career themes represented by certified pathways remains very limited in most districts. In fall 2013, the career theme options among certified pathways available to entering students varied from district to district, from a low of no certified pathway options (Montebello) to a high of six pathway options representing five different career themes (Porterville). Los Angeles Unified had certified pathways for just two career themes. Students in the rest of the districts (six of the nine) could enroll in certified pathways representing three or four different career themes.

As shown in Exhibit 2-1, the predominant career themes of 31 of the 33 certified pathways in the districts at the start of the 2012–13 school year align with a total of 6 of the 15 industry sectors defined by the California State Center Consortium (State Center Consortium, 2014). Two certified pathways in Sacramento had no single predominant career theme, and we categorize them as "multi-sector." Most Linked Learning pathways include multiple career options within a broad industry sector, and some pathways focus on careers in more than one industry sector. For example, many of the certified pathways in Media and Design Arts and in the Engineering and Design category also have a strong focus on information technology careers. Some pathways in the Engineering and Design category also cover the Building Trades and Construction career theme. The largest numbers of certified pathways have career themes in the Arts, Media, and Entertainment industry sector, a very broad and diverse family of career

pathways. Because of the diverse range of occupations within this sector, we divided the certified pathways with Arts, Media, and Entertainment themes into two groups: a larger group that consists of pathways that focus on technical coursework related to media, information technology, and design careers and a smaller subset that includes a substantial focus on performing arts (music, dance, theater) in the pathway course of study.

Exhibit 2-1
Certified Pathways by California Career Pathway Industry Sectors

Career Pathway Industry Sector	Pathway Name	District
Arts, Media, and Entertainment	Media and Communications (JMAC)	Long Beach Unified
	New Media Academy[a]	Los Angeles Unified
	Los Angeles School of Global Studies	Los Angeles Unified
Media and Design Arts	Media College Preparatory	Oakland Unified
	Creative Arts, Media, and Design Academy (CAMAD)	Pasadena Unified
	Arts, Entertainment, and Media Academy (AEM)	Pasadena Unified
	Academy of Digital Communication and Design (DDC)	Porterville Unified
	Multimedia Technology Academy (MTA)	Porterville Unified
	Multimedia Academy	West Contra Costa Unified
Performing Arts	Community of Musicians, Performers, Artists, and Social Scientists (COMPASS)	Long Beach Unified
	Los Angeles High School of the Arts (LAHSA)	Los Angeles Unified
	Academy of Performing Arts (APA)	Porterville Unified
Engineering and Design	Engineering and Designing Green Environments (EDGE)	Antioch Unified
	California Academy of Mathematics and Science (CAMS) [b]	Long Beach Unified
	Architecture, Construction, and Engineering Academy (ACE)	Long Beach Unified
	Engineering and Environmental Science Academy (EESA)	Pasadena Unified
	Academy of Engineering (AOE)	Porterville Unified
	School of Engineering and Sciences	Sacramento Unified
	Engineering Partnership Academy	West Contra Costa Unified
Health Science and Medical Technology	Dozier-Libbey Medical High School	Antioch Unified
	Life Academy of Health and Bioscience	Oakland Unified
	Partnership Academy of Health Sciences (PAHS)	Porterville Unified
	Health Professions High School	Sacramento Unified
	Health Academy	West Contra Costa Unified
Public Services	Law and Justice Academy (DVLJA)	Antioch Unified
	PEACE Academy[c]	Long Beach Unified
	Law Academy	West Contra Coast Unified
Finance and Business	Business and Entrepreneurship Academy (BE)	Pasadena Unified
	Partnership Academy of Business (PAB)	Porterville Unified
	Johnson Corporate Business Academy (JCBA)	Sacramento Unified
Education, Child Development, and Family Services	Education Academy	Oakland Unified
Multi-sector, no predominant career pathway	The MET	Sacramento Unified
	New Technology High School	Sacramento Unified

[a] This pathway is excluded from the analyses in this report, as the LAUSD data is restricted to those schools that were originally in Local District 4 and ended up in the Intensive Support and Innovation Center after district reorganization.

[b] CAMS is a STEM high school and, strictly speaking, does not have a predominant engineering career theme. It is included here within the engineering career theme because CAMS offers courses in engineering and because many CAMS students have an engineering career interest.

[c] PEACE Academy has a social justice and international negotiations emphasis that aligns best, though not precisely, with the legal and governmental services subset of the public services sector.

To improve pathway access, the districts are paying greater attention to middle school outreach than in previous years and engaging in a range of efforts to improve communication with students and families about their pathway options.

District leaders are expected to establish strategies to market all pathway options to middle school students and their families (ConnectEd, 2014). As we noted in our fourth-year evaluation report, some districts, such as Antioch, Porterville, and Long Beach, have formal recruitment structures at the district level and are actively engaged in efforts to communicate with students and families about available pathway options. For example, Long Beach hosted three regional information nights to inform families about their pathway options and augmented its high school fair by adding parent rooms in both English and Spanish to help parents fill out school choice forms. In addition, the district has become more intentional about ensuring that nonselective pathways are included in the information sessions and is developing a middle school career module that will include discussion of students' high school pathway options. Porterville holds pathway "showcases" that bring in all 8th-graders and their families to learn about various pathways. The district has found that videos, student presenters, and 8th-grade teachers have been effective in influencing student choice, while marketing letters and brochures have been less impactful. District leaders in Sacramento have also engaged in a range of pathway marketing efforts, including advertising Linked Learning, translating marketing materials into the top five or six home languages, and providing translators at recruitment events. Other districts, including Pasadena and Oakland, are picking up middle school recruitment and marketing efforts and are in the early stages of establishing career exploration modules. For example, through a federal i3 grant with the College Board, Oakland has initiated a program for students to develop individual college and career plans in the 8th and 9th grades. The district hopes these plans will be a mechanism for advising students into pathways and will improve access and equity. In addition, in several districts, district leaders are increasingly reaching out to middle school teachers and counselors to improve their understanding of pathways so they can help their students make informed choices.

With the exception of Porterville, districts have adopted few districtwide enrollment and choice policies to facilitate access to pathways beyond these communication and recruitment efforts. Porterville has made a conscious effort to make all pathways accessible to students and to encourage students to choose a pathway by career theme (and not on the basis of where their relatives went or where their friends are going). In addition to the robust communication and marketing campaign to inform 8th-grade students and families about their pathway options, the district provides districtwide transportation (a necessity since the district draws students from a large, rural area).

District leaders identified pathway career theme and academic reputation as increasingly important factors in determining students' pathway choices.

These efforts by districts to help students make informed choices about their high school program of study through increased communication and recruitment may be paying off. District leaders reported in interviews that career theme is an important factor in attracting students to a pathway. For example, in Porterville, the initiative district with the greatest number of open-access certified pathways, district and school staff reported that the pathway career theme is taking on increasing importance in students' choice of schools and pathways, while school location is less a factor.

> ...until [the transportation technology pathway] doesn't feel like auto tech to parents in a primarily Latino community, that continues to be an issue [for student recruitment].
>
> -District administrator

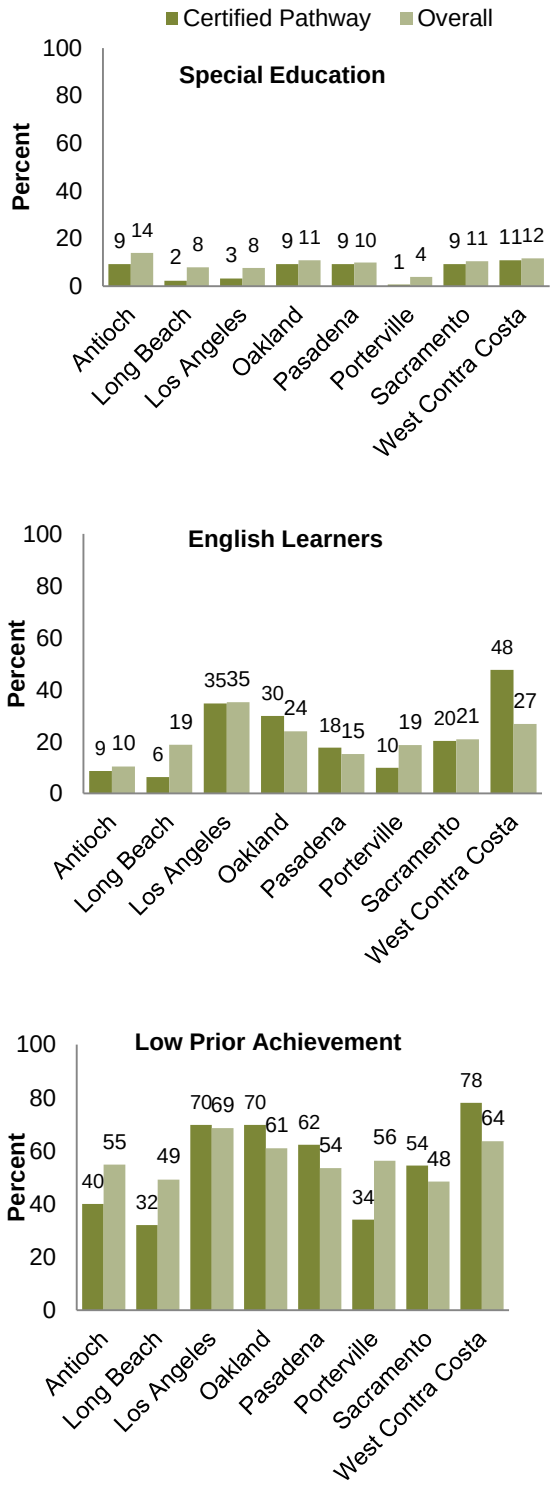
One challenge pathways face is that students' choices may be based on outdated perceptions of pathways. District leaders reported that the reputation of some pathways (whether positive or negative)

can be hard to change, resulting in self-sorting of students based on prior achievement or other student characteristics, or difficulty in attracting students. For example, a transportation technology pathway has been undersubscribed because families and students conceive of it as a vocational track. A district leader reported that the pathway "feels like automotive as opposed to more complex or advanced technology," adding, "until it doesn't feel like auto tech to parents in a primarily Latino community, that continues to be an issue." Other pathways in the initiative have established a reputation for having a strong academic program (e.g., Dozier-Libbey in Antioch, CAMS in Long Beach, Engineering Academy at Harmony Magnet in Porterville). These programs appear to be attracting families who are actively seeking out the most rigorous academic options for their children, and some of them have entry criteria, ensuring that they serve a lower proportion of students with low prior achievement than the district as a whole.

Special education students, English learners, and underachieving students are underrepresented in certified pathways in three districts, but in four other districts we see a higher percentage of underachieving students enrolled in certified pathways than in the district as a whole.

We examined the student enrollment patterns in certified pathways that result from this interplay among pathway availability, theme, and district recruitment practices. West Contra Costa, Oakland, and Pasadena have been particularly successful in ensuring equitable representation of special education students and overrepresentation of English learners, and underachieving students (defined as those below proficiency on the 8th grade ELA CST exam) in certified pathways. Students from these subgroups are underrepresented in certified pathways in Antioch, Long Beach, and Porterville (Exhibit 2-2).[11] Achieving representative enrollment of special education student in certified pathways has been a challenge in almost all the districts, though Oakland, Pasadena, Sacramento, and West Contra Costa manage to enroll percentages comparable to those of their district as a whole. In contrast, English learners had similar

Exhibit 2-2
Student Subgroup Enrollment in Certified Pathways



[11] The data in this chapter represent the most complete data available for 9th-grade students in the 2013 cohort in Antioch, Long Beach, Pasadena, and Porterville and the 2014 and 2015 cohorts in all districts.

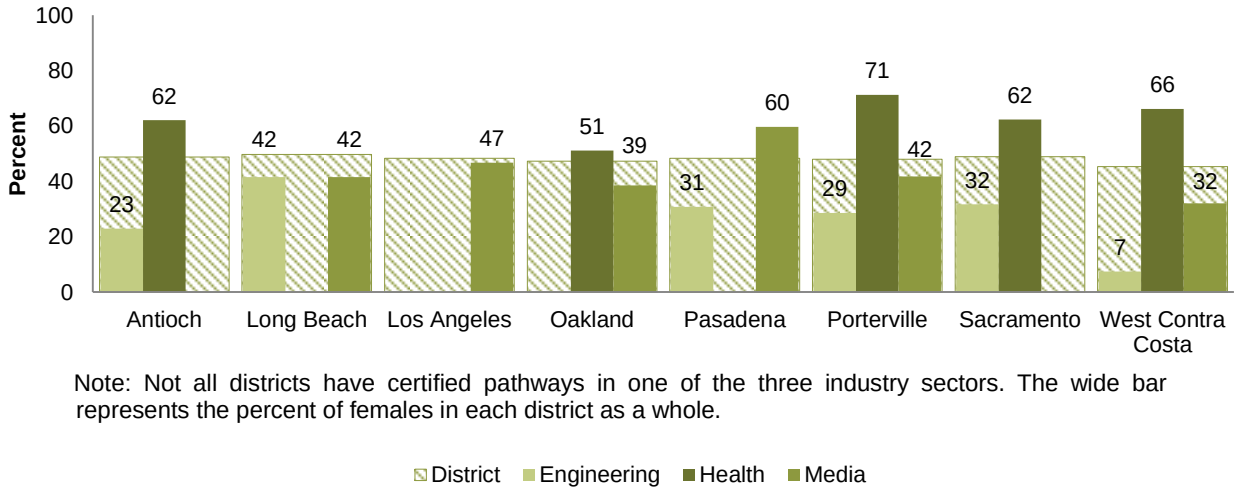
enrollment rates as other students in half the districts and were overrepresented in certified pathways in Oakland and West Contra Costa, but remained underrepresented in Long Beach and Porterville. Certified pathways enrolled the same or greater percentages of underachieving students, compared with the district as a whole, everywhere except Antioch, Long Beach, and Porterville, with Oakland, Pasadena, Sacramento, and particularly West Contra Costa enrolling higher percentages of these students in certified pathways.

Female enrollment is consistently low in engineering pathways and consistently high in health pathways.

> [G]irls enrolled at disproportionately low rates in engineering pathways and at disproportionately high rates in health pathways. This pattern of gender imbalance in enrollment holds true across all districts.

We also see patterns of student enrollment by gender in certified pathways with different career themes. The proportion of girls in high schools in the districts ranges from a low of 45% in West Contra Costa to a high of 50% in Long Beach. The percentage of female enrollment in certified pathways exceeds the average female enrollment rate in seven of the eight districts by anywhere from 2 (Long Beach and Porterville) to 8 (Oakland) percentage points. West Contra Costa is the only district in which girls are underrepresented in certified pathways overall; girls constituted just 35% of students who enrolled in certified pathways, compared with 45% of students in the district overall. Focusing on the three career pathway industry sectors that represent the largest numbers of certified pathways—Engineering, Media, and Health—we find that girls enrolled at disproportionately low rates in engineering pathways and at disproportionately high rates in health pathways.

Exhibit 2-3
Female Enrollment in Certified Pathways by Career Theme Compared with District Average



Note: Not all districts have certified pathways in one of the three industry sectors. The wide bar represents the percent of females in each district as a whole.

Exhibit 2-3 shows the share of girls enrolled in certified pathways in each of the listed themes (colored bars) and the share of girls in the district overall (wider uncolored bar). This pattern of gender imbalance in enrollment holds true across all districts that have certified pathways in health and engineering career themes. In contrast, the numbers of girls who enrolled in certified pathways with a media career theme varied from district to district. Female enrollment in certified media pathways was high in Pasadena, about the same as the district proportion in Los Angeles, and low in Long Beach, Oakland, Porterville, and West Contra Costa, though the sizes of these discrepancies are smaller for these media pathways than the gender gaps in heath and engineering pathways.

We conducted a similar analysis of enrollment in certified pathways by career theme for special education students, English learners, and underachieving students and found no consistent patterns of disproportionate enrollment for any of these student subgroups.

Retention in Pathways

To realize the goals of Linked Learning, it is not sufficient to convince students to enroll in pathways in the early years of high school; pathways must also effectively engage and support students such that they choose to remain in the pathway as they progress to higher grades. In this retention analysis, we present the percentages of students who remain in their initial certified pathway, those who switch between pathways, and those who stay enrolled in the district but opt out of pathways, an indication that these pathways may not be meeting their needs. We also present the percentage of pathway students who leave the district altogether, a category that includes both students who enroll in another district (reflecting family mobility, which educators cannot control) and those who drop out of school (an outcome pathways are designed to avoid). This analysis does not address the question whether pathways are more or less effective at retaining students than other high school programs; we do not provide data for students in other programs in the districts, nor do we adjust for students' background characteristics and prior achievement. Rather, this descriptive analysis of pathway retention addresses the simple question of whether pathway students stay in their pathway. In doing so, we provide context for the student engagement and achievement outcomes presented in Chapter 6, which includes an analysis of whether Linked Learning pathways are any more or less effective than other high school programs in retaining students in the district.[12] In addition, just as we present pathway enrollment rates for English learners, special education students, and underachieving students as an indicator of equity of access, here we present retention rates for these populations as an indicator of how well pathways are serving their needs.

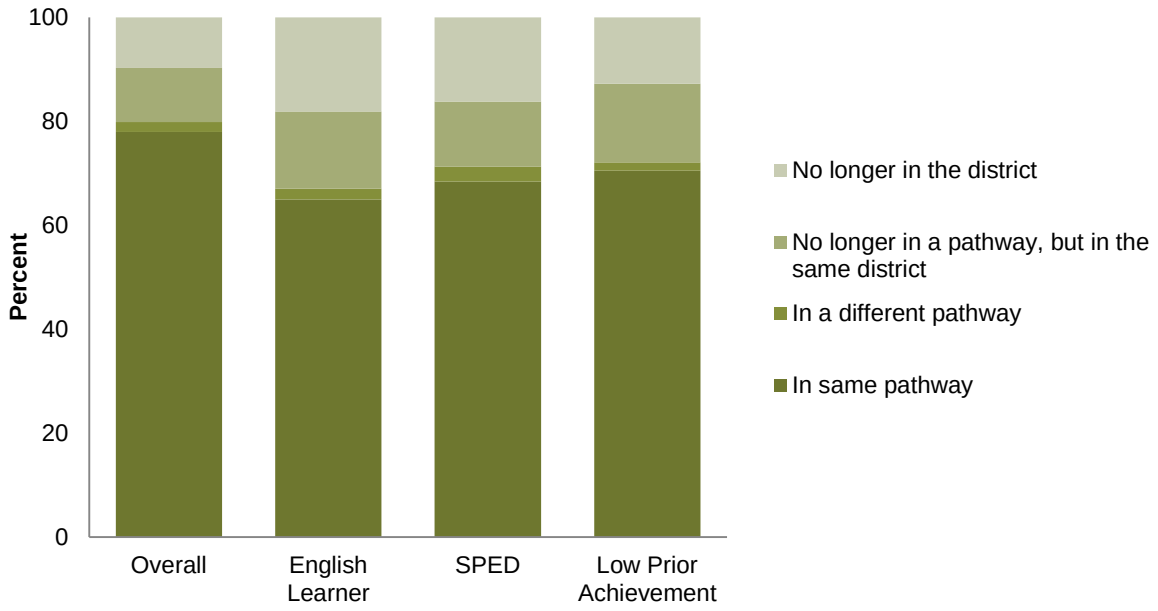
Nearly 80% of students who initially enrolled in a certified pathway remained in the pathway through the beginning of the 11th grade.

Across the seven districts for which we have data, 78% of students who started out in a certified pathway in 9th grade were still in the same pathway by the time they reached 11th grade, and less than 1% of students who started in a certified pathway switched to a different pathway.[13] The fact that nearly four-fifths of students choose to stick with their initial pathway selection suggests that these programs are effectively engaging and supporting students. Overall, 10% of students who started in a certified pathway chose to opt out of these pathways altogether; nearly 10% of students who enrolled in a certified pathway in its initial year had left the district by the beginning of 11th grade (Exhibit 2-4).

[12] In Chapter 6, we compare engagement and achievement outcomes for students in certified pathways with those of their peers enrolled in more traditional high school programs. To reduce selection bias, we conduct an Intent to Treat analysis, defining pathway enrollment based on students' enrollment in the earliest grade level served by the pathway. This means that approximately 20% of pathway students have only one or two years of exposure to a Linked Learning pathway (grades 9 and/or 10).

[13] Montebello had no certified pathways during the study period. We excluded West Contra Costa and Oakland from this particular analysis because pathways in these two districts begin in 10th grade. We conducted separate analysis of pathway retention in West Contra Costa and Oakland and found provided similar results. See appendix for details.

Exhibit 2-4
Retention to the 11th Grade in Certified Pathways Overall and by Student Subgroup



English learners, special education students, and underachieving students face significant barriers to pathway persistence, though district and school staffs are increasingly aware of the need to ensure that all students can participate in the pathway program of study.

English learners, special education students, and underachieving students in certified pathways have lower than average pathway retention rates, driven by both higher than average movement out of pathways and greater departure from the district. Overall, 10% of all students in certified pathways had left the district by the beginning of 11th grade; in comparison, 18% of English learners, 16% of special education students, and 13% of underachieving students who started in certified pathways had left the district by that time. Similarly, 10% of all students in certified pathways had moved out of any pathway (and into either a traditional high school program or alternative program in the district) by the beginning of 11th grade, compared with 15% of English learners, 13% of special education students, and 15% of underachieving students. This analysis suggests that pathways are struggling to retain students in these subgroups but does not address the question whether a more traditional high school program would better serve their needs. The lower district retention rates for these students are likely to be due, in part, to higher household mobility among these groups, a factor that educators cannot control. The fact that these subgroups were less likely than other students to persist in a certified pathway and, in many cases, left for another program within the same district suggests that these groups may face unique challenges that prevent them from persisting in pathways or may be leaving to seek services they were unable to access in their pathway.

Although each of these groups faces a different set of challenges and requires a different set of supports, interviews and focus group findings point to two reasons why these students may leave their pathway that districts and pathways can address: scheduling and adequate academic supports. Scheduling is a common barrier to full inclusion of special populations in pathways because students in these groups are more likely to be enrolled in classes that interfere with their enrollment in the pathway core. For example, underachieving students are more likely to need to repeat a failed course, and English learners may have to fit their schedules around courses that support their English language development. For the most part, districts have not devised solutions to these scheduling challenges; one exception is a large comprehensive high school in Pasadena that offers an eight-period day, which has enabled special

populations to take their required classes while also accessing the pathway program of study. In addition to more flexible schedules, districts must consider more targeted interventions to ensure that all students can successfully participate in and complete a pathway course of study. At least two districts, Antioch and Porterville, are beginning to think more systematically about how to improve interventions and expand supports for special populations—for example, by providing summer bridge programs or hiring intervention specialists. Note that for English learners, however, teachers generally reported in interviews that all but the least proficient English learners are able to access support services in pathways to the same extent as they would be outside of pathways. In addition, there are challenges to pathway persistence that are unique to each of these student groups. For example, our focus group and interview responses offer some insight into the reasons underachieving students may leave. Students in some pathways reported that their peers left the pathway because they felt it was too academically challenging. Students with low prior achievement could be especially likely to seek a different program of study if their pathway seemed too demanding.

Teachers and district administrators reported that pathways struggle to serve special education students; districts and schools are implementing different strategies to address this challenge.

In general, pathway teachers reported that students with mild/moderate disabilities are able to participate in pathway courses and receive the supports required by their Individualized Education Programs (IEPs; for example, accommodations such as extra time to complete assignments). However, pathway teachers find it more challenging to include students with severe disabilities because they do not feel they have the knowledge and skills to support these students effectively in an inclusive model. As a pathway teacher noted, “For kids who are developmentally disabled, they are harder to integrate. Sometimes you don’t feel like you’re supporting them enough, but worry about neglecting the other students.”

Some schools and pathways are developing targeted strategies to include special education students. For example, in one comprehensive high school with wall-to-wall pathways (i.e., all students are enrolled in a pathway), special education students are placed into one of two academies so special education teachers can support them more effectively. Pathway teachers expressed mixed feelings about this structure—while it allows students to receive more concentrated supports, some teachers feel frustrated when their particular pathways receive a disproportionate concentration of high-needs students. In addition, this strategy does not support open access to the full range of pathway options in the district for these students. Another example is a comprehensive high school in a different district that is piloting a program to enable special education students to participate in pathways in a more meaningful way than they could before. Special education teachers from that high school are meeting with every special education student, asking them which pathway they want to affiliate with, and setting up an IEP to allow them to participate in the pathway that they choose. As part of this process, special education teachers are having discussions about how to allow their students to participate in the same integrated projects as the rest of their cohort, but with modified outcomes and embedded life skills development that will help special education students meet the objectives of their IEPs.

Student Course-Taking in Pathways

Once a student enrolls in a pathway, his or her high school experience is not set in stone. Although most pathways have a fixed course of study, we have seen throughout the initiative that course-taking patterns within pathways vary from student to student. Students who take fewer courses in their pathway’s program of study will not experience as much of the relevant, integrated instruction that is central to the approach as those who take the full course of study. It is also more difficult for teachers to implement an integrated curriculum when they have mixed classes with both pathway and non-pathway students enrolled.

To better understand variation in course-taking patterns, we looked to data gathered from our interviews with pathway teachers and students and from review of pathway course of study documents, as well as pathway course-taking data. These data were available for only a small proportion of certified pathways, so rather than present general findings, we focus on course-taking patterns of the 2013 graduating cohort in two pathways, one in the Arts, Media, and Entertainment (AM&E) sector and the other in Engineering and Design (E&D). For each pathway, we calculated the percentage of pathway students enrolled in the

most common class for their pathway in each subject area in each semester of their high school career. The experiences of these pathways and other pathways across the initiative suggest that the program of study of students in a single pathway varies, particularly in the upper grades and in math in all grades.

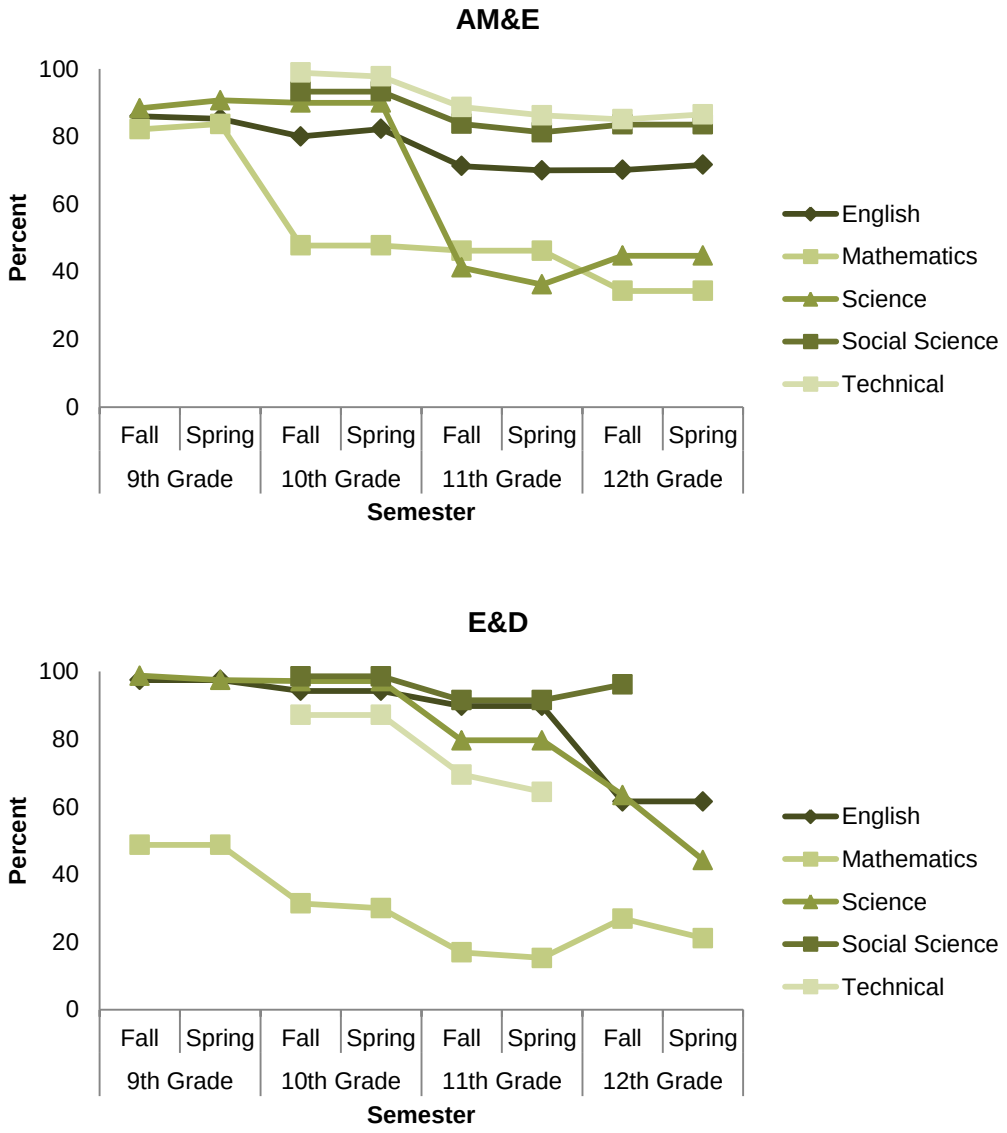
Pathway students experience the most variation in course-taking in math and science classes.

Our interviews with pathway teachers and administrators indicate that creating master schedules that allow dedicated courses for pathway students is hard in general. It is especially difficult to schedule certain classes (especially math and, to some extent, science classes) in a way that meets students' needs and allows them to participate fully in their pathway. For example, math has typically been among the most highly differentiated subjects in comprehensive high schools, and math sequences in high school are often formalized with students required to pass prerequisite courses before they can move to more advanced courses (Adelman, 1999; Lee, Croninger, & Smith, 1997; Stevenson, Schiller, & Schneider, 1994). This means that pathway students may be in different levels of the same course (e.g., remedial, regular, college-prep, advanced placement), and that pathway students who fail a course may not be able to proceed to the next level with their peers. Some pathways, such as those at Richmond High School in West Contra Costa Unified, have removed math classes from their pathway programs of study entirely. Other pathways attempt to integrate math and science classes in the pathway program of study, but do not have all students take the same course. On the other hand, our reviews of pathway programs of study and interviews with pathway leads and teachers indicate that the majority of pathway students do enroll in the same English, social science, and technical classes, at least in the lower grades of high school.

Selection of Example Pathways for the Course-Taking Analysis

We selected the two pathways for this analysis because they have career themes reflecting two of the most common industry sectors represented by certified pathways (Arts. Media and Entertainment, and Engineering and Design), reflect the pathway experience in two different districts, and are located in large, comprehensive high schools, the kind of schools where achieving cohort purity is the most challenging and students' course-taking patterns in pathways are most likely to diverge.

Exhibit 2-5
Pathway Students in the Most Common Class for Their Pathway in Each Subject



Note: These percentages represent the percentage of pathway students who take the course in each subject area with the highest proportion of pathway students.

Source: District-provided data.

This pattern of convergent course-taking in English, social science, and technical subjects and divergent course-taking in math and science is largely true in two pathways for which we analyzed course-taking data. Exhibit 2-5 shows the percentage of students enrolled in the pathway for each semester and grade level who are enrolled in the most common course in each subject.[14] Nearly all students in each of the pathways take the same English, social science, and technical classes, at least in the first two years of high school. However, although 80% of pathway students in the AM&E pathway take the same math

[14] The percentages in Exhibit 2-5 reflect the extent to which pathway students are concentrated in the same course in each subject area. However, the data do not allow us to capture the proportion of pathway students in a given section of a course, so the actual purity of these classes may be lower than these numbers imply.

course in 9th grade, this drops to less than 50% by 10th grade. And in the E&D pathway, 51% of pathway students take the same math class in 9th grade and the percentage drops in subsequent years.

To a certain extent, these patterns map to the pathway program of study. According to our review of pathway documents outlining the course of study, juniors in the AM&E pathway may be enrolled in one of four different math classes (geometry, algebra II, advanced math, or AP calculus) or in one of five different science classes (chemistry, physics, biotech, AP biology, or AP chemistry). For the 2013 graduating cohort of AM&E students, we have data on the most popular math and science classes taken during their junior year (2011–12) and can see that 51% of the 73 students in the pathway that year took geometry as their math class and 45% of pathway students took physics as their science class. The E&D course of study does not provide options for science courses in the upper grades (chemistry 1-2 in 11th grade, physics in 12th grade) but does offer two options for math for pathway juniors (integrated algebra or pre-calculus) and seniors (pre-calculus or calculus). However, despite the listing of few options for math and science in the upper grades, the actual science and math course-taking of students in the E&D pathway's 2013 graduating cohort did vary in the upper grades; more than 80% of juniors enrolled in chemistry, but this drops to 63% of seniors in enrolled in the first semester of physics and 43% in the second semester, and we do not see a concentration of students in any single math course beyond the 9th-grade year.

Some pathways provide more options in the program of study in the upper grades.

In some respects, the fact that individual pathway student course-taking patterns diverge more in the upper grades of high school is by design. The pathway programs of study for the E&D and the AM&E pathways each list increasing numbers of possible pathway courses students may choose to take each successive year of high school. For example, the E&D pathway course of study offers multiple options for technical courses for pathway students in their junior and senior years. The purpose of adding more course options to the pathway program of study in upper grades is to tailor the pathway experience to individual student needs and interests. Allowing flexibility in student course options is one way to address the need to keep pathway participation open to the widest range of students, including students with special learning needs and students who want to take advanced-level or AP courses. However, increasing options for course-taking also means that pathway students in upper grades have fewer courses in common with other pathway students. Students may also decide to enroll in courses outside of their pathway later on in high school because they simply want to pursue interests outside of their pathway theme. This opting out, combined with the different options available within the pathway course of study, means that even for two students who complete the course of study and graduate from the same pathway, we cannot assume that they experienced a uniform program of study, especially in the upper grades.

Some pathway students opt out of pathway courses during their junior and senior years to take AP or honors classes.

Another source of variation in course-taking in the upper grades stems from enrollments in honors and AP courses. Pathway staff members have identified, and students have confirmed, that some higher-achieving students opt out of pathway courses during their junior and senior years because of a desire to take AP or honors classes. For example, in the AM&E pathway, 31% of seniors took AP English Language and Composition, and in the E&D pathway, 18% of juniors and 16% of first-semester seniors took this course. Pathway teams typically cannot accommodate advanced courses within the pathway curriculum because only a small proportion of pathway students will be prepared to take them. Although this pursuit of rigorous coursework is consistent with the goals of Linked Learning, it does contribute to a less consistent program of study across pathway students in the upper grades.

Implications

Linked Learning district leaders have long been mindful of the need to ensure equitable access and opportunities to participate fully in pathways for all interested students. They have made significant progress in communicating broadly the message that Linked Learning pathways are open to all students, including students with disabilities, English learners, and underachieving students. However,

communicating the message of inclusion is just one very small step toward full inclusion of all students in pathways. Patterns of pathway enrollment by students with special learning needs differ greatly from district to district. In addition, relying on communications and recruitment strategies to ensure open access to pathways will result in self-sorting of students by characteristics such as gender, as we see with the health- and engineering-themed pathways. To ensure more equitable representation of all students in all pathways, districts will need more aggressive recruitment strategies to move beyond the traditional patterns of enrollment by gender, and for pathways that have a reputation for rigor and/or entrance criteria, prior achievement level.

It is not enough to enroll students; pathways must also retain them. The lower rates of retention in pathways we see for English learners, students with disabilities, and underachieving students speak directly to the need to strengthen supports for students with special learning needs in pathways. Students with special learning needs require stronger academic and other forms of support to complete a pathway course of study than other students. Simply relying on existing district and school support systems that are available to all students with special learning needs, regardless of whether or not they are in a pathway, is inadequate. Pathways demand more of students, and districts and schools should focus attention on tailoring supports in ways that enable more English learners, students with disabilities, and underachieving students to be retained and complete a pathway course of study.

Diversity of students' experiences within a pathway is not by itself a problem. Flexibility in the pathway course of study is necessary to meet the needs of a diverse student population. However, evidence of variation in levels of participation in a pathway program of study is troubling. Without some common courses, it is difficult for pathways teachers to develop integrated projects and lesson sequences. District leaders and pathway leads and teachers will need to examine the various paths that students take through a pathway course of study and work to address any barriers to pathway completion and to strong college and career readiness for all students in the pathway.

Chapter 3: Curriculum, Instruction, and Assessment

Key Findings

- In districts that have provided teachers with tools and a road map to align Common Core standards and Linked Learning, pathway teachers are better positioned to integrate the new standards into existing curriculum.
- In districts where Common Core and Linked Learning efforts were not strategically aligned, competition for professional development and planning time and a perceived misalignment between existing pathway curriculum and new Common Core curriculum slowed momentum for Linked Learning.
- Pathway staff in many Linked Learning districts continued to work on developing performance-based assessments, which provide students an opportunity to demonstrate deep content learning through authentic applications.
- Pathway instruction has not received the consistent focus and attention that district leaders realize are needed to improve student outcomes, although some districts are engaged in early efforts in this area.
- A greater share of twelfth-grade students in certified pathways than comparison students reported experiencing rigorous, integrated, and relevant instruction, suggesting that initial work to improve pathway curriculum and instruction may be paying off.

In the preceding chapter, we took an in-depth look at students' access to Linked Learning pathways in the nine districts, examining trends in enrollment, retention, and course-taking. In this chapter, we discuss students' experiences with the academic and technical programs of study once they enroll in a Linked Learning pathway. To meet the goal of preparing all young people for a range of postsecondary opportunities and, ultimately, high-skill employment, the Linked Learning approach demands a fundamental and complete transformation of teaching and learning. The approach requires teachers to deliver challenging academic content that is consciously and effectively linked to the pathway theme and to make explicit connections across content areas through a project-based approach. It involves students' being engaged in learning that is inquiry based and contextualized in real-world experiences and applications. In a fully developed Linked Learning pathway, students experience core academic courses and a technical course sequence that are integrated so that what is learned in one content area is combined with and reinforced in the other content areas over an extended time. In addition, students participate in several project-based, multidisciplinary units each year that are aligned to the pathway theme and that immerse students in problem solving around real-world issues.

In past evaluation reports, we have observed that pathway teams, with support from district staff and ConnectEd coaches, invested significant time and effort developing pathway curricula that integrate content across disciplines and provide students with authentic, project-based experiences. More recently, pathway teams have begun to develop and implement authentic assessments and inquiry-based instruction techniques designed to help students engage with more rigorous content. In SRI's fourth-year report (Guha et al., 2014), we found that many pathways had successfully developed integrated academic and technical curricula and had made progress with performance-based assessments. We also noted that the rigor of academic and technical curricula and the quality of instructional practice continued to be two areas that needed attention within and across the nine districts for students to experience fully the promise of Linked Learning.

The 2013–14 school year presented new opportunities for the nine Linked Learning districts to improve curricular rigor and instructional practice in pathways. It was the first year that districts began implementing the new Common Core State Standards (CCSS) in earnest, with students across the state piloting Common Core–aligned assessments in spring 2014. The new standards, in theory, align fully with the goals of Linked Learning. Together, Common Core and Linked Learning have the potential to lead to major improvements in the way high school teachers teach and assess students and the way students learn, given the common focus on developing students' higher-order thinking skills, application of real-world concepts, and authentic demonstrations of learning. Many pathway teachers reported having a head start on implementing the new standards through their experiences developing and teaching integrated projects. However, we know from decades of studying school reform that teachers often experience multiple new initiatives and reforms as being disconnected from one another; despite the positive intentions behind these initiatives, teachers may feel overwhelmed and overburdened trying to implement several new programs simultaneously.

Commonalities: Linked Learning and the Common Core Standards

1. Shared student learning outcomes with an emphasis on higher order thinking skills;
2. Compatible approaches to interdisciplinary curriculum, instruction, and performance-based assessment;
3. Real-world integration and application of academic and technical skills and knowledge;
4. Student assessment through authentic demonstrations of learning (e.g., portfolios, project defenses, exhibitions).

Source: Rustique and Stam (2013).

Thus, it is critical how the nine districts communicate the alignment of Common Core and Linked Learning and implement these initiatives strategically so that teachers view the initiatives as complementary and not competing. We begin this chapter by describing district-level efforts to improve pathway curriculum, instruction, and assessments, with a focus on the alignment of these efforts with Common Core standards implementation. We then discuss pathway-level efforts to develop performance-based assessments, as well as early efforts to improve instructional quality in pathways. We then delve into students' own reported experiences with classroom learning and expectations to assess whether students themselves find the curriculum and instruction to be engaging, relevant, and meaningful.

Developing Pathway Curriculum, Instruction, and Assessments

This year, the nine Linked Learning districts made it a priority to support teachers in the transition to the Common Core standards. The Linked Learning approach lends itself to supporting implementation of the Common Core through emphases on integrating academic and technical curricula, interdisciplinary instruction, and authentic demonstrations of learning. Through leadership institutes and coaching, ConnectEd worked to communicate the alignment between the Common Core standards and Linked Learning. Notably, the message from ConnectEd, along with district leaders and coaches, was that the Common Core standards are what teachers are expected to teach, while Linked Learning is the vehicle through which teachers can teach those standards.

In districts that have provided teachers with tools and a road map to align Common Core standards and Linked Learning, pathway teachers are better positioned to integrate the new standards into existing curriculum.

Linked Learning leaders across the nine districts understand and agree that Linked Learning is well aligned with and can support Common Core implementation. In fact, a recent publication from ConnectEd and SCOPE (Rustique & Stam, 2013) lays out for districts how the Linked Learning approach supports teachers in teaching the new standards (see text box for list of commonalities).

Pasadena is an example of a district that has been able to effectively align the rollout of the new standards within existing efforts to implement Linked Learning districtwide. The district provided all high school teachers with training in project-based learning and used the same project design template for

pathway integrated projects and Common Core standards–aligned projects. Thus, teachers have a common instructional foundation from which they will all be working moving forward.

In addition, while revamping the district's secondary curriculum, the Linked Learning director in Pasadena worked closely with the chief academic officer to organize curriculum work groups and intentionally included pathway staff in those groups. As a district leader shared, "We had a lot of Linked Learning teachers in the curriculum revision workshops. A lot of units were developed with Linked Learning teachers. That is why I'm confident we have that alignment." A pathway teacher concurred, "Everything in Linked Learning is connected to the Common Core. Everything asks about integration."

Similarly, Sacramento drew on the expertise of Linked Learning staff to support districtwide Common Core English Language Arts implementation. The district also approached its redesign of the high school English curriculum "from a Linked Learning paradigm." District instructional leaders are looking at how to create a flexible high school curriculum that enables pathways to easily integrate the pathway theme into Common Core–aligned curricular units.

In other districts, district leaders focused primarily on messaging, explicitly communicating the connections between Linked Learning and the Common Core standards to staff. For example, Antioch included discussions about Linked Learning and Common Core standards integration as part of the district's Common Core task force. Staff supporting pathways in Montebello made a conscious effort to discuss Common Core and Linked Learning together when working with pathway teachers on curriculum and instruction. As a coach described,

> We have worked to make sure that teachers understand it's all the same work, [and understand] all the commonalities between Common Core and Linked Learning…. [We] try to make the connections for them in their professional development and talked specifically about where/when to make Common Core connections throughout the day.

These strategic efforts to align and communicate the alignment of Linked Learning and the Common Core standards have helped create more cohesion between the two initiatives in these districts, thus providing a more seamless transition for pathway teachers as they work to integrate the new standards into existing curriculum.

In districts where Common Core and Linked Learning efforts were not strategically aligned, competition for professional development and planning time and a perceived misalignment between existing pathway curriculum and new Common Core curriculum slowed momentum for Linked Learning.

In districts that have been less effective at coordinating and balancing their districtwide Common Core efforts with Linked Learning, the emphasis on Common Core seems to have slowed pathway progress around curriculum and instruction. Although district leaders and coaches across the nine districts, along with ConnectEd, have consistently made the case for the alignment between Linked Learning and the Common Core standards, pathway staff in some districts felt the implementation of the two efforts was disconnected, resulting in frustration. A district administrator reflected, "While we always understood that it [CCSS] was the frame of Linked Learning, it did not feel that way to teachers. It's slowly resolving itself…. Everything that is happening in the district right now is a huge change." Likewise, a teacher in a district where Common Core training did not initially align with Linked Learning struggled to both shift to the new standards and keep on track with integrated projects. As she described,

> While we always understood that it [CCSS] was the frame of Linked Learning, it did not feel that way to teachers. It's slowly resolving itself… Everything that is happening in the district right now is a huge change.
>
> -District administrator

> Changing to the CCSS curriculum has thrown me a little bit away from [the pathway] or from the project that I had in mind at the beginning of the year. We haven't been able to do as much as I wanted to. I'd like every couple of weeks to be doing something [integrated] and I don't think I have gotten to that.…We haven't been so up and down and gone back and forth on the pacing calendar [because of the shift to the Common Core].

There were several reasons for the tensions that pathway teachers experienced. First, implementation of the Common Core emphasizes collaboration among single-subject teams, such as English teachers, working together to develop and revise lessons and units, which unintentionally disrupted the work of pathway teams on their integrated, interdisciplinary projects. Second, Common Core directly competed with Linked Learning this year for professional development and teacher collaboration time, especially where the two initiatives were rolled out by different offices. In one district, for example, where different district offices were responsible for Common Core and Linked Learning implementation and staff were unable to work together effectively, Common Core and Linked Learning professional development was always scheduled at the same time, forcing teachers to choose which training to attend. A pathway teacher discussed this tension:

> The challenge is that I've gone to zero professional development sessions for Linked Learning because I lead the professional development onsite for the English department. I feel like in my short experience in the classroom, when I started, we were on this movement away from collaboration around content and more toward Linked Learning. With Common Core, it is pushing us back to realizing the value of content collaboration as well as cross-curricular collaboration. It's a challenge to find that balance. It's hard to get all my English teachers at a professional development meeting because some are at academy/pathway meetings. It's a balance. I believe that both are essential.

In a different district, the separation of Common Core and Linked Learning professional development limited teachers' understanding of how to use the Linked Learning approach effectively to support Common Core implementation. As a district staff member noted,

> The expectation is that it [Common Core and Linked Learning] is aligned. But there is a challenge in terms of teacher understanding of how that connects. [Teachers] don't get that it could all be in one. They will sometimes silo in the classroom—"We're doing Linked Learning right now, and Common Core at this time"—and we need to get them to understand that, "No, you're just doing good teaching in relation to the pathway and that addresses both.…"

A third related issue is that pathway teachers in some districts experienced a misalignment between integrated pathway curriculum and new districtwide Common Core standards–aligned curriculum. For example, in one such district, educators perceived the Common Core–aligned curricular units as highly prescriptive, developed without input from Linked Learning teams, and pushed out to teachers to implement without any time for them to try to adjust their integrated projects. Consequently, some pathways did not implement as many integrated projects as they had in the past. A pathway teacher reflected on this experience: "I think the CCSS is very tightly scheduled. Sometimes the [pathway] projects, you really need to tweak them. [CCSS] feels like something extra." As a district leader observed, "We had a lot of very frustrated, unhappy teachers."

The experiences of these districts suggest that ideological support from district leadership for the alignment of reform initiatives is different from practical support in the form of time, professional development, and coaching. In a number of districts, a stronger district leadership team that comprises Linked Learning and curriculum and instruction staff (and who work closely together) may have mitigated the challenges and frustrations that pathway teachers experienced. In fact, leaders in these districts recognize the challenges encountered during their rollout of the Common Core standards and have planned or already implemented changes to support better alignment with Linked Learning. Promising changes include cross-staffing Linked Learning and Common Core instructional support teams, adjusting

Common Core units for pathways and providing pathway teachers flexibility with the implementation of those units, and meetings with school staff to communicate the alignment of the two efforts more clearly.

Pathway staff in many Linked Learning districts continued to work on developing performance-based assessments, which provide students an opportunity to demonstrate deep content learning through authentic applications.

Although rollout of the Common Core standards slowed pathway progress in some districts this year, all districts and pathways continued to work toward improving the quality of students' classroom-based experiences. Notably, during the 2013–14 school year, more than half of the districts made some efforts to support pathway teachers with the development of performance-based assessments. Performance-based assessments provide students an opportunity to demonstrate deep content learning and apply newly acquired higher-order skills through authentic products and performance. With support from district staff and/or coaches, teachers in several pathways worked on developing performance tasks, developing and refining common rubrics for scoring those performance tasks, revamping senior projects (including movement toward senior defense models), and/or backward-mapping curriculum across grades or to graduate outcomes. For example, in one district where coaching has focused on supporting pathway teams with the development of performance-based assessments and common rubrics, pathway teachers reported broad use of performance-based assessments in day-to-day classroom instruction, as well as for more involved integrated projects. In another district, staff reported more modest steps—just working on exposing teachers to performance tasks, but not yet providing direct support for classroom implementation. Within several districts, pathways themselves varied in their development and implementation of rigorous performance-based assessments. In at least two of these districts, the use of performance-based assessments appeared limited to pathways that are certified or otherwise more advanced.

The performance-based assessments that pathway staff are developing are consistent with the goals and types of performance tasks that students will face under the new Common Core assessments, which ask students to "demonstrate an array of research, writing, and problem solving skills."[15] Pathway teachers' experiences developing performance-based assessments, and students' experiences demonstrating their problem-solving and analytic skills through authentic performance tasks, should provide a solid foundation for taking future Common Core–aligned assessments.

Pathway instruction has not received the consistent focus and attention that district leaders realize are needed to improve student outcomes, although some districts are engaged in early efforts in this area.

As the initiative has matured, district leaders are recognizing that developing new, integrated curriculum is not sufficient to truly transform teaching and learning in ways that improve students' achievement outcomes. To that end, there needs to be a greater focus on supporting pathway teachers to provide high-quality instruction. ConnectEd's Behaviors of Learning and Teaching (BLT) Framework, lays out expectations for how students should be learning and teachers should be teaching in effective Linked Learning pathways (ConnectEd, 2013). According to the BLT Framework, students should experience collaborative, student-directed, outcome-focused, relevant, rigorous, and integrated instruction. The BLT components are reflected in high-quality integrated projects that ask students to work in collaborative settings with peers and external partners; provide students the opportunity to engage in self-directed inquiry; engage students with industry-specific authentic tasks; tie student learning to broader school, work, or personal goals; engage students in critical thinking and challenging content; and integrate content across subjects. Ideally, students would experience instruction characterized by the BLT components outside of projects as well.

Although district leaders recognize the need to focus on instruction, supporting teachers to develop instructional practices aligned with the BLT Framework is still not a major focus of professional development and coaching. However, this year we heard from district staff in more than half of the districts about early efforts to foster BLT-aligned practices among teachers. For example, in one district,

[15] See http://www.smarterbalanced.org/k-12-education/teachers/.

Linked Learning staff are encouraging pathway teachers to incorporate one or two BLT components into integrated projects. Two other districts have started or plan to incorporate elements related to Linked Learning instruction into instructional walkthroughs and/or the training of assistant principals as instructional leaders who can more closely support and monitor pathways.

On the whole, however, the quality of pathway instruction continues to be a concern for many Linked Learning leaders, with district staff in six districts describing instructional quality as varied across pathways or as an area needing support. One district coach described the importance of explicitly working with teachers to improve instruction:

> We have not shifted learning and teaching, not nearly enough, because that's not where we put the emphasis. We thought that it would naturally occur when the [Linked Learning] components were in place and people had deep understanding, but they didn't have deep enough understanding when they put components in place to truly transform student learning.

We have not shifted learning and teaching, not nearly enough, because that's not where we put the emphasis. We thought that it would naturally occur when the [Linked Learning] components were in place and people had deep understanding, but they didn't have deep enough understanding when they put components in place to truly transform student learning.

-District coach

The implementation of the Common Core standards, and the challenges of teaching to the new standards, may encourage district leaders to pay more attention to improving instructional practice across their high schools, including in Linked Learning pathways.

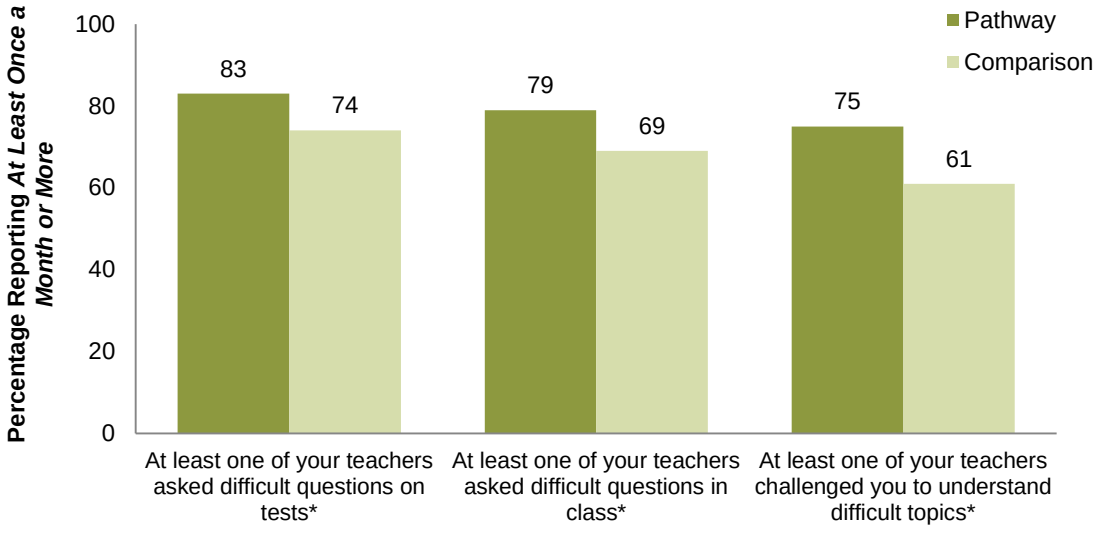
Students' Experiences with Pathway Curriculum and Instruction

As pathway teachers make changes in curriculum and instructional practice, we expect students' academic experiences in pathways to change as well. Although our findings from this and previous years suggest that there is still work to be done to improve curricular rigor and instructional practice in Linked Learning pathways, early efforts do appear to be paying off. Data from the student survey show that a greater proportion of pathway students than of comparison students experienced rigorous, relevant, and integrated instruction.

A greater share of pathway students than of comparison students experience rigorous, integrated, and relevant instruction, suggesting that initial work to improve pathway curriculum and instruction may be paying off.

The BLT Framework calls for rigorous instruction that engages "students in deep critical thinking" (ConnectEd, 2013). As Exhibit 3-1 illustrates, greater percentages of twelfth-grade students in certified pathways than of comparison students reported that at least one teacher asked difficult questions on tests (83% versus 74%), asked difficult questions in class (79% versus 69%), and challenged them to understand a difficult topic (75% versus 61%) about once a month or more.

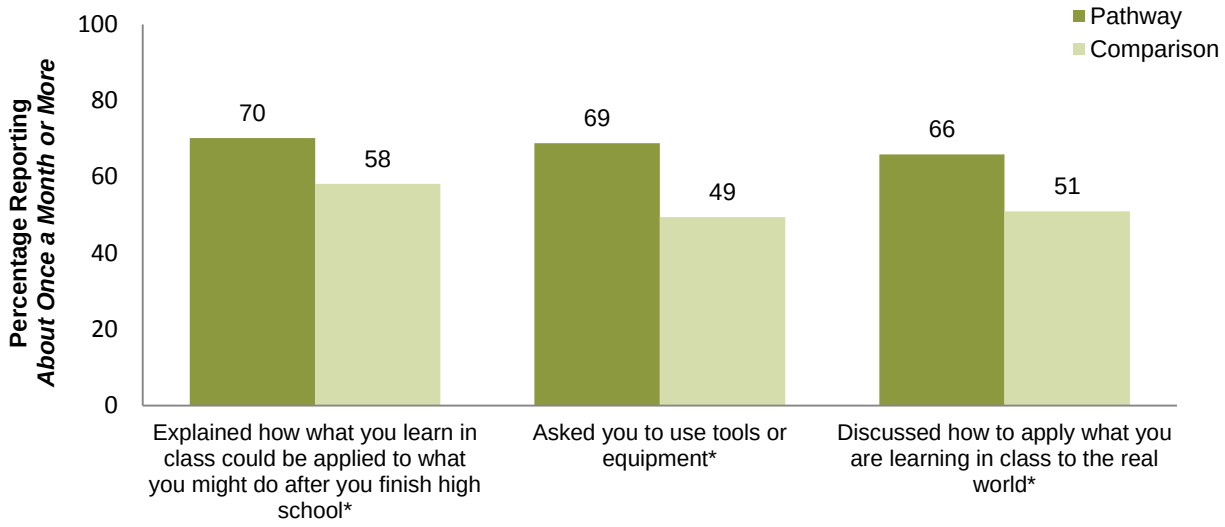
Exhibit 3-1
Students Reporting Feeling Challenged by Their Teachers



*Difference between pathway and comparison students is statistically significant at the $p < .05$ level.
Source: Spring 2014 12th-Grade Student Experience Survey.

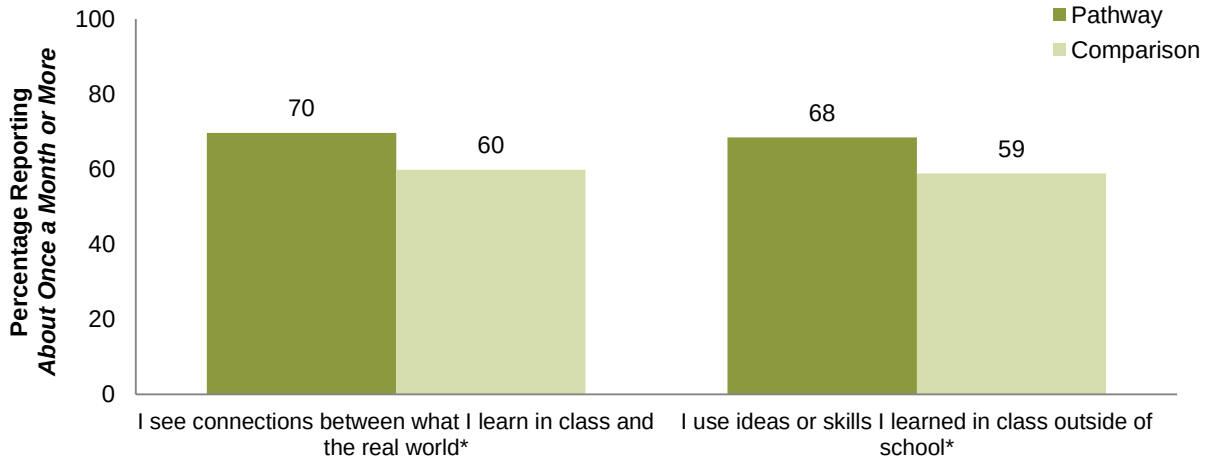
Tying classroom learning to the real world is central to the Linked Learning approach. According to our student survey, greater percentages of pathway students than of comparison students are experiencing relevant instruction and understand the application of that learning to work and life. More specifically, greater percentages of pathway students than of comparison students reported that a teacher explained how what they learned in class could be applied to what they might do after they finished high school (70% versus 58%), asked them to use tools or equipment (69% versus 49%), and discussed how to apply what they were learning in class to the real world (66% versus 51%) about once a month or more (Exhibit 3-2). Similarly, greater percentages of pathway students than of comparison students reported seeing connections between what they learned in class and the real world (70% versus 60%) and using ideas or skills learned in class outside of school (68% versus 59%) about once a month or more (Exhibit 3-3).

Exhibit 3-2
Students Reporting At Least One Teacher Supporting Application of Classroom Learning



*Difference between pathway and comparison students is statistically significant at the $p < .05$ level.
Source: Spring 2014 12th-Grade Student Experience Survey.

Exhibit 3-3
Students Reporting Outside Application of Classroom Learning



*Difference between pathway and comparison students is statistically significant at the $p < .05$ level.
Source: Spring 2014 12th-Grade Student Experience Survey.

These survey data suggest that pathway students' academic experiences with Linked Learning differ from those of comparison students. Specifically, the findings suggest that a greater proportion of pathway students than of comparison students are experiencing challenging and relevant instruction.

Implications

Over the past five years, pathways have made significant progress in developing strong integrated academic and technical curricula. Districts continue to work toward improving the rigor of pathway curricula and building authentic assessments of student learning through the development of performance-based assessments. However, consistent high-quality instruction aligned with the BLT Framework is still lacking in most districts. Linked Learning staff are engaged in efforts to support teachers in changing their instruction, but the variation and concern for quality of instruction expressed by district and school staff suggest room for improvement and a continued need to work with teachers on implementing BLT-aligned instructional practices. To change the vision of *how* curriculum is delivered (instruction) takes more time than changing the content of *what* is delivered (curriculum). Generally speaking, the types of supports cited by district and pathway staff for supporting implementation of a strong academic program remain the same. Even as pathways mature and reach certification, they still continue to need consistent time to plan and collaborate on instruction, stable staffing, strong pathway leadership, and coaching to consistently deliver high-quality integrated instruction.

The dominance of the Common Core standards in districts' curriculum and instruction efforts this year also highlighted a continued need for systems-level coordination around curriculum and instruction. ConnectEd's *Framework for Developing a System of Linked Learning Pathways* suggests "that the planning and adoption process for a system of pathways is aligned with other district priorities, strategies, and plans" (ConnectEd, 2014, p. 10). Common Core rollout has demanded resources, such as teacher time, substitutes, and internal coaches. These resources are finite, and coordination and alignment can help with identifying ways that Linked Learning can be used to implement Common Core, and ensure that these resources can be used to mutually support both Common Core standards and Linked Learning implementation. Long-term, other curricular or instructional reforms may be introduced, which may require similar coordination. Districts may benefit from continuing structures such as cross-staffing district curriculum and Linked Learning teams that they have put in place to support Common Core and Linked Learning alignment.

Chapter 4: Work-Based Learning

Key Findings

- District and pathway leaders took steps to expand the number and variety of work-based learning opportunities for pathway students, but they see a clear need for development of more opportunities at the high end of the work-based learning continuum.
- District leaders are planning to leverage new federal- and state-level funding opportunities to strengthen and expand work-based learning systems.
- Some districts have begun developing systems to track students' participation in work-based learning experiences, but these efforts are nascent.
- Pathway leaders and teachers need time and support to effectively integrate work-based learning experiences with pathway curricula in an intentional and structured way.
- Twelfth-grade students in certified pathways have access to work-based learning at the career awareness and exploration levels, but students' access to and participation in career preparation and training are limited by institutional and student-level barriers.
- Twelfth-grade students in certified pathways reported satisfaction with their work-based learning experiences and believed that such experiences provided useful preparation for their future.

The preceding chapter examined the nine districts' efforts to develop and improve pathway curriculum, instruction, and performance assessments, and students' experiences with the academic and technical core. In addition to offering a challenging academic program that is integrated with a demanding technical sequence of courses, Linked Learning pathways should provide all students with access to a continuum of high-quality work-based learning opportunities that help them connect what they are learning in the classroom to the skills and knowledge needed in a particular industry sector. It is the integration of the academic and technical curricula with work-based learning that makes the Linked Learning experience so unique for students. Moreover, work-based learning experiences provide students with opportunities to learn important career-readiness skills and to interact with working adults who can serve as mentors, role models, and resources for understanding the education and skills required for employment.

We have noted in past evaluation reports ConnectEd's efforts to broaden educators' perspectives of what experiences—beyond internships—constitute work-based learning. This understanding of a broad continuum of work-based learning is a first step toward building a robust district system. Early on in the initiative, educators had a fairly narrow focus on developing internship opportunities for students. At this point in the initiative, district and school staff are aware and understand that work-based learning spans a continuum that ranges from career awareness to exploration to preparation and finally to career training. We also have pointed out districts' efforts to support pathway teams with work-based learning, primarily by hiring staff at the district or school level who are charged with developing relationships with industry partners and connecting students to work-based learning opportunities. Although the nine districts have been focused on increasing the number and range of work-based learning opportunities available to students, an infusion of new state funding in 2014, through the California Career Pathways Trust, provided momentum for these districts to strengthen their work-based learning systems. In 2014, 39 partnerships across the state (including all nine districts involved in the initiative) were allotted $250 million in grants to develop work-based learning infrastructure, create regional partnerships, and improve and expand career pathway programs statewide.

In this chapter, we discuss the status of the nine districts' efforts to build comprehensive systems of work-based learning, focusing on their ongoing work to develop a continuum of opportunities and use new state and federal funding to put in place (or retain) work-based learning staff. We also summarize early efforts by district leaders to develop data systems to track students' work-based learning experiences. We then discuss pathway teachers' early efforts to make connections between students' work-based learning experiences and their classroom learning and the inherent challenges of this work. Finally, given the status of work-based learning systems, we examine students' own reports of their experiences with work-based learning.

Building a System of Work-Based Learning Opportunities

ConnectEd's *Rubric for Linked Learning Pathway Quality Review and Continuous Improvement* (2012) defines the quality of work-based learning in terms of the scope and sequencing of work-based learning experiences and the quality of connections of work-based learning to pathway coursework. According to ConnectEd (2012), the first basic quality criterion for work-based learning is: "All pathway students, regardless of prior academic achievement and behavior, participate in and have access to a continuum of high-quality, real-world learning experiences. The sequence culminates in an extended, intensive work-related experience…." (p. 7). The second criterion for work-based learning is: "[Work-based learning] experiences are aligned with pathway student learning outcomes and provide opportunities for students to apply academic and technical knowledge and skills learned in the classroom" (p. 7). Although some individual pathways have met or come close to meeting these two basic quality criteria for work-based learning, not all students in Linked Learning pathways have access to a full range of work-based learning experiences. Further, in all but a few exemplary pathways, pathway leaders and teachers have not fully integrated work-based learning with classroom learning and pathway outcomes. For districts' leaders and staff to make substantial progress in meeting the basic quality criteria for work-based learning across all pathways, they will need to develop strong district-level systems. This year, leaders in all the districts made progress in expanding the scope of work-based learning activities in pathways, and, in some cases, they also made progress in expanding district-level work-based learning support systems.

District and pathway leaders took steps to expand the number and variety of work-based learning opportunities for pathway students, but they see a clear need for development of more opportunities at the high end of the work-based learning continuum.

This year, district and pathway leaders and support staff in all the districts made concerted efforts to expand the number and range of work-based learning activities available to pathway students across the full range of the work-based learning continuum, from career awareness (guest speakers and field trips) and exploration (job shadows and mentoring) to career preparation (internship and practicum) and training (work experience and training). In particular, new funding opportunities to support work-based learning provided momentum for districts' efforts in this area. As discussed below, all nine districts applied for funds through the federal government's Youth Career Connect grant and/or the California Career Pathways Trust.

District leaders focused their efforts this year on expanding student access to work-based learning opportunities at the higher end of the work-based learning continuum, particularly job shadows and internships. Some districts also took steps to improve students' preparation for these opportunities. On the whole, however, district leaders see much room for improving the number of opportunities available to students and students' readiness. For example, in Pasadena, district leaders addressed the need to increase pathway students' levels of participation in internship opportunities by taking steps to help students prepare for internships. For this purpose, the district leaders developed and implemented a program to provide all 11th-grade students with an introduction to internships and communication training. The program included help for students in preparing resumes and tips for interacting with adults in work settings. Meanwhile, in Porterville, district-level work-based learning coordinators have been particularly effective at developing and advertising opportunities for job shadows, mentoring, and a variety of types of internships ranging from one-time community service activities to long-term paid internships. The efforts to better prepare students for internships in Pasadena and to better communicate to students opportunities for higher-level work-based learning in Porterville are noteworthy. However, district leaders

in these two districts recognize that these efforts alone will not be sufficient to address the need for increasing the number of higher-level work-based learning opportunities available to students in pathways.

District leaders are planning to leverage new federal- and state-level funding opportunities to strengthen and expand work-based learning systems.

As part of their efforts to expand access to and participation in higher-level work-based learning opportunities for all pathway students, district leaders are planning and implementing district-level work-based learning supports, including hiring district-level coordinators, to help mitigate ongoing capacity challenges at the school and pathway levels. Currently, six of the nine districts employ district-level staff whose primary responsibility is to support work-based learning across school sites. These roles range from one part-time position spread across multiple schools to several full-time coordinators who oversee responsibilities across the district. With the new funding opportunities that were available this year, many districts are planning to use these funds to hire additional district-level work-based learning staff or sustain current work-based learning support staff and build regional work-based learning support structures.

At the time of our site visits in spring 2014, all but a few districts had submitted applications for the Youth Career Connect grant, a federal initiative supporting regional collaborations between LEAs and workforce investment systems to "enhance instruction and deliver real-world learning opportunities for students."[16] In addition, all nine districts submitted applications for the California Career Pathways Trust, which supports the development of career pathway programs through collaborations between K–12 schools, institutions of higher education, and local businesses (California Department of Education, 2014).

Districts' applications for these funds included plans to expand work-based learning support staff and develop regional work-based learning support systems. For example, one district planned to fund up to six work-based learning coordinator positions housed at intermediary organizations to provide school- and pathway-level supports. Another district planned to use funds to staff its new regional intermediary, including hiring three career specialists who would work with the high schools and business partners to set up work-based learning experiences and internships. Another district distinctly expressed wanting to build a system akin to the one in Porterville Unified, which has hired two full-time district-level coordinators to oversee the development and expansion of opportunities across the district. However, even in Porterville, which is seen as a model for district-level support for work-based learning, coordinators are hard pressed for time amid wide-ranging responsibilities and increased demand for student access to work-based learning.

With several districts still relying on pathway-level staff to coordinate higher-level opportunities for students, such as internships, district-level coordinators offer the potential for mitigating capacity challenges and increasing access to such opportunities. Coordinators also play a pivotal role in developing broader district-level work-based learning structures and systems, as well as building and sustaining strong connections with diverse industry partners that pathway-level staff have no time for or are often not equipped to do. Furthermore, ongoing challenges, such as teacher turnover and limited teacher time, provide an additional incentive for relying on district-level coordinators to develop and maintain industry partnerships.

Although all nine districts ultimately received Career Pathways Trust grants and one district received Youth Career Connect funds, we have no indication whether districts will carry out their plans as originally outlined. Our interviews suggest districts recognize the need for building and sustaining capacity for work-based learning at the district and systems levels and view these funding opportunities as pivotal in moving that work forward.

[16] http://www.whitehouse.gov/the-press-office/2014/04/07/fact-sheet-youth-careerconnect.

Some districts have begun developing systems to track students' participation in work-based learning experiences, but these efforts are nascent.

In addition to hiring district- and pathway-level staff to coordinate and support work-based learning, Linked Learning district leaders are in the early stages of thinking about how to collect data about student participation in a range of work-based learning experiences, the quality of those experiences, the associated outcomes, and variation across pathways in offerings and access. Despite encouragement from ConnectEd and NAF, few districts have made any substantial progress in planning or implementing data collection systems to track individual students' work-based learning experiences, and where such systems exist, they remain relatively cumbersome and inefficient.

Two districts, Porterville and Pasadena, have made notable progress in developing a tracking system and database to collect information on student work-based learning experiences across all pathways in each district. For example, students in Pasadena write on a piece of paper how many hours of work-based learning they participate in, and school-based Regional Occupational Program (ROP) techs input the information into an Excel spreadsheet. Pathway and district staff then use the data to track the number and types of work-based learning experience for each student. They also use the data to track student accumulation of work-based learning hours necessary to earn a medallion (which signifies pathway graduation). Porterville has the most extensive district system for tracking work-based learning experiences. Porterville requires a minimum level of work-based learning experience for all pathway students and tracks three activities at the individual student level: resume preparation in 10th grade, mock interview in 11th grade, and internship in 12th grade. These three activities are recorded in the AERIES student MIS system. But even in this most developed case, a district administrator reported that the work on collecting work-based learning data was just getting under way and that they were still "toying around with the system."

Some other districts have school-based systems to track students' work-based learning experiences, but in most cases the work-based learning data that districts have consists of an inventory of industry and community partners who have provided students with work-based learning opportunities. The value of a central database of industry partners is that it prevents overloading those partners with competing requests for internships from multiple pathways. For example, Sacramento has been working on developing a database for collecting information on key industry partners that provide work-based learning opportunities for students in the district. A district staff member in Sacramento reflected, "We're working with industry partners at a higher level, so it isn't a teacher-to-employers relationship, but a school district to an organization.… A central clearinghouse for work-based learning.… That way industry isn't being hit up by 14 different people."

One promising step is a work-based learning data collection pilot project that ConnectEd and the Institute for Evidence-Based Change (IEBC) are rolling out during the 2014–15 school year. The pilot is designed to work with a small group of districts involved in the initiative to identify how to collect, manage, and analyze work-based learning data, with plans to use lessons learned and share them with other districts in the initiative and throughout the state. District data teams, with guidance and support from ConnectEd and IEBC, are developing data systems to capture the number of guest speakers and job shadows that pathway students experience, as well as whether or not students experienced an internship, whether this internship was compensated, and any work experience (and the relevance of that job to the students' pathway). Through the pilot, ConnectEd and IEBC will identify promising strategies, challenges, and supports needed for districts to collect work-based learning data, providing valuable information to the field as more districts across the state implement Linked Learning pathways.

Pathway leaders and teachers need time and support to effectively integrate work-based learning experiences with pathway curricula in an intentional and structured way.

Work-based learning experiences linked to the pathway theme can help students broaden their understandings of the careers that exist within an industry sector while building their professional skills. When integrated with projects and daily instruction, work-based learning experiences can help reinforce academic and technical content knowledge and strengthen students' desire to further develop skills and knowledge related to their career interests. Although district staff have been working to develop systems and supports around work-based learning, they have paid relatively little attention to how students' work-based learning experiences are consciously and effectively aligned with classroom coursework. During our site visits to the districts this year, we uncovered positive examples of effective integration of work-based learning with curriculum and coursework in some pathways, but found very little evidence of systematic integration of work-based learning outcomes with academic and technical coursework. When asked to report how often students tie their work-based learning experiences back to the schoolwork, 28% of pathway students reported doing so "most of the time" or "always."

> We learn because we're not just learning in one class and it's not just focused on one thing, but focused on everything that's happening around us.
>
> -Student in an arts pathway

The fact that few teachers have strong connections to working professionals or time to develop relationships makes integration of work-based learning with classroom learning a difficult challenge to overcome. As an external coach observed, there is a need to prepare teachers for "what to look for, who to contact [in making connections to professionals]and that takes a lot of time…to do the phone calls or emails." Pathway leads and teachers must play a central role in integrating work-based learning with instruction in the pathway, but they have had very little time and support to do so. Given the many constraints on teachers' time, including Common Core implementation, teacher capacity and time constraints will continue to be significant barriers to integration. A district leader talked about the challenges the district faces to increase integration and elaborated on the importance of developing connections between classroom experiences and work-based learning:

> We want our students to see the relevance of what they're learning through the application to a particular industry. We need more support for our students to do job shadows or internships in the field. Then [it's] being able to use the lessons learned to impact their units.

Another key challenge to achieving better integration of work-based learning experiences with student learning in academic and technical courses is the difficulty of timing work-based learning experiences to coincide with delivery of course content. The challenge of integrating work-based learning experiences with classroom-based learning is part of the broader challenge of integrating curriculum and instruction across subject areas in Linked Learning pathways. When done well, such integration can have a powerful impact on student learning and motivation. Work-based learning experiences that are not only linked with the pathway theme but also integrated with daily instruction and coursework can help reinforce academic and technical content knowledge, while also helping students make connections between their learning experiences and the application of that learning in their lives and communities.

A student in an arts pathway described how her experience with an integrated curriculum that included learning outside the classroom made her feel more connected to her community:

> In art you express it, in English you write about it, and somehow it's connected to math. I think the teachers put so much time into one little question that can lead to a huge project, and I feel like we learn. We learn because we're not just learning in one class and it's not just focused on one thing, but focused on everything that's happening around us, in our community, at the school.

Pathway Students' Experiences in Work-Based Learning

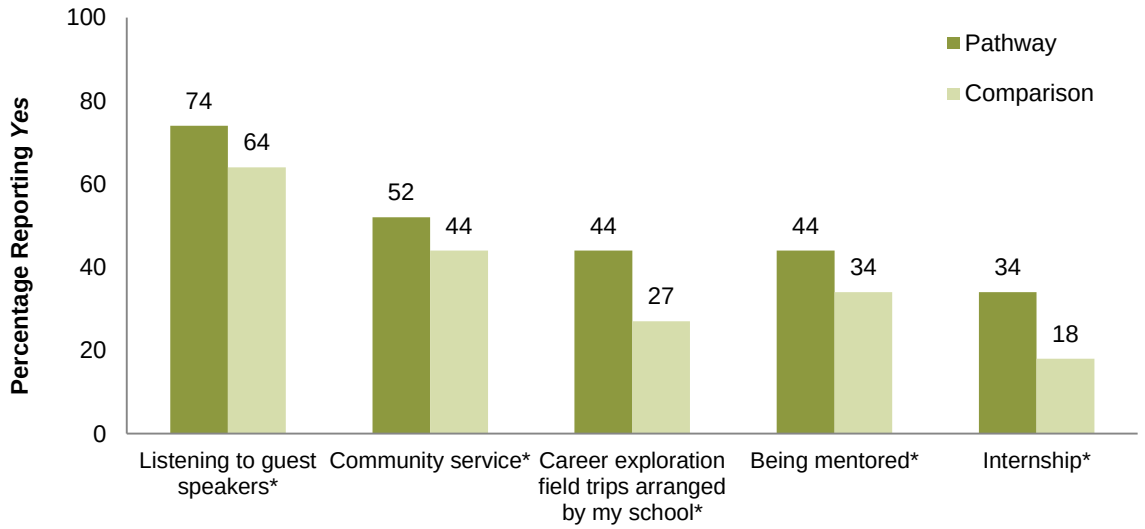
Although districts and pathways continue to work on developing a full range of work-based learning opportunities, students across these districts reflected positively on the work-based learning experiences they have had. Students believed that their work-based learning experiences provided valuable college- and career-readiness skills, while also serving as forums for learning from industry peers, growing as individuals, and gaining a deeper understanding of their communities (see Chapter 5, "Perceptions of Skills Gained in Pathways," and Chapter 7, "Student Postsecondary Plans and Supports," for further discussion of college- and career-readiness skills).

Pathway students have access to work-based learning at the career awareness and exploration levels, but students' access to and participation in career preparation and training are limited by institutional and student-level barriers.

On our survey, the vast majority of twelfth-grade students in certified pathways across all districts (ranging from 80% in Antioch to 93% in Oakland) reported participating in at least one work-based learning experience during the 2013–14 school year, with 87% of pathway students participating overall. A high proportion of comparison students (79%) also reported participating in at least one work-based learning experience. The difference in participation between pathway and comparison students is statistically significant.

Across the range of experiences, pathway students most frequently reported engaging in activities on the earlier end of the work-based learning continuum (career awareness and career exploration), including listening to guest speakers and participating in community service (Exhibit 4-1). To meet the basic quality criterion as established by ConnectEd for participation in a full range of work-based learning experiences, students should progress to a culminating experience such as an internship, but only 34% of pathway students reported participating in an internship during the 2013–14 school year.

Exhibit 4-1
Pathway and Comparison Students Participating in Specific Work-Based Learning Activities in 2013–14



*Difference between pathway and comparison students is statistically significant at the $p < .05$ level.
Source: Spring 2014 12th-Grade Student Experience Survey.

District and school staff reported in interviews that Linked Learning pathway students had ready access to work-based learning experiences such as guest speakers, panels, career fairs, and field trips; however, access to some types of higher-level work-based learning experiences—specifically, internship and practicum opportunities—was very limited. District leaders will need to work through institutional and student-level barriers in order to reach desired levels of student participation in these types of work-based learning experiences.

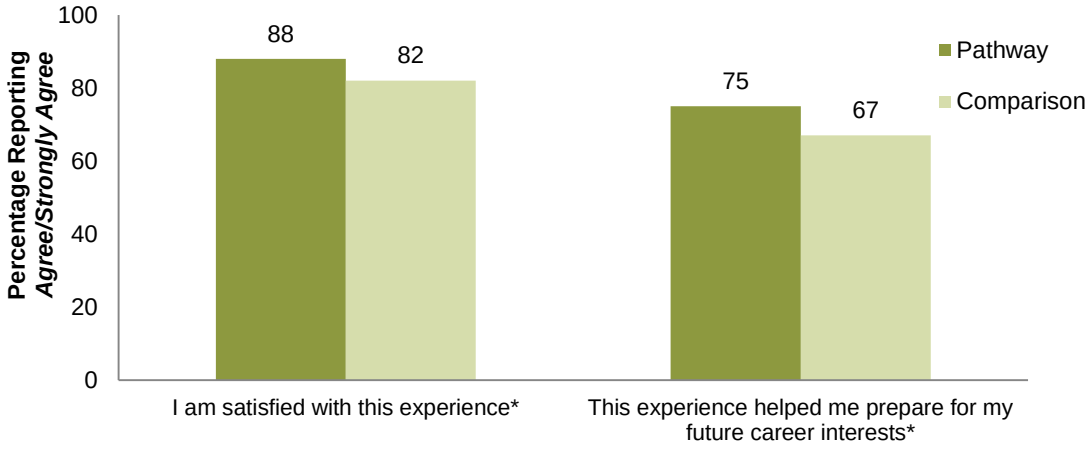
In fact, many pathway students did not have internship opportunities available to them. When asked to report which work-based learning opportunities were not available to them, 34% of pathway students across all districts reported having no internships available to them at all. Students also faced other institutional barriers to participation in internships, including limited pathway staff capacity to connect students to internship opportunities and limited district staff capacity to generate and communicate opportunities for internships to students. With notable exceptions (see the Porterville and Pasadena examples above), district-level strategies for addressing these barriers to broader access and participation in career preparation and career training experiences are not yet in place. Students in pathways that had successful site-based, student-run enterprises or strong integrated projects with multiple interactions with professionals had opportunities to participate in career preparation work-based learning experiences that other pathway students did not.

Even in pathways that made career preparation and training opportunities available, not all students were able to take advantage of those opportunities. Students faced two types of obstacles to participation in the "extended, intensive work-related experience" called for in the ConnectEd quality criteria for work-based learning. First, student-level barriers to participation in career preparation and training opportunities were related to competing demands on students' time, limited transportation options, the need or desire to earn money (very few internships are paid), the need for credit recovery, and students' lack of interest in the internship opportunities offered. Second, in some cases, counselors or teachers actively discouraged or prohibited students with low GPAs from participation in an internship. For example, a respondent in one district reported that students with less than a 2.0 GPA or with behavioral issues were not allowed to participate in some internships. District staff explained that restricting access to internships might motivate students to bring up their GPA; they also felt that it would ensure that students who participated in internships would meet industry and community partner expectations and, in doing so, help maintain good relations with these partners so that they would continue to work with the district.

The vast majority of pathway students reported satisfaction with their work-based learning experiences and believed that such experiences provided useful preparation for their future.

Across pathway and comparison students who reported participating in some type of work-based learning experience (87% and 79%, respectively), a greater proportion of pathway students than of comparison students reported feeling satisfied with their experience (88% versus 82%) when asked to reflect on their "most meaningful" work-based learning experience. Pathway students were also more likely than comparison students to report believing that their experience helped them prepare for their future career interests (75% versus 67%) (Exhibit 4-2).

Exhibit 4-2
Students Reporting on Their "Most Meaningful" Work-Based Learning Experience



*Difference between pathway and comparison students is statistically significant at the $p < .05$ level.
Source: Spring 2014 12th-Grade Student Experience Survey.

Pathway students participating in focus groups echoed similar sentiments, specifically regarding the belief that their work-based learning experiences provided opportunities to develop relevant college- and career-readiness skills. These students described developing "soft" professional skills, including communication, collaboration, and organizational skills. They also described gaining industry-specific technical skills and knowledge through real-world experiences (see Chapter 5, "Perceptions of Skills Gained in Pathways," for more detail). For example, a student in a health pathway described her internship experience in a veterinary clinic. She valued the opportunity not only to develop relevant skills but to engage in a collaborative environment with her industry peers:

> I worked [with a veterinarian] at a small animal clinic alongside her pet technicians. It was great to be put into the field…to be given the same tasks [as them] with the same respect and to know that they trust me to do the same things as well.

Additionally, students participating in focus groups described learning about expectations for professional behaviors and how to put together job application materials, such as resumes. As students prepared to graduate, they credited the development of such skills and knowledge as beneficial in feeling better prepared for their postsecondary pursuits. A student in a technology pathway described feeling more prepared for employment as a result of his internship experience: "I learned what it is going to be like when I am working…getting instructions from a supervisor…working with co-workers." Similarly, another student in the pathway described how his internship experience allowed him to better understand his working style and how to be a strong leader:

> I learned a lot about myself. I learned that I really like to take charge and have authority. That's what really motivated me to want to work hard enough to move up.…[I learned] how to be sensitive to others, because that's something I had a problem with, was really understanding certain people. Being able to accommodate and manage people, because that's what you're doing all day long, really helped me out."

Students in focus groups also noted developing deeper understandings of people and of the workplaces and communities they encountered as a result of their work-based learning experiences. Speaking about how what she learned from her internship at a convalescent home complemented what she learned in the classroom, one twelfth-grade student explained, "[You] gain more of an understanding for people. In a classroom, you can study the statistics or say the conditions are 'this,' but until you go out and see, it is just a surface understanding." Similarly, a student in an education pathway described how she developed

a deeper understanding of dealing with individual differences in an educational setting through her internship:

> I worked at [an] elementary school.… I would help take care of the [kids], making sure they are all doing fine. Kids go through different struggles…[this experience] got me learning how to help each different individual in their own way. Everyone needs separate attention.… [I learned about] how different each person's mind can be.

Implications

Work-based learning is a core component of the Linked Learning approach and as such is an essential aspect of the student experience in a Linked Learning pathway. Yet, work-based learning is also a significant departure from "business as usual" in California high schools. District leaders recognize the value of work-based learning and have focused considerable attention on the task of building systems of district-level supports that will make it possible to bring work-based learning to scale and offer all pathway students a full range of work-based learning experiences. Increasing the number of higher-level work-based learning experiences and integration of work-based student learning with pathway coursework are two of the biggest unfinished tasks in developing a high-quality system. For district and pathway leaders to succeed in increasing the numbers of career preparation and career training opportunities and in integrating work-based learning with pathway coursework will require extensive external support (coaching, professional development, support staff) to pathway leads and teachers.

Sustainability of high-quality work-based learning is also an open question. The need to fund district-level and site-level support staff is perhaps the most daunting aspect of this challenge. It is fortunate that district leaders spent time thinking about and planning new regional systems of support for work-based learning as part of their work on California Career Pathway Trust applications. This planning bodes well for the future of work-based learning in the districts. Still, it remains to be seen how well these funds will be applied and whether regional intermediaries and other supports created through California Career Pathways Trust funding will strengthen work-based learning systems in the districts.

Chapter 5: Perceptions of Skills Gained in Pathways

Key Findings

Twelfth-grade students in certified pathways reported

- Their high school experiences helped them develop 21st century skills, such as communication and collaboration, which will equip them for success in college and the workplace.
- Their high school experiences helped them develop the productive dispositions and behaviors integral to engagement and success in school, as well as in their postsecondary pursuits.
- Exposure to professional standards and technical skills relevant to a variety of careers.
- Their high school experienced prepared them to navigate the world of work, both in terms of the job application process and behavioral norms for the workplace.

In previous chapters, we reported on pathway students' experiences with the Linked Learning core components of rigorous and integrated academic and technical curricula and work-based learning. In Chapter 6, we will report on students' preparation for postsecondary transitions. Combined, these experiences aim to improve students' readiness for college and career. This chapter examines whether pathway students indeed feel that high school has helped them prepare to enter and succeed in postsecondary education or the workplace. We look specifically at whether students perceive that their pathway experiences have helped them develop a range of skills and competencies including the 21st century skills, productive dispositions, technical knowledge and skills, and career navigation skills that they will need after high school. We draw on surveys of pathway and comparison students, highlighting findings from our recent survey of 12th-graders in certified pathways, and incorporating findings from student focus groups.

We begin by providing a framework for the four groups of skills we consider in this chapter (Exhibit 5-1). Through an integrated curriculum that includes project-based learning and authentic assessment, combined with work-based learning experiences, pathways have the potential to develop the communication and collaboration skills, such as public speaking and working with people from different backgrounds, critical to today's workplace. In addition, the scaffolding and personalized supports of the pathway community may foster the personal accountability, productive mindsets, and organization skills that have been linked to success in school and postsecondary endeavors. Finally, the career and technical components of Linked Learning—the integrated technical sequence and work-based learning—could lead to greater technical skills among Linked Learning students compared with their peers and greater familiarity with both the process of obtaining a job and the behavioral expectations for the workplace.

Exhibit 5-1
Skills Needed for Postsecondary Success

21st Century Skills and Productive Dispositions

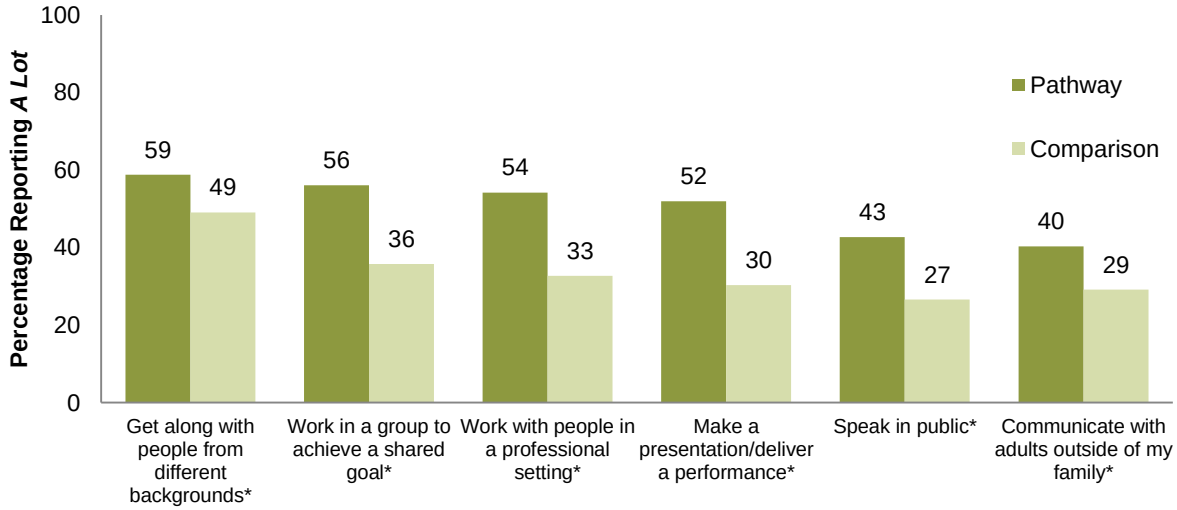
As described in our fourth-year report (Guha et al., 2014), today's students need 21st century skills to succeed in any postsecondary endeavor. The *Linked Learning College and Career Readiness Framework* defines these skills as "the range of cross-cutting cognitive processes and applications of knowledge needed to succeed in postsecondary education and future careers" (ConnectEd, 2012). For example, given the globalized economy and current immigration trends, students must be prepared to communicate and collaborate with peers and colleagues of diverse cultures, religions, and other backgrounds. Facing increasingly easy access to an overabundance of electronic information, students need to become savvy and informed consumers of data. Students also need productive dispositions and behaviors, such as self-efficacy and self-management, in order to succeed in life after high school.

Pathway students reported that their high school experiences have helped them develop 21st century skills such as communication and collaboration.

Consistent with findings from previous years, twelfth-grade students in certified pathways reported feeling that high school had helped them improve their communication and collaboration skills (Exhibit 5-2).[17] Specifically, pathway students were more likely than comparison students to report that high school had helped them develop the skills necessary to interact effectively with people from different backgrounds (59% versus 49%), to collaborate in a group to achieve a shared goal (56% versus 36%), and to work with people in professional settings (54% versus 33%). Pathway students were also more likely than comparison students to report that high school had helped them improve their ability to present information to an audience, whether by making a public presentation or performing in front of a group (52% versus 30%), or by speaking in public (43% versus 27%). Additionally, pathway students were more likely than comparison students to report that high school had helped them develop the skills necessary to communicate with adults outside of their family (40% versus 29%),

[17] Throughout this chapter, we report on the percentage of pathway and comparison students who responded that high school had helped them "A lot" in each area. The other response options were "Somewhat," "A little," and "Not at all."

Exhibit 5-2
Students Reporting That High School Had Improved Their Communication and Collaboration Skills



*Difference between pathway and comparison students is statistically significant at the $p < .05$ level.

Source: Spring 2014 12th-Grade Student Experience Survey.

Pathway students in focus groups described the value of their acquired 21st century skills. In particular, focus group students appreciated how work-based learning activities helped them develop presentation, communication, and collaboration skills that will prove useful in college and the workplace. Some students also described how their pathway experiences helped increase their sense of confidence, which will serve them throughout life regardless of their choice in postsecondary pursuits.

- **Public speaking and communication.** Students across several districts credited work-based learning experiences, particularly presentations for peers or industry representatives, with helping them develop public speaking and communication skills. For example, a student in a health pathway shared how her school engaged pathway students in middle school recruiting activities that required them to apply their oral communication skills to address an immediate, real-life need: "Since day one, this school has been working on oral communication skills…. A few months ago…[we] went to [our] intermediate [school] to recruit 8th-graders…. We had an assembly for [the] 6th- through 8th-graders. Taught us how to talk to big crowds of people we don't know." A student in an engineering pathway noted, "We had at least one large presentation every year. The most memorable one was during freshman year. [We presented to several] professional engineers…. By sophomore year we were already used to presenting in front of people."
- **Collaboration.** Consistent with survey findings, students in focus groups discussed how their pathway experience taught them to get along with people from different backgrounds—a skill that will be critical in any postsecondary environment. For example, a student in a health pathway shared, "The main thing [I took away] is that there are a lot of different kinds of people in the world that you would have to [help], even if they say they don't need [help]." Another twelfth-grade pathway student similarly noted, "One thing you really learn is that you are going to meet [people] that you don't work very well with, but [you learn] to cooperate with [difficult] people."
- **Confidence.** Students from a range of focus groups across pathway themes acknowledged how pathway opportunities to develop public speaking and communication skills also helped to grow their confidence. For example, a student in a law pathway explained that "[Pathway experiences such as Model UN and mock trial] have made me a more confident person." A pathway student in

a small performing arts school observed, "[I]t's interesting to see our school versus other schools.… I feel like when we make presentations or go out in public, we're a lot more open and a lot less afraid. [Actors] have to be on stage, have to open up to people. Having three to four years of that, I feel like you get used to that, get comfortable on stage, and suddenly you're not afraid."

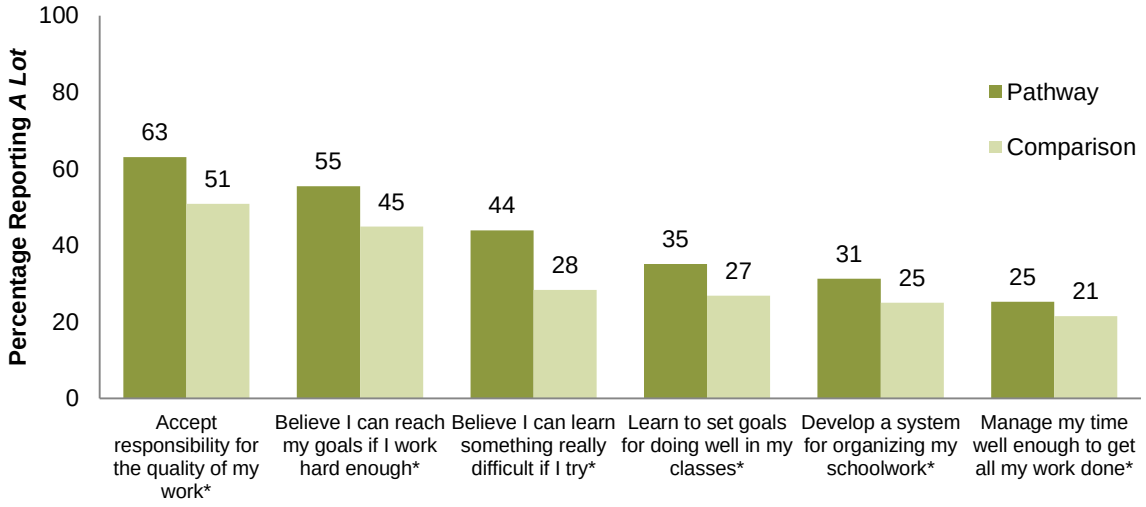
Pathway students were also more likely than comparison students to report that their high school experiences improved their ability to exercise critical-thinking skills and act as intelligent consumers of information. For example, pathway students were more likely than comparison students to report that their high school experiences helped them develop their ability to use information to make good decisions (55% versus 38%), conduct online searches to answer a question (52% versus 36%), summarize information from multiple sources (45% versus 32%), and judge whether they can trust the results of an online search (42% versus 25%).

> I feel like when we make presentations or go out in public, we're a lot more open and a lot less afraid.
>
> - Student in a performing arts pathway

Pathway students reported that high school helped them develop productive dispositions and behaviors that can help them engage and succeed in school and postsecondary endeavors.

As noted in our fourth-year report (Guha et al., 2014), recent research cites the importance of academic mindsets in predicting the perseverance and academic behaviors that lead to school success (see, for example, Farrington et al., 2012). In our spring 2014 survey, we asked 12th-graders to report on the extent to which they felt high school had helped them improve skills and behaviors related to strong academic mindsets, such as personal accountability, self-efficacy, and self-management (Exhibit 5-3). Pathway students were more likely than comparison students to report that their high school experiences improved their ability to accept responsibility for the quality of their work (63% versus 51%), to believe they can reach their goals through hard work (55% versus 45%), and to believe they can learn something really difficult if they try (44% versus 28%). Pathway students were also more likely than comparison students to report that their high school experiences taught them useful self-management skills, such as setting goals for doing well in their classes (35% versus 27%), developing a system for organizing schoolwork (31% versus 25%), and managing their time in order to get all their work done (25% versus 21%).

Exhibit 5-3
Students Reporting That High School Had Improved Their Sense of Self-Efficacy and Self-Management Skills



*Difference between pathway and comparison students is statistically significant at the $p < .05$ level.
Source: Spring 2014 12th-Grade Student Experience Survey.

Pathway students in focus groups elaborated on how their high school experiences increased their sense of personal accountability and maturity, self-efficacy, and self-management skills.

- **Personal accountability and maturity.** A twelfth-grade pathway student explained how her pathway experience enhanced her sense of responsibility, maturity, and autonomy: "[The pathway] gives you a purpose to wake up every morning and [think], 'OK, now I am going to school or now I am going to my internship because I know that people rely on me and I am responsible because I am going to be an adult soon.' [You have] freedom and opportunity to really fulfill your potential, without having someone tell you that you need to do this or you need to do that." Similarly, a student in a health pathway noted, "Being [an] academy member, your maturity just skyrockets from freshman to senior year. [You] want to be treated like an adult, you have to act like an adult."

> [The pathway] gives you a purpose to wake up every morning and [think], "OK, now I am going to school or now I am going to my internship because I know that people rely on me and I am responsible because I am going to be an adult soon."
>
> - Student in a pathway

- **Self-efficacy.** Pathway students noted how their pathway experiences helped them learn to succeed or grow as leaders through effort and perseverance. For example, a student from a performing arts pathway described planning to apply lessons in patience and perseverance in order to find success after graduation: "I feel like a lot of people who are in theater, they want [success] now, and I think one thing I've kept in mind through all these experiences is to be good at managing your time and to be patient. If you have a craft, work on it, go to school for it, and refine it to the point where no one can tell you anything about it. And then go out and say, 'Hey, you know, I can do this.'" A student in an arts and media pathway described how her internship experience directing a professional documentary film crew and multiple high school student film

crews taught her "leadership [and] discipline. [Being] assigned as a director you need to understand your crew members and [the] subject."

- **Self-management.** Pathway students also reported how their academic experiences taught them organizational and time management skills that will serve them well in college. For example, a student in an education pathway shared, "The Ed academy helped me be more organized. I do feel prepared for college…. How we have to get organized for our teaching helped me organize my binder or backpack…prepare materials, what you have to teach to students." Another student in a culinary arts and hospitality pathway noted how he appreciated the efficiency achieved with effective time management: "I feel very prepared for college, compared to freshman year. [Before I was] just procrastinating all the time…. Now I get my work done ahead of time…. When you learn to manage your time, you get more time to do the things you want to do instead of just procrastinating…. The pathway teachers push you to do good and then sometimes you don't listen to them but then you start thinking 'Maybe I should start listening to them, they know what they're talking about.'"

Pathways continue to equip students with universally applicable 21st century skills while fostering productive behaviors and mindsets to better engage students in their high school experience and ultimately lead to their postsecondary success. This year, twelfth-grade students who shared their insights in student focus groups also reported how their pathway experience helped them develop relevant skills that specifically enhance their sense of preparedness for college.

> I feel very prepared for college, compared to freshman year…When you learn to manage time, you get more time to do the things you want to do instead of just procrastinating. The pathway teachers push you…they know what they're talking about.
>
> - Student in a culinary pathway

Technical Knowledge and Skills

Although the districts continue to work on implementing rigorous and high-quality integrated curriculum and providing students access to higher-level work-based learning experiences, districts also routinely provide pathway students with opportunities for developing technical knowledge and skills through real-world activities. Students credit these real-world experiences with helping them feel more prepared for their postsecondary pursuits.

Pathway students believed that their work-based learning experiences provided authentic exposure to professional standards and technical skills relevant to a variety of careers.

Work-based learning experiences provide students with the opportunity to develop hands-on skills through real-world activities, which may include using or creating industry-specific tools and materials. In focus groups, pathway students talked about developing technical skills and knowledge by using tools or relevant materials in authentic settings.

- A student in a health pathway explained how interning at a local Veterans Affairs hospital provided an opportunity for authentic exposure to the industry: "Interning at the VA gives us a firsthand look at what really happens. Since this is a class we're taking, we go [to the hospital] and this is the real deal. We can't prescribe medication, but we're going in and watching [doctors] do ultrasounds and draw blood. We get to see up close and personal." Similarly, a student in an education pathway described learning how to develop a curriculum and how to plan and teach that to a group of students: "I've been able to use those same skills, to teach elementary students, to teach high school, to develop any type of curriculum."
- Another student in a computer arts and technology pathway described already knowing what career field she wanted to pursue, and how the pathway provided opportunities to gain relevant skills for that industry: "[I] already had an idea of what I wanted to do prior to high school. Finding out about the [pathway] program just satisfied my need to get there. [I] did learn some new things, 3D stuff, film production. [I] was already teaching myself some [technical skills], but [the pathway] was a push forward."

Teachers and students also explained how some of their pathways offered certification programs that enabled students to establish professional connections and build skills beneficial for future employment.

- One teacher in a health pathway described the range of certifications students can attain through the pathway: "When [students] finish [high school], [they] will receive Health Insurance Portability and Accountability Act (HIPAA) certification, Cardiopulmonary resuscitation (CPR) certification, medical certification, first aid certification, [and] have peer education certification in HIV."
- A student in a different health pathway explained how he built relationships with industry professionals and obtained certifications through his experiences that would help him pursue his career goals after high school: "With clinics…[you build] connections in knowing people [in the industry]. This will help you get a job right out of high school if you have the right certifications." A teacher in the same health pathway corroborated this perspective, explaining that "Every place of work will still require them to do these [certifications], but it helps with getting kids in there when an employer knows they've been certified and they understand confidentiality."

Although pathway students with more defined career interests potentially benefit the most from their work-based learning experiences by being able to develop relevant technical skills, work-based learning activities also offer all students the opportunity to engage in decision-making around postsecondary plans. For example, one student in a health pathway described entering the pathway desiring to pursue a career as a pediatrician, but the pathway afforded her opportunities to explore other medical careers: "I came in wanting to be a pediatrician. I saw what an EMT, paramedics, firefighter do…and we had a speaker come in and tell us about his experiences…[that] got me more interested in [these other options]."

Career Navigation Skills

As with observations from previous years, pathways exposed students to a range of possible careers, as well as offered opportunities for students to develop skills that can help them navigate the professional world.

Pathway students explained how work-based learning has helped them explore their career interests and improve their understanding of how to pursue their career goals.

Pathway students across focus groups described how they gained exposure to particular industries and professions through their work-based learning experiences, helping them to better understand and home in on their career interests. Students believed that without their work-based learning opportunities, they would not have had the advantage of exploring their interests prior to enrolling in college or starting a career.

> The benefit is you get to do everything ahead of time. We get to do patient care, which you can't do unless you're licensed, but since we're in the [academy] we get to help out. You get to see if that's really what you want.
>
> -Student in a health pathway

- **Career exploration.** A student in a health pathway explained the benefit of being able to explore her interests before enrolling in college: "The benefit is you get to do everything ahead of time. We get to do patient care, which you can't do unless you're licensed, but since we're in the [academy] we get to help out. You get to see if that's really what you want." A fellow student in the same pathway described developing an understanding of the emotional aspects of his chosen career path, which helped him better reflect on whether this career was something he would want to fully pursue: " I learned a lot when I was in post-surgery. I worked with patients with hip and mental problems. There was one patient…[he] was suffering from dementia and I didn't realize it, but I saw it progress and saw how his family reacted. I saw the emotional side of working in a hospital. Something I learned [to ask myself]: am I mentally and physically ready to work in a place like this?" A student in an arts pathway explained, "One thing that surprised me was the amount of opportunities there are…. I didn't think I would be able to work with professional artists and understand their careers and just the field the way I do."

Pathway students reported developing relevant skills for navigating the professional world, including learning expectations for professional behaviors and how to assemble job application materials.

Pathway students were more likely than comparison students to report that high school had improved their knowledge of expectations for professional behaviors (59% versus 39%), as well as their ability to create a resume or write job application letters (41% versus 19%). Similarly, pathway students who participated in focus groups explained how they acquired and applied these professionally relevant skills.

- **Learning expectations for professional behaviors.** A student in an arts pathway described learning about workplace expectations as part of a training workshop to prepare for his internship: "We went through an orientation [on] professional skills. We [addressed professional behaviors such as] dressing up professionally, being on time, clocking in and clocking out." Another student in a law pathway described how he applied the skills and knowledge gained from his professional behaviors class throughout his internship experience: "My internship was an opportunity for me to put into practice what I've been told to do…told to go in there, look confident, shake hands…. [The] confidence, [knowledge on] dress, attire, punctuality…[I] don't feel I would have gotten [these things] had it not been for the law academy."
- **Comfort with the job application process.** Pathway students in focus groups described engaging in simulated activities, such as mock interviews, that helped them develop relevant skills for navigating the professional world. For example, in Antioch, 11th-grade pathway students participated in a one-day "pre-internship" training that covered topics such as writing resumes and teaching students how to give 15-second elevator pitches. Similarly, all 11th-grade pathway students in Porterville must participate in a two-day mock interview that includes putting together a resume and receiving job skills training to prepare for the event. One student in a health pathway described the mock interview as "good for [preparation]; [as a result] we know what we need to do." Students then interview with panelists, including industry professionals, who may then offer students actual job opportunities.

In light of the need to help students develop career navigation skills, pathways continue to integrate relevant opportunities into classwork and work-based learning experiences. Pathway students also acknowledged the benefits they received from such experiences in enhancing their sense of preparation and their ability to succeed in their postsecondary endeavors.

Implications

This chapter delved into individual students' perspectives on their pathway experiences, and their positive reports reflect a high level of engagement in high school and a sense of promise regarding their ability to pursue their postsecondary plans. Consistent with evaluation findings from previous years, the large majority of surveyed pathway seniors agreed or strongly agreed that their high school experience had prepared them for the job or career of their choice (66%). Similarly, twelfth-grade pathway students in focus groups credited their high school experience with equipping them with the 21st century knowledge and skills, productive dispositions and behaviors, technical knowledge and skills, and career navigation skills to help them succeed in a broad range of postsecondary options.

The Linked Learning approach can engage students in school through authentic experiences beyond those found in a traditional academic classroom. By aligning these experiences with students' personal interests, pathway programs can help establish a foundation and enthusiasm for continuous learning. A student in a performing arts pathway echoed this enthusiasm in reflecting on what he appreciated about his high school experience: "[S]omething I've really learned is that whatever you want to do with your life, make sure you love it…make sure it's something that you look forward to getting up to [do]." How consistently this positive momentum will translate to actual college enrollment, persistence, and gainful employment remains to be seen, as the 2014–15 school year begins and the first cohort of Linked Learning district graduates embark on their postsecondary pursuits. In Chapter 7, we delve into students' planned transitions to higher education and the workforce, and explore the ways in which districts and pathways are supporting students as they head into this transition.

Chapter 6: Student Engagement and Achievement

Key Findings

- Certified pathway students were more likely to remain in the same district through the 12th grade than similar peers in traditional high school programs—a difference of more than 5 percentage points.
- Certified pathway students made more progress toward high school graduation than similar peers in traditional high school programs. The sizes of differences on these measures indicate that Linked Learning has the potential for a meaningful impact on long-term student educational attainment.
- Certified pathway students differed from similar peers at traditional high schools on one of six available standardized tests, outscoring similar peers by about 2 points on the ELA section of the California High School Exit Exam.
- Students in traditionally underserved subgroups enrolled in certified pathways have outcomes at least as strong as, if not stronger than, similar peers in traditional high school programs.

In previous chapters, we described pathway students' experiences with classroom instruction and work-based learning, as well as their perceptions of skills they have gained as a result of these experiences. Ultimately, the goal of the Linked Learning approach is for students' experiences in pathways to lead to improved short- and long-term outcomes. In the fourth-year report (Guha et al., 2014), we examined student outcomes for the majority of the Linked Learning districts for the first time.[18] Now, with another year's worth of data, we present a single Linked Learning estimate across all districts. This single cross-district estimate is conceptually appropriate given that Linked Learning is an approach, not a series of individual initiatives implemented separately in each district. We also for the first time present the results of students enrolled in certified Linked Learning pathways in comparison with those of similar peers in a traditional high school program, providing a clear-cut distinction between the experiences of pathway and non-pathway students. We also present estimates of Linked Learning students' 12th-grade outcomes in four of the nine districts; given the smaller sample, we caution that these results are preliminary. Moreover, for the first time, we provide estimates of the differences between Linked Learning students and traditional high school students for various subgroups of interest.

Our results reinforce the strongest and most consistent results from the third- and fourth-year evaluation reports: students in certified pathways outperform similar peers in credit accumulation in the 9th–11th grades and are more likely to remain in the district through the 12th grade. We did not find evidence that Linked Learning is resulting in higher scores on most standardized achievement tests, also consistent with earlier reports. Results related to the completion of college entrance requirements differ from earlier evaluation findings, however. While we find that 10th-grade students are more likely to complete the suggested coursework, the estimates for 9th- and 11th-grade students fall just shy of being statistically significant, despite being of a size similar to earlier years' estimates.[19] These results indicate that Linked

[18] We requested data from all nine districts and were able to include analyses for eight. Montebello was not included because it did not have any certified pathways during the data collection period.

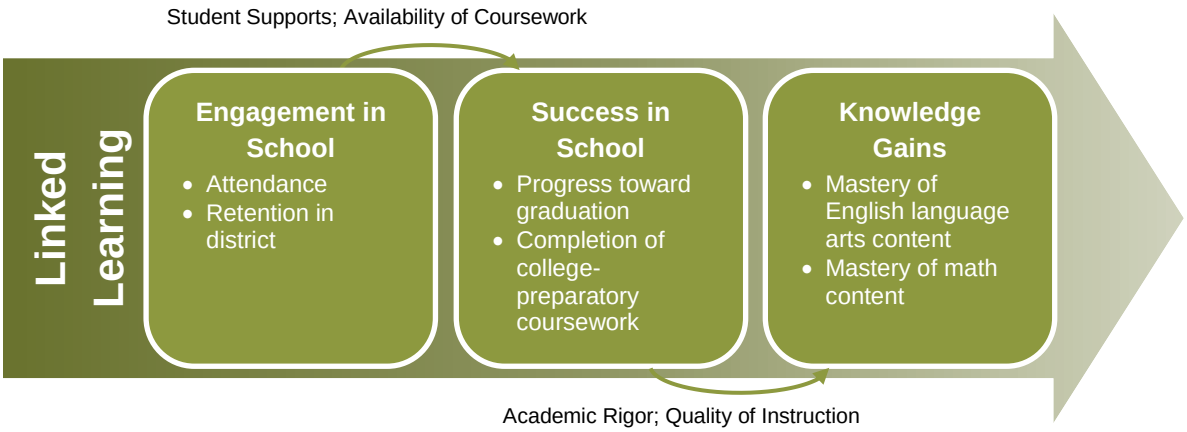
[19] We set alpha, the required level of statistical significance, to .05 for this report. As such, all analyses must have a *p*-value of less than .05 to be considered statistically significant. The analysis for the 9th-grade college entrance

Learning may be leading to greater student engagement and moderately greater success in school. Below, we introduce our conceptual framework for interpreting the results, provide the results in more detail, and discuss some possible explanations for these findings and their implications for the initiative.

How Pathways May Affect Academic Achievement

In Exhibit 6-1, we offer a framework for examining how enrollment in a Linked Learning pathway may affect academic achievement. We consider three related categories of outcomes: engagement in school, success in school, and knowledge gains. These outcomes may naturally feed back into one another: succeeding in school and gaining knowledge could change students' dispositions toward education, thus leading to greater engagement. In our framework for this chapter, however, we estimate these outcomes separately and discuss them in terms of how tightly aligned they are with the Linked Learning approach.

Exhibit 6-1
Framework for How Linked Learning Affects Student Academic Achievement



- **Engagement in school.** Perhaps the most significant way Linked Learning differs from the traditional high school model is that it makes school more relevant for students. Several of the fundamental elements of a Linked Learning pathway—including work-based learning, project-based learning, industry themes, and student supports—have the potential to increase students' engagement in school beyond what traditional high school models can achieve. As discussed in earlier chapters, Linked Learning educators have made significant progress in putting these structures in place over the last four or five years. Thus, if we are able to measure this outcome effectively, we would expect to see significantly greater engagement for students in certified pathways.
- **Success in school.** Once the basic structures are in place and students are engaged in a pathway, pathways can influence students' course-taking behavior and course completion. Pathway students are generally given a default set of classes that meet high school graduation and college entrance requirements. Such a prescribed curriculum is an example of a "constrained curriculum" that could lead students to enroll in a higher number and a more rigorous set of classes than students might otherwise choose from a "cafeteria-style" curriculum (Lee et al., 1997; Powell, Farrar, & Cohen, 1985). With the right set of classes and appropriate supports, engaged students should be able to graduate high school eligible to enroll at a CSU or UC. Additionally, we look for students to have completed Algebra II by the end of 11th grade, allowing them to take more advanced mathematics while still in high school, a critical determinant of postsecondary preparation and success (Adelman, 2006). However, as noted in previous chapters, many pathways still have room to grow in providing academic supports for students.

requirements has a *p*-value of .053; the 11th-grade analysis has a *p*-value of .061. We refer to these results as "marginally significant."

For example, many pathways find it challenging to meet differentiated student needs that require scheduling remedial or advanced coursework alongside pathway classes. As a result, although we may expect positive findings related to students' school success in Linked Learning pathways, these effects potentially could be tempered by the limited supports available to students.[20]

- **Knowledge gains.** If pathway students successfully complete college preparatory courses, they should be developing measurable academic knowledge. However, instructional quality, academic rigor, and alignment of curriculum with the tested standards determine the extent to which school success leads to knowledge gains on standardized tests. To date, the effort required to implement the basic structures of the Linked Learning approach (e.g., work-based learning, integrated curriculum) has stretched the capacity of teachers and administrators. As a result, few certified pathways have had an explicit focus on improving instructional quality and academic rigor, as described in Chapter 3. We may thus expect only small differences in knowledge gains between pathway students and similar peers in their district.

We present the methods used in this chapter in the text box below. We then present the results of our analyses comparing students in certified Linked Learning pathways with similar peers in their district on measures of engagement, success in school, and knowledge gains.

[20] Cumulative grade point average is another metric of success in school. Grading standards may vary by academic program in high schools. As such, results of an analysis of students' GPAs would be difficult to interpret, given that lower GPAs for Linked Learning students could potentially signal either lower achievement or higher academic standards; similarly, higher GPAs might signal either lower academic expectations or higher achievement by Linked Learning students. We have therefore been cautious about including GPA as an outcome in these analyses, but will consider adding it in future years given the potential for GPA to represent student engagement and other important non-cognitive outcomes (Farrington et al., 2012), as well as the prominence of the GPA in determining eligibility for California public four-year colleges and universities.

Methods and Data

Students in certified pathways are those we might expect to have academic achievement different from that of the average student in some districts—as discussed in Chapter 2, students in certified pathways in three districts are higher achieving, as well as less likely to be English learners or special education students, than students in the district as a whole.

In this chapter, we use statistical controls that enable us to compare pathway students with students in traditional high schools who have similar demographic characteristics and prior achievement (measured by standardized test scores the year before the pathway begins). What we cannot control for, however, are unobserved and unmeasured characteristics of students, such as motivation and parental support. Our models therefore can neither shed light on nor adjust for possible differences in unobserved characteristics between pathway and traditional high school students other than those captured by the statistical controls accounted for in the model.

The methods in this chapter reflect two substantial changes from the third- and fourth-year evaluation reports. In those reports, we compared outcomes for students in certified pathways with those of the average student in the district as a whole. As mentioned above, however, in the analyses presented in this report we have shifted the reference group to traditional high school students (i.e., excluding programs categorized as a certified or noncertified pathway from the reference group). This change in reference group allows for a clearer understanding of the distinction between the experience of the students in certified pathways and that of the comparison group. Second, in previous reports, we estimated results separately for each district; the current report provides a single estimate of the differences between Linked Learning and similar students within the same district, combined into a single estimate across the districts using a hierarchical linear model (HLM). This single cross-district estimate is conceptually appropriate given that Linked Learning is an approach, not a series of individual initiatives implemented separately in each district. It also has technical advantages because the HLM model adjusts for the precision of the estimate for each individual pathway in combining them into a single overall estimate across all the districts. As in the fourth-year report, we assign students to their first enrollment (in either the 9th or 10th grade, depending on the availability of the pathway) to estimate an Intent to Treat effect.

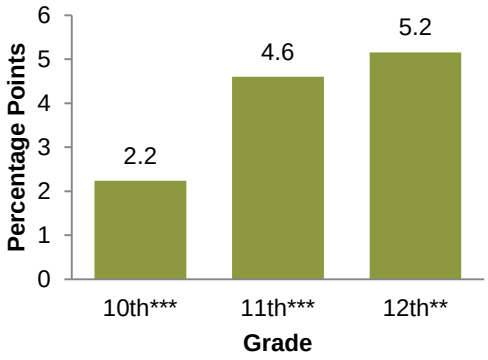
The results below include data from up to nine districts. Results for 12th-grade outcomes should be considered preliminary, since they include, at most, one cohort in four districts. In Los Angeles, the analytic sample includes only the high schools that were originally in Local District 4 and ended up in the Intensive Support and Innovation Center after district reorganization, while the entire district is in the analytic sample for the rest. Montebello's data are included in the estimation of traditional high schools and the estimation of differences between students in non-certified pathways and those in traditional high schools, provided in the appendix. As Montebello does not currently have any certified pathways, this district does not contribute to the estimation of outcomes for pathway students provided in this chapter. For Antioch, Long Beach, Pasadena, and Porterville, we provide results of analyses on students scheduled to graduate in 2013, 2014, and 2015. In Los Angeles, Oakland, Sacramento, and West Contra Costa we have data on those students scheduled to graduate in 2014 and 2015. Pathways begin in 10th grade in Oakland and West Contra Costa, so these districts (and the pathways beginning in 10th grade in Long Beach and Pasadena) are excluded from 9th-grade analyses. All other exceptions are due to missing data and are provided in footnotes and in the appendix.

Engagement in School

In this chapter, we use attendance and retention in district as two measurements of student engagement (Fredricks et al., 2011; Farrington et al., 2012).

- **Attendance.** Students who feel engaged will be less likely to miss school unnecessarily than those who do not see school as a priority. Fewer days absent for students enrolled in certified pathways may therefore indicate a greater level of engagement.
- **Disruptions to educational progress.** We use retention within the district as a measure of disruptions in a student's education and a proxy for dropout prevention.[21] Students may leave the district for several reasons. Some of these reasons, such as parental financial difficulties or job transfers, are beyond easy control of either students or their parents; these reasons should not systematically differ between pathway and non-pathway students. However, pathway enrollment may affect other reasons for leaving the district, such as dropping out or choosing to seek a better educational environment. Higher likelihood of retention within the district indicates that pathway students experience fewer disruptions to their educational progress than similar peers in their district; most likely these differences operate through students continuing to attend school instead of dropping out before graduation.[22]

Exhibit 6-2
Pathway Students Were More Likely to Remain in the Same District



Source: District-provided student data.
**Statistically significant at $p < .01$.
***Statistically significant at $p < .001$.

Students in certified pathways were more likely to remain in their district than similar peers in traditional high schools, indicating that pathway students are less likely to drop out of school prior to graduation. The two groups did not differ on daily attendance.[23]

Students in certified pathways remained in the same district from initial enrollment through the 10th, 11th, and 12th grades more frequently than similar students in traditional high schools (Exhibit 6-2). On average, students enrolled in certified pathways were 2.2 percentage points more likely to stay within their district from 9th to 10th grade, 4.6 percentage points

[21] Districts face difficulty in collecting accurate dropout data, as students who cease to attend school without notifying the district may do so for multiple reasons (e.g., illness, relocation, dropping out). In treating this data as a proxy for dropping out of school, we assume that (1) reasons for leaving the district other than dropping out or satisfaction with the educational options will not differ between pathway and comparison students (i.e., the measurement error in the outcome variable is uncorrelated with the treatment indicator) and therefore the estimate of this difference is unbiased and (2) a minority of parents in these districts have the resources to relocate to another district or private school because of their satisfaction with the educational options – meaning that the majority of this observed difference between treatment and comparison students will be driven by students dropping out of traditional high schools at higher rates than from the pathway programs. For a similar use and interpretation of this outcome, see Reardon, et. al., 2010.

[22] For future reports, we will explore the feasibility of refining this analysis by using exit codes from the district to identify students who drop out of school; however, we do not have reason to believe that Linked Learning pathways serve a differentially mobile student population compared with other academic programs in the districts.

[23] Given the statistical models required to estimate most of the outcomes in this chapter (i.e., all outcomes except credit accumulation and standardized test scores), the size of the differences between Linked Learning and similar peers in traditional high schools is generally estimated for the "average student" (i.e., one who is average in the sample on all covariates). See the appendix for more details.

more likely to stay through 11th grade, and 5.2 percentage points more likely to remain through 12th grade, compared with similar students enrolled in traditional high school programs.[24] These findings indicate that pathways may be more likely to engage students so that they are motivated to remain in school. Higher retention through the 12th grade in the four districts for which we can analyze these results is an especially promising finding, since older students are more likely to drop out.

Cross-district attendance results do not show statistically significant differences between pathway and similar comparison students.[25] According to these estimates, students in certified pathways were absent between a tenth of a day and nine tenths of a day less in 9th through 12th grades, but these differences are small enough that they may have arisen by chance.[26]

The findings for indicators of engagement, therefore, do not tell a clear and direct story—perhaps not a surprising result given that these data also include a number of factors beyond students' direct control.[27] Students are more likely to remain in the district through the 12th grade (though these 12th-grade results should be considered preliminary, since they contain only one cohort of four districts). This measure is the closest proxy we have to measuring dropout prevention and, in and of itself, speaks to the increased satisfaction students seem to have with the Linked Learning experience. An additional explanation for these findings, however, is that students who enroll in certified pathways may come from more stable backgrounds and are less at risk to change districts or drop out, even without the Linked Learning experience. On balance, these results suggest that students in certified pathways are at least somewhat more likely than peers to be engaged in school. To look for evidence that this engagement translates into success in the classroom, we next turn to indicators of students' academic progress.

Success in School

Even if students are regularly attending school, they cannot progress through high school and toward college or career without successfully completing the necessary coursework. We examined the following indicators of student success in school:

- **Progress toward graduation.** Fewer course failures and greater number of credits accumulated in each grade indicate successful progression through high school. These measures are strongly associated with students' likelihood of graduating from high school.[28]

[24] The 11th- and 12th-grade findings include students whose pathways began in 10th grade; therefore, these students are retained to the 11th and 12th grades from either 9th or 10th grade, depending on when their pathway began. Note that this variable is treated as cumulative, unlike the majority of outcomes presented in this chapter, which are typically specific to the grade year. The increase in size over the three years therefore reflects that students who leave the district do not return and, furthermore, that the magnitude of this difference between retention of certified pathway students and similar peers in traditional high schools grows each year.

[25] The following district by cohort combinations are missing from the absence analyses: Antioch for all grades and cohorts: Long Beach for the 9th grade for the Class of 2013; Los Angeles for the 11th grade for the Class of 2014 and 10th grade for the Class of 2015; Pasadena for the 9th grade for the Classes of 2013 and 2015, 10th grade for the Class of 2014, and 11th grade for the Class of 2013; West Contra Costa for the 9th and 11th grades for the Class of 2014.

[26] For reference, the average student in a traditional high school program in these districts missed around seven school days per academic year. These findings differ from those in the fourth-year evaluation report, where we saw that students in three pathways were less likely to be absent, compared with the district average. These differences no longer rise to the level of statistical significance when aggregating results across districts and comparing certified pathway students with traditional high school students.

[27] Roughly 50% of students had zero absences, so it is reasonable to expect that many of the absences we observed were due to illness or other uncontrollable factors.

[28] The Consortium on Chicago School Research found that students in Chicago Public Schools who earned at least 25% of the credits necessary for high school graduation and failed no more than a single semester of an academic core course by the end of their freshman year of high school were 3.5 times more likely to graduate from high school than those who did not (Allensworth & Easton, 2007).

- **Completion of a college-preparatory coursework.** We examined the extent to which students in certified pathways complete the coursework necessary to enter the California State University system.[29] Four-year public college systems in California require that students complete a set number of courses across academic subjects and earn a grade of C or better (these courses are collectively referred to as the *a–g requirements*). Given the importance of the a–g requirements for California high school students, we asked whether an average student in each district was more likely to complete the grade-level recommended coursework if enrolled in a certified pathway. We call special attention to the completion of Algebra II by the end of 11th grade. Students who progress further through the mathematics curriculum (i.e., reach more advanced courses) should not only learn more mathematics during high school but also have better odds of attaining a bachelor's degree (Adelman, 1999; Gamoran & Hannigan, 2000; Horn et al., 2001). In California, students are not eligible to participate in the mathematical portion of the California State University Early Assessment Program, which assesses their readiness for college-level math, until they enroll in Algebra II. Those students entering the workforce directly will also find a more advanced level of mathematics to be of use—working in science-, technology-, engineering-, and mathematics-related fields provides a 10% wage premium within those jobs that require an associate's degree or less (Rothwell, 2013).

Students in certified pathways accumulated more credits in grades 9–11 than similar peers in traditional high schools, indicating that they had better progression toward graduation than similar peers. The two groups did not differ on course failures.

Students in certified pathways earned more credits than traditional high school students in grades 9–11 (Exhibit 6-3).[30] California high school students need 220 credits to graduate high school—an average of 55 per year. Students in traditional high schools earned an average of 54 credits in the 9th grade, 53 in the 10th grade, and 56 in the 11th grade. The extra credits that pathway students earn in early grades may provide them with a buffer against later failures, thereby preventing them from falling off track toward graduation.

The size of these differences drops between 10th and 11th grade, which may be the results of several factors. First, as discussed in Chapter 2, not all students remain in their pathways throughout all of high school; to the extent that Linked Learning students continue to take a constrained curriculum not available to traditional high school students, attrition from these pathways would reduce the estimated difference between the experience of Linked Learning and comparison students. Second, students' needs diversify as they progress through school. Students may experience less of a constrained curriculum in later grades, as some students need additional time to successfully complete math classes required for graduation and others seek out additional challenges in honors coursework. Finally, Linked Learning

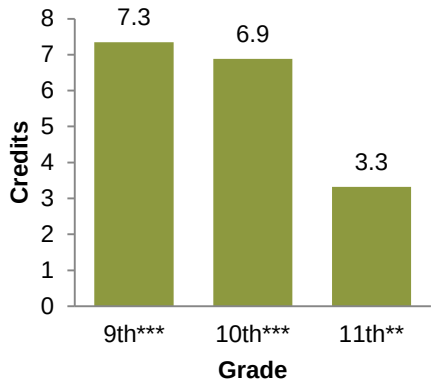
[29] We use the grade-level classes suggested by the University of California's Transcript Evaluation Service to determine what coursework students should have completed by the end of each grade. At the end of 9th grade, this means two semesters each of an English (b) and math (c) class and four other semesters of a–g–approved classes. At the end of 10th grade, being a–g on track requires completion of four semesters of English, four semesters of math, and six other a–g approved semesters. At the end of 11th grade, being a–g on track requires completion of six semesters each of English (b) and math (c) classes, two semesters each of history/social science (a), laboratory science (d), and language other than English (e) classes, as well as four additional a–g–approved classes. Students must earn a grade of C or higher in each semester for the class to count toward a–g completion. Completion of a–g requirements in the 12th grade includes all curricular requirements. Our a–g on track indicator does not include courses above the number required for CSU admission (e.g., more than two semesters of "g" courses). We also exclude a–g courses taken in middle school because we lack consistent course data for grades prior to the ninth. We assume that students who consistently take math CSTs beyond Algebra I (i.e., Geometry, Algebra II) have successfully completed two semesters of math (c) curriculum in middle school.

[30] The following district by cohort combinations are missing from the credit accumulation and course failure analyses: Oakland, Pasadena, and Sacramento for 10th grade for the Class of 2015 and 11th grade for the Class of 2014 and Pasadena for the 12th grade for the Class of 2013. Antioch's data was excluded from all course-taking analyses. Because we have only 12th-grade credit data in two districts for a single cohort, we do not estimate this result.

students in upper grades may be leaving campus to complete work-based learning experiences that do not accumulate credits but do provide valuable learning experiences.

These differences in credit accumulation seem to be driven by students taking more classes than similar traditional high school students; students in certified pathways failed only slightly fewer classes in these grades (around 1/5th of a class fewer failures). These estimated differences are small enough that they do not rise to the level of statistical significance.[31] Given that an average student in the sample failed only one course per year, Linked Learning has little room to impact this particular indicator of progression toward graduation, however.

Exhibit 6-3
Pathway Students Earned More Credits

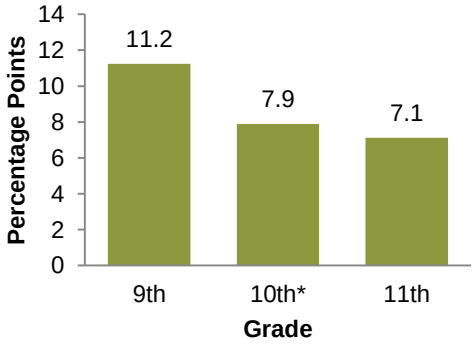


Source: District-provided student data.
** Statistically significant at $p < .01$.
*** Statistically significant at $p < .001$.

Students in certified pathways were more likely than similar peers in traditional high schools to be on track to complete a–g curriculum requirements in the 10th grade; although the results point in the right direction in the 9th and 11th grades, the differences between the two groups are not statistically significant.

At the end of the 10th grade, Linked Learning students were 7.9 percentage points more likely to be on track to complete the a–g curriculum requirements than similar peers in traditional high schools (Exhibit 6-4).[32] The difference between pathway and traditional high school students on this outcome does not rise to statistical significance in either the 9th or 11th grade, though both results are marginally significant at the $p < .1$ level. The weaker findings for the 9th and 11th grades may be due in part to our use of an a–g on-track indicator rather than number of a–g credits earned. The on-track indicator does not capture incremental differences in the number of a–g courses taken unless these differences move students from not being on track to completing a–g to being on track. In future years, we will look at the cumulative a–g credits earned by pathway students and similar peers by the end of 12th grade to assess whether pathway students complete more college preparatory requirements throughout high school.

Exhibit 6-4
Pathway Students Made Greater Progress Toward a–g Completion in 10th Grade



Source: District-provided student data.
*Statistically significant at $p < .05$.

[31] These findings differ from those in the fourth-year evaluation report, where we saw that students in three districts failed fewer classes. These differences no longer rise to the level of statistical significance when aggregating results across districts and comparing certified pathway students with traditional high school students.

[32] The following district by cohort combinations are missing from the a–g analyses: Oakland's Class of 2015 in 10th grade; Pasadena's Class of 2015 in 10th grade and 2014 in 11th grade; Sacramento for all cohorts and grades except the 2014 cohort in 9th grade. Antioch's data was excluded from all course-taking analyses. Because we have only 12th-grade a–g completion data in two districts for a single cohort, we do not estimate this result.

Finally, we examined the likelihood that students took Algebra II by 11th grade, indicating mathematical success in high school. The difference between similar pathway and traditional high school students' likelihood of taking Algebra II by the end of 11th grade is not statistically significant.[33]

Collectively, our analyses find limited but promising evidence that pathway students are more successful in high school than their peers: pathway students earn a full semester-long course's worth of credits or more over and above what their peers earn in 9th and 10th grades, and students in at least the 10th grade are more likely to progress through a–g curriculum. Future exploration with more complete data may reveal whether or not these extra credits may help students actually reach graduation and enter and succeed in higher education.

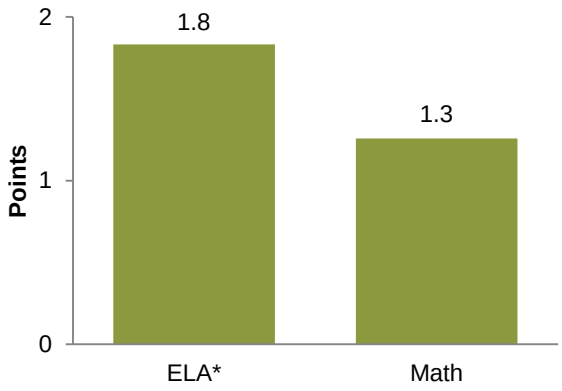
Pathway students earn a full semester-long course's worth of credits or more over and above what their peers earn in 9th and 10th grades, and students in at least the 10th grade are more likely to progress through a a–g curriculum.

Knowledge Gains

We use a set of standardized test scores to measure academic knowledge. These tests measure mastery of the content the California State Board of Education considers most important, that set the bar for high school graduates in the state, and that indicate readiness for college-level work. Because the state did not administer the California Standards Test (CST) in 2014 and will be switching to a new and quite different set of tests in 2015, we will not be able to examine Linked Learning's effect on test scores for several years following this report. For now, we use the following indicators to measure the knowledge gains of pathway students and their peers:

- **Mastery of English language arts (ELA) content.** Mastery of ELA content standards is assessed by 9th- through 11th-grade ELA CST scores and 10th-grade California High School Exit Exam (CAHSEE) scores. Students' readiness for ELA college work is indicated by a *ready* or *conditionally ready* status as determined by CSU's Early Assessment Program (EAP) test.
- **Mastery of mathematics content.** Mastery of mathematics content standards is assessed by 10th-grade CAHSEE scores.[34]

Exhibit 6-5
Pathway Students Scored Higher on the ELA CAHSEE



Source: District-provided student data.
*Statistically significant at $p < .05$.

Pathway students outperformed similar peers in traditional high schools on the ELA CAHSEE. However, their performance was similar to their peers' on other tests of ELA and mathematics content knowledge.

Although estimated differences between pathway students and similar peers at traditional high schools tend to be positive, these differences tend to be both practically and statistically insignificant, with the exception of ELA CAHSEE scores. The size of this difference is representative of the small estimated difference on each of these exams. Pathway students outscore similar peers at traditional high schools by an average of 1.8 points on an exam with a range of 175 points (Exhibit 6-5).

[33] This analysis excludes Long Beach's Class of 2014.

[34] Because CSTs in mathematics in high school are course specific, they do not provide a consistent measure of mathematical ability across all students in the same grade and are therefore excluded from our analysis. The EAP exam in mathematics is excluded from the analyses because it was taken by less than 50% of 11th-grade students.

The content measured by these exams provides one explanation for the weak findings. The majority of these measures focus on ELA and provide minimal information on the quality of instruction provided in other subjects not covered, including science, social studies, and career and technical education. Even though we do have information on one mathematics exam, the content measured by the CAHSEE mathematics exam falls below grade level for most 10th-graders—it measures primarily mastery of California 6th- through 8th-grade mathematics standards, with a small amount of Algebra I. This measure is less than ideal for the pathways under consideration, given that each district has at least one certified pathway with an industry theme that more naturally lends itself to a focus on mathematics rather than ELA (e.g., engineering, business, health).

The incompleteness of the available measures of knowledge gains may partly explain the weak findings, but the results also point toward a lack of focus on curricular rigor and instructional quality, consistent with findings noted elsewhere in this report. Our strong findings on retention and credit accumulation suggest that Linked Learning is affecting students' engagement and success in school, but these differences in behavior will not lead to additional knowledge gains unless instruction is strong.

Outcomes by Subgroup

Although the results presented above generally indicate that students in certified pathways are more engaged and more successful in school than their peers in traditional high schools, the impact of participating in a Linked Learning pathway may be different for different types of students. Ethically, it is important to verify that the overall positive (or null) effects of Linked Learning are not masking negative effects for specific subgroups. Performing this type of subgroup analysis is particularly important when evaluating initiatives that create multiple small learning communities (such as Linked Learning pathways), because the existing literature suggests that this type of reform, if implemented poorly, can exacerbate educational inequality by increasing the stratification among pathways by race, class, or prior academic achievement (Lee & Ready, 2007). If disadvantaged student subgroups are more likely to select lower-quality pathways, we might reasonably worry that the instruction they receive will not rise to the rigor of that delivered in a traditional high school setting. To address these concerns, we investigated the outcomes of Linked Learning for the most at-risk student subgroups, namely African Americans, Latinos, English learners, and students with low prior achievement.[35] In addition, given the finding that women tend to select different pathways than their male peers, we included these students as an additional subgroup.

To estimate these results, we re-ran our analyses for each subgroup of interest. To do so, we limited the statistical sample to students of the subgroup of interest and estimated the difference between students of that subgroup in Linked Learning pathways and similar students of the same subgroup enrolled in a traditional high school. Because the population of subgroups varies by district and subgroup, not all districts and certified pathways are represented in the analyses presented in this section.

For the purpose of these analyses, we focused on two key sets of outcomes: credit accumulation and test scores. We selected these outcome sets for both substantive and methodological reasons. Substantively, credit accumulation is of particular interest because we have consistently seen positive results for Linked Learning pathways in this area. If these positive findings were masking negative credit accumulation outcomes for one or more subgroups, it would have strong implications for practitioners of Linked Learning. We also examine test score results by subgroup because these are the outcomes most likely to be affected if certain subgroups are in fact being tracked into less rigorous pathways or courses. Additionally, these two sets of outcome measures offer a methodological advantage in this type of analysis.[36]

[35] We classified students as having low prior achievement if they scored in the "Below Basic" or "Far Below Basic" proficiency levels on the 8th grade ELA CST, roughly the lowest quartile on this exam in our sample.

[36] Models using continuous variables will generally provide more statistical power than models using binary or count data; more statistical precision means less Type II error (i.e., less likelihood of failing to detect a negative effect if one exists). This added precision is particularly important, given the reduction in sample size that is necessary to conduct subgroup analysis.

Pathway students in each subgroup of interest perform at least as well as similar peers in their subgroup in traditional high schools on credit accumulation and test score outcomes.

There were no negative and statistically significant differences between the performance of pathway students and similar students in their subgroup on credit accumulation or test scores (Exhibit 6-6). Generally speaking, results for the subgroups are consistent with the overall results in that credit accumulation and ELA CAHSEE differences are generally positive and statistically significant, while the other test score findings are not significant.

Exhibit 6-6
Credit Accumulation and ELA and Math Content Knowledge by Student Subgroup

		Female	African American	Latino	English Learner	Low Prior Achievement
More Credits Earned	*Through 9th Grade*	+	+	+	+	+
	Through 10th Grade	+	+	+	+	+
	Through 11th Grade	+	○	+	+	○
ELA CST Score	*9th Grade*	○	○	○	○	+
	10th Grade	○	○	○	○	○
	11th Grade	○	○	○	○	○
ELA CAHSEE Score	*10th Grade*	+	○	○	○	+
Math CAHSEE Score	*10th Grade*	○	○	○	○	+

Notes: "+" indicates a statistically significant and positive finding; "○" indicates a null finding.

We classified students as having low prior achievement if they scored in the "Below Basic" or "Far Below Basic" proficiency levels on the 8th grade ELA CST, roughly the lowest quartile on this exam in our sample.

There are a few cases where the results differ, however. Students with low prior achievement did better than their peers on the ELA CST in 9th grade and the math CAHSEE in the 10th grade. Overall, these results provide an indication that Linked Learning serves traditionally underserved students at least as well as the traditional high school programs they would otherwise attend.

Implications

Looking across the entire initiative to date, this year's analysis reinforces previous findings that Linked Learning may contribute to increased student engagement and greater success in school. Students in certified pathways stay in their district for significantly longer and accumulate substantially more credits than their peers in traditional high schools. There is also some indication that they might be more likely to

be on track to complete the a–g requirements. Collectively, these findings suggest that the Linked Learning approach may help increase student engagement and school success.

Test scores are hard to affect: even if students are more engaged and complete more credits, if pathways do not deliver more rigorous instruction and better student supports than traditional high schools, pathway students are not going to perform better on standardized tests. Our interviews with district and pathway staff members suggest that instructional and curricular rigor is increasingly a focus of pathways. However, the progress that has been made in this area is too recent to be reflected in students' test scores, and where progress has been made, the focus of integrated projects may not be aligned closely with the content measured on the state tests. In light of these findings, Linked Learning practitioners should pay particular attention to delivering rigorous instruction to all students as they continue to expand and develop pathways.

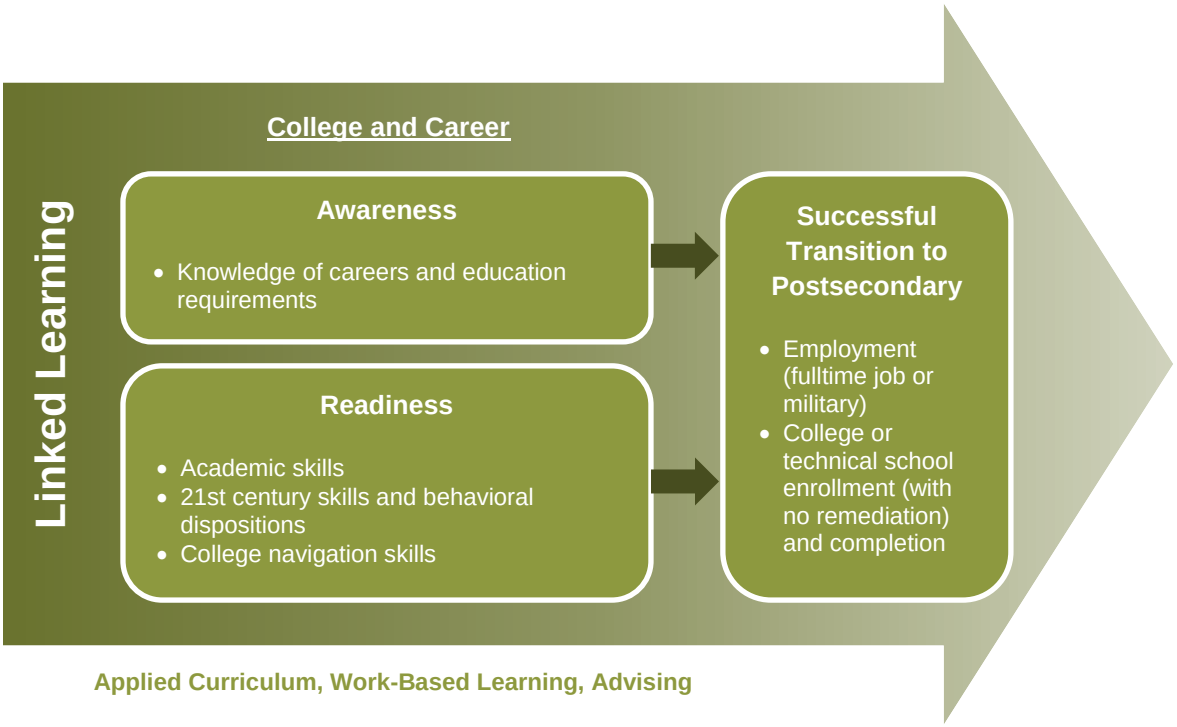
Chapter 7: Student Postsecondary Plans and Supports

Key Findings

- Twelfth-grade students in certified pathways reported that their high school experiences raised their awareness of career options.
- Twelfth-grade students in certified pathways reported receiving support from school staff to plan their future and understand the requirements necessary to reach their postsecondary goals.
- Although all pathways provide students with access to at least a few a–g approved classes, students in some pathways cannot complete all a–g courses in their pathway. If pathway CTE classes are not a–g approved, students are less likely to be able to meet admission requirements for four-year colleges.
- The fact that opportunities for pathway students to take AP classes are typically outside the pathway program of study makes it challenging for students to participate in integrated projects and complete pathway requirements.
- Twelfth-grade students in certified pathway reported that their high school experience helped them develop 21st century skills and productive dispositions and that they were getting substantial assistance in navigating critical steps to college entry, but pathway students and the teachers and administrators at their schools expressed concern about students' readiness to transition to postsecondary education.
- Similar to traditional high school students, twelfth-grade students in certified pathways reported that they planned to pursue a variety of options once they leave high school.

The four core components of Linked Learning—rigorous academics, real-world technical skills, work-based learning, and personalized support— are designed to provide high school students with relevant, engaging high school experiences and to raise students' awareness and interest in college and career opportunities. In earlier chapters, we described how Linked Learning is providing students with experiences beyond the traditional high school course of study: pathway students are gaining greater exposure than comparison students to rigorous academics and real-world technical skills, while work-based learning experiences are providing students with valuable career- and college-readiness skills. Through these experiences, students are developing 21st century skills and productive dispositions and behaviors necessary for success in school and postsecondary endeavors. In this chapter, we explore whether these Linked Learning experiences also foster college and career awareness and readiness, and ultimately whether participating in Linked Learning supports students' successful transitions to college and careers.

Exhibit 7-1
Framework for How Linked Learning Affects Student Transition to Postsecondary Experiences



In Exhibit 7-1, we offer a framework for examining how enrollment in a Linked Learning pathway may affect the transition to postsecondary education and employment that boosts students' earning power after high school. First, Linked Learning pathways are intended to increase students' college and career awareness by exposing them to information on careers and the educational requirements necessary to make those career options a reality. In this chapter, we look at pathway students' awareness of their career options and the guidance they receive to plan for college and careers. Because the framework posits that awareness would need to be accompanied by readiness for students to transition successfully to college and careers, we then describe the status of college and career readiness measures across pathways. Specifically, we focus on academic skills to meet college entrance requirements without the need for remediation and to successfully complete a postsecondary course of study, 21st century skills and behavioral dispositions/academic mindsets to succeed in careers and the school environment (see Chapter 5, "Perceptions of Skills Gained in Pathways"), and college navigation skills (e.g., understanding the college admissions process) to improve access to postsecondary education.

Data from district and school staff interviews, student focus groups, and student surveys suggest that Linked Learning pathways have been reasonably successful in increasing students' awareness of their career options through work-based learning and career exploration experiences. Although our survey findings suggest that pathway students were more likely than comparison students to believe that their high school experiences helped them develop a range of skills they will need for their futures, interview and focus group data indicate that staff and students had mixed perceptions with regard to how well pathways truly increased the skills students need to succeed once they leave high school.

Awareness of Career Options and Postsecondary Requirements

We would expect pathway students to have more awareness than their non-pathway peers of their career options, given the emphasis Linked Learning places on work-based learning opportunities and career exposure. We also would expect pathway students to have a stronger understanding of the concrete steps they will need to take to reach their career goals. Indeed, participating in pathways has helped students identify career interests and enhanced their understanding of the education and training necessary to prepare for postsecondary opportunities.

Pathway students reported that their high school experiences raised their awareness of career options.

As discussed in Chapter 5, pathway students attributed a growing understanding of their own career interests, available jobs, and related job requirements to their participation in pathways. Students told us in focus groups that their pathway experience had helped them identify future career fields that appealed to them and helped them understand which careers they were not interested in. Looking at survey data from twelfth-grade students in certified pathways along with data from student focus groups provides for a more nuanced interpretation of how pathways influence students' career choices. A quarter to a third of pathway students reported that high school had helped them "a lot" to figure out what career they wanted (26% versus 15% for comparison students) or to identify the education needed for that career (34% versus 22%).

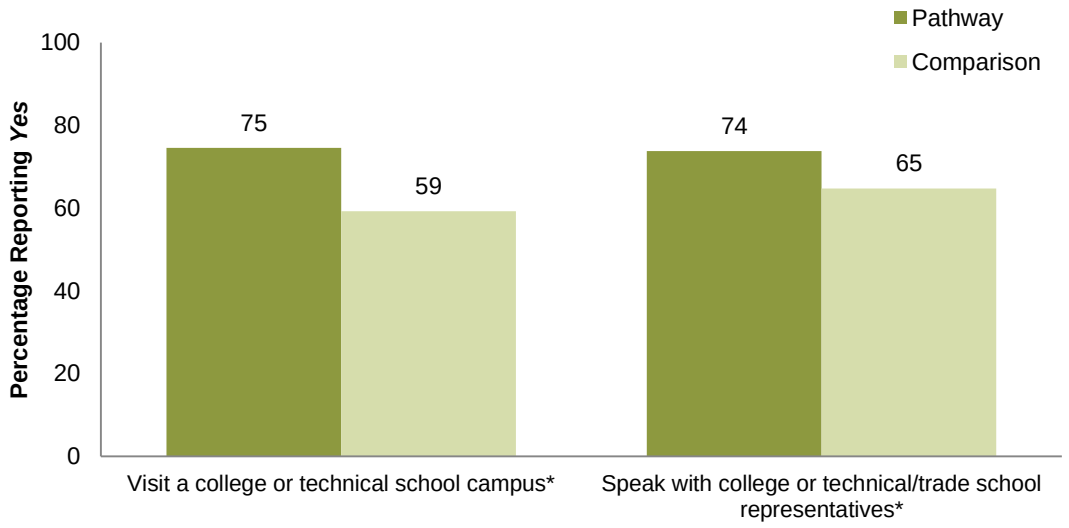
Pathway participation helped students clarify or refine their career plans. This distinction is important because without exposure to the breadth of options in different fields, students may identify career goals that are poorly informed or ill considered.

Although we might have expected a higher percentage of pathway students to report that participation in pathways helped them make career choices, what we learned in student focus groups is that pathway participation helped students clarify or refine their career plans. This distinction is important because without exposure to the breadth of options in different fields, students may identify career goals that are poorly informed or ill considered. One twelfth-grade student made a comment illustrating how pathway participation, particularly internships, opened him up to more options within a particular field: "I've always known I wanted to do something in the medical field, but [before this pathway] I only knew there were surgeons and doctors. Coming here you start to learn exactly what you want to do." The opportunity to explore career choices early may be financially beneficial for pathway students as well. One twelfth-grade student stated that "[I] think it's better this way. You get a taste of something you are interested in and that way you don't spend a lot of money later on just to realize it's not something you are really passionate about. That's something I really appreciate the pathway for."

Pathway students reported receiving support from school staff to plan their future and understand the requirements necessary to reach their postsecondary goals.

Greater percentages of pathway students than of comparison students reported getting support from adults at their school to explore their future education and career plans. Supports included opportunities to visit a college or technical school campus (75% versus 59%) and to speak with college or trade school representatives (74% versus 65%) (Exhibit 7-2).

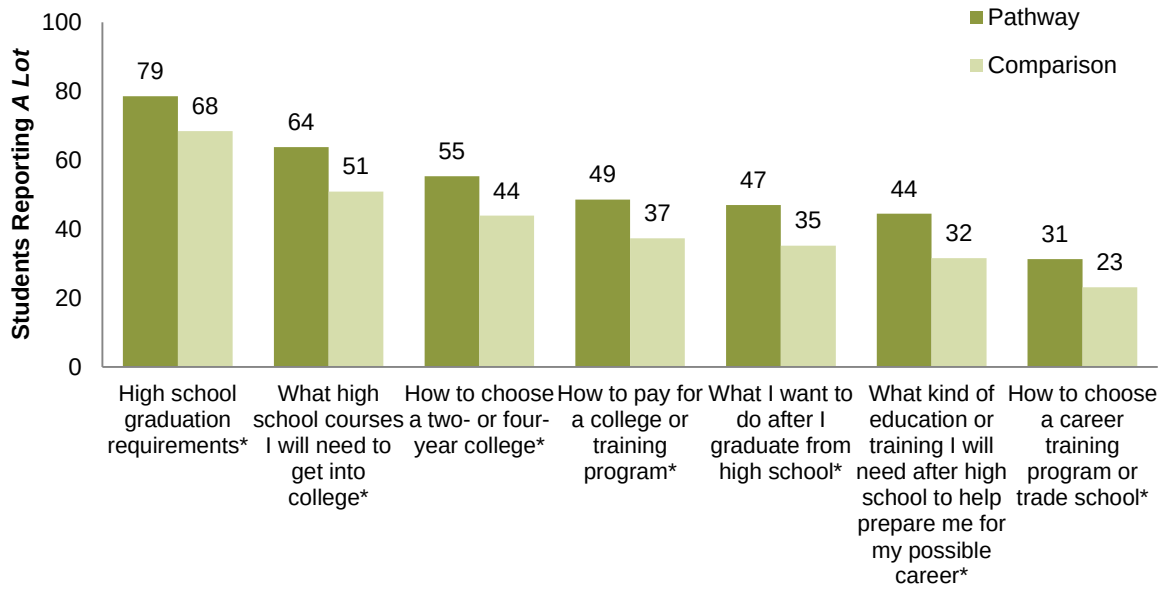
Exhibit 7-2
Students Reporting Opportunities to Explore Future Education Plans



*Difference between pathway and comparison students is statistically significant at $p < .05$.
Source: Spring 2014 12th-Grade Student Experience Survey.

Pathway students also were more likely than comparison students to report that they were getting "a lot" of help to understand high school graduation requirements (79% versus 68%), the high school courses needed to get into college (64% versus 51%), how to choose a two- or four-year college (55% versus 44%), how to pay for college or training (49% versus 37%), what they wanted to do after they graduated high school (47% versus 35%), what kind of education or training is needed to prepare for a possible career (44% versus 32%), and how to choose a career training or trade school (31% versus 23%) (Exhibit 7-3).

Exhibit 7-3
Students Reporting Extent of Adult Guidance for Postsecondary Planning



*Difference between pathway and comparison students is statistically significant at $p < .05$.
Source: Spring 2014 12th-Grade Student Experience Survey.

Career and College Readiness

In Chapter 5, we reported that students' experiences in Linked Learning pathways offer opportunities to develop a skill set that increases their readiness to successfully pursue a career and navigate the professional world. Specifically, on our survey, students credited pathways with developing their communication and collaboration skills, learning technical skills and professional standards, and becoming informed consumers of information. Students also credited pathways with increasing their confidence that they have what it takes to achieve successful careers.

Pathway students also reported on the survey that their high school experience had prepared them for college, although Linked Learning district administrators and pathway teachers did not always agree that pathway students were academically ready for college coursework and the college environment. Fully 90% of pathway students reported feeling that high school prepared them for a two-year college and 75% for a four-year college. District administrators and pathway teachers, on the other hand, voiced a range of opinions on how well pathway students were prepared for the rigor of college work. Pathway students may be meeting some a–g requirements (as discussed in Chapter 6, "Student Engagement and Achievement"), but according to district administrators and pathway teachers, students' reading, writing, mathematics, and critical-thinking skills were still in need of improvement. Some Linked Learning educators expressed concern that there is a disconnect between high school graduation requirements and actual college readiness—for example, some mentioned that even Advanced Placement (AP) students are being placed into remedial college classes. Early Assessment Program (EAP) 2013 data (California State University, 2014) suggest that many pathway students are only "conditionally ready" or "do not demonstrate readiness" for college-level work, but few Linked Learning districts have data on how well their pathway students are actually performing in college.

In this section, we delve more deeply into academic readiness in Linked Learning pathways. We look at measures of college readiness and opportunities pathway students have to participate in rigorous coursework, and then describe student supports for navigating college entrance requirements.

Different definitions or indicators of college readiness identified by educators result in different opinions of pathway students' readiness for the rigor of college coursework.

Test scores have traditionally been viewed as strong indicators of student learning and college readiness. Scores on college entrance exams often determine whether students are placed in remedial or credit-bearing courses. College readiness assessments such as EAP (a subset of items given to 11th-grade students as part of the CST) indicate that large percentages of California high school students are scoring below college-ready levels. According to 2012–13 data, across the initiative districts, an average of 16% of 11th-grade students were ready for college English and an average of 8% were ready for college mathematics (California State University, 2014). District administrators and pathway teachers in a few districts expressed some skepticism about how accurately test scores predict students' ability to do college work (the relative importance of course outcomes over tests scores in predicting future school success is discussed in Allensworth & Easton, 2007; Geiser & Santelices, 2007). Currently, there is a great deal of variation across California colleges in the placement tests used and the benchmark scores set to determine readiness for credit-bearing courses. One district administrator told us that "it's hard to get an accurate read on [how well test data predicts student readiness for college courses]. For example, students that enroll in remedial courses, are they really that far behind? Do they really need these courses?" Another added, "When we are sending kids [to college] who are deemed 'not ready,' is it possible that some of that is on the receiving end?"

Districts in the initiative are just beginning to develop metrics (such as graduate profiles) to define what it means for students to be college and career ready. Graduate profiles typically specify multiple competencies for what students should know and be able to do when they graduate from high school, with an emphasis on 21st century skills (e.g., critical thinking, communication, leadership, technology proficiency). However, the majority of districts have yet to determine how they will assess the skills identified in their profiles. One college-readiness benchmark that district administrators described as promising is completion of rigorous academic coursework in high school. Since a–g approved classes, AP courses, and dual-enrollment classes are all closely aligned with the demands of college, assessing students' participation and success in this coursework can help signal that pathway students are academically prepared to meet the demands of college.

Although pathways provide students with access to at least a few a–g approved classes, students in some pathways cannot complete all a–g courses in their pathway. If pathway CTE classes are not a–g approved, students are less likely to be able to meet admission requirements for four-year colleges.

To ensure that Linked Learning pathways support the goal of college readiness, ConnectEd certification criteria call for all pathway students to have access to a UC/CSU-approved a–g curriculum (ConnectEd, 2011). Chapter 6 of this report examined the extent to which students in certified pathways were completing the coursework necessary to enter the California State University system. Our analysis found that students in certified pathways are as likely as similar peers to be on track to meet college entrance requirements in terms of successful completion of a–g requirements; they are more likely than similar peers to be on track in the 10th grade only.

This year's qualitative data suggest that most pathways provide students with access to at least some, though not all, a–g approved classes through the program of study. Because many pathway CTE courses are still not a–g approved and pathways often lack a foreign language course, pathway students may be challenged to complete college entrance requirements unless they complete some required courses outside of the pathway. Our reviews of certified pathway documents confirmed feedback from district staff and teachers that there is variation across pathways in whether or not they provide a–g approved CTE and foreign language classes in their core course sequence. The document reviews also provided several illustrative examples of how some pathways are including more a–g approved classes as a part of the program of study. For example, Jordan High School's Media and Communication (JMAC) SLC in Long

Beach has a foreign language requirement (Spanish) and several CTE-approved courses in digital arts and imaging that fulfilled the "f requirement" for visual and performing arts. Similarly, the Education Academy in Oakland includes two a–g approved electives: Introduction to Education and Educational Psychology.

Pathway and district staff are aware of these limitations, and districts have been responding by revisiting pathway courses of study and revamping pathway CTE courses to meet a–g standards. For example, Oakland has been working to get more CTE courses approved by working with the UC Curriculum Integration program (University of California, n.d.). [37]

The fact that opportunities for pathway students to take AP classes are typically outside the pathway program of study makes it challenging for students to participate in integrated projects and complete pathway requirements.

AP classes offer the opportunity for students to build confidence in their ability to handle advanced coursework and earn college credit. A student in a hospitality pathway explained, "AP Comparative Government is really immersive [in a college-like environment].… You're independent and you're responsible for all your work and you turn it in or else you don't get credit. [You] really get a taste of what it'll be like in college." Similarly, a health pathway student added, "Last year…AP World [History]…was a learning experience.… It was a culture shock, [I thought] 'wow, this is an everyday basis in college'.… In AP, [the work is] all you. No one else except yourself."

Because of their small enrollment, most pathways often are unable to offer AP courses as part of the pathway core since those courses would not have sufficient numbers of qualified and interested students.

Reviews of selected pathway courses of study revealed that some pathways are including AP classes. For example, one pathway with a hospitality theme includes AP Environmental Science because, according to the pathway lead, the course standards are aligned with industry standards. Another pathway with a sustainability theme allows students to choose either AP Environmental Science or a non-AP sustainability course in their senior year. A third pathway with an arts theme enrolls all its junior and senior students in an AP English and AP English Literature course as part of its program of study.

There are, however, scheduling issues for pathways to overcome if advanced courses are to become a regular part of a pathway course of study. Because of their small enrollment, most pathways often are unable to offer AP courses as part of the pathway core since those courses would not have sufficient numbers of qualified and interested students. Consequently, pathway students often take AP classes outside the pathway course of study, meaning that those classes are not pure and AP teachers do not participate in multidisciplinary pathway projects. As a result, pathway students miss out on the full benefit of integrated projects and must engage in additional work to meet project deadlines. When students take AP courses outside the pathway core, it can be harder for pathway staff to maintain cohort purity with fewer students in pathway classes.

Although offering AP classes as part of the required pathway course of study is one approach to exposing students to advanced coursework, pathway staff noted the lack of flexibility in adapting the AP curriculum to reflect a pathway theme. Some pathways have required or are thinking of requiring student participation in AP classes if that coursework is aligned with pathway student outcomes (e.g., AP English if English and communication skills are critical to success in the pathway's industry sector). Another challenge is providing sufficient academic support (e.g., supplementary reading, writing, and math

[37] There is a statewide trend of more CTE courses being certified in the sciences. For example, in 2009–10 there were 847 UC-approved Health Science and Medical Technology courses, and in 2012–13 the number had increased to 1,165 courses.

instruction) to make AP classes accessible to all pathway students (e.g., school schedules that lack sufficient time to accommodate academic support classes).[38]

Few pathways include dual enrollment as an option for students to earn college credits while in high school. As a result, there are limited opportunities for students to get a jump start on earning college credits and to gain exposure to the demands of college work.

Interviews with pathway teachers and reviews of certified pathway courses of study revealed that opportunities for dual or concurrent enrollment have been fairly minimal in Linked Learning districts. Where offered, pathway students reported that participation in dual enrollment classes helped them get a feel for college-level expectations. For example, when asked how prepared he felt for college, one health pathway student responded, "[I feel prepared] having taken various college courses." Another commented, "Doing [college-level work] for two to three years, it's kind of doable. You have to stay on top of [your work] and [not] slack off…[it] gives you a sense of initiative."

The ability of pathways to offer dual enrollment options requires collaboration between districts and colleges to align courses of study, train teachers and faculty, share data, and manage logistics.

Research on dual enrollment in California, such as the Concurrent Courses Initiative, suggests that career-focused dual enrollment programs can provide important benefits for students who are underachieving and underrepresented in higher education (Hughes et al., 2012). The ConnectEd *Framework for Developing a System of Linked Learning Pathways* (2014) also identifies dual enrollment options (critical element D4.3) as a way to round out pathways with advanced coursework that the district may not be able to offer. The ability of pathways to offer dual enrollment options requires collaboration between districts and colleges to align courses of study, train teachers and faculty, share data, and manage logistics. Some of this collaboration is just beginning to develop through regional work stimulated by the California Career Pathways Trust. For example, the Los Angeles Community College District applied for a Career Pathways Trust grant to strengthen its dual enrollment programs. The concerns expressed by pathway teachers and administrators about students' readiness for the academic rigors and independence of college underscore the need for these kinds of collaborative efforts.

Although pathway students reported that their high school experience helped them develop 21st century skills and productive dispositions, pathway students and the teachers and administrators at their schools expressed concern about students' readiness to transition to postsecondary education.

In addition to concerns about academic readiness, administrators and teachers expressed concerns about pathway students' acquisition of the productive dispositions and behaviors required to succeed in life after high school, sometimes referred to as noncognitive skills. Among these skills are the ability to study, manage time, be aware of one's performance, demonstrate persistence with difficult tasks, seek out help when needed, and set and achieve academic and personal goals (Farrington et al., 2012; Conley, 2010). Although pathway students were more likely than comparison students to report that their high school experience had helped them develop 21st century skills and productive mindsets (as described in Chapter 5, "Perceptions of Skills Gained in Pathways"), interview and focus group data suggest that pathway students may not have all of the self-regulatory skills to be fully prepared for college. In particular, pathway staff described a tension between providing sufficient supports to help students succeed academically in high school and helping students develop the independence and behavioral attributes that will equip them to succeed in postsecondary education. A few district

[38] In our fourth-year student survey, greater percentages of comparison students than of pathway students reported enrolling in AP (44% comparison versus 38% pathway students), International Baccalaureate (IB) (4% comparison versus 2% pathway students), and honors courses (45% comparison versus 40% pathway students). A greater percentage of pathway than comparison students reported enrolling in courses that gave students credits that can transfer to college (excluding AP and IB classes)—24% pathway versus 31% comparison students. Although statistically significant, the magnitudes of the differences between the percentages of pathway and comparison students are small, suggesting fairly similar experiences with taking advanced coursework.

administrators and pathway teachers wondered whether they had been "sheltering" students or "hand holding" too much. Some students shared their teachers' concerns about their ability to navigate high school academic requirements without some hands-on attention to complete assignments. As one pathway student remarked when asked about his readiness for college, "I don't feel prepared. I need someone like the teachers to be telling me 'oh this is due, or your grades are [getting] low, or do this or do that' and I know in college there's not [going] to be anybody telling me…. I'm basically on my own."

These types of academic behaviors need to be developed systematically over time if they are to become ingrained in students by the time they reach a postsecondary program, where they will be expected to take much more responsibility for their own learning. A pathway lead commented,

> For the first two years of college there is a big gap in the kind of attention that they [students] get here [versus] at the college level. We are teaching them to be self-directed and motivated. If they don't have it in high school, then it is too overwhelming when they get to college. Our students who are able to seek out help are able to make it.

In addition, many students who are struggling to graduate have poor academic and study skills. According to one pathway teacher, "Big gaps [in students] are in academic skills, study habits, and in overall attitude toward school. Embracing a challenge rather than complaining about it. You see that shift when the work becomes more meaningful to the kids."

Pathway students reported understanding that college presents some significant obstacles academically, emotionally, and socially. In some cases, cultural norms do not support students' leaving home or their community, particularly first-generation college goers. As one twelfth-grade student explained, "I personally am ready to graduate, but [am I] prepared? I don't know, I don't think so. I know teachers tell us what's going to happen, but they don't tell you the full experience, how lonely you're going to feel. I'm moving out of state; that's pretty scary." Another student added,

> I feel like I'm not mentally ready. I'm not an adult yet. [I] want to go to community college for two years to get myself ready, adjust to that lifestyle…my senior year has been way too chill, too easy. The colleges all talk about being rigorous, [having] sleepless nights, and I feel like I'll fall behind or end up dropping out.

Informal counseling from teachers was the primary strategy for addressing students' concerns about the transition to college, but feedback from pathway students suggests that pathway teachers and counselors may need to pay greater attention to developing noncognitive skills—that is, developing the attitudes and behavioral attributes students must demonstrate to succeed in postsecondary education and increasing students' confidence levels with navigating a new school environment.

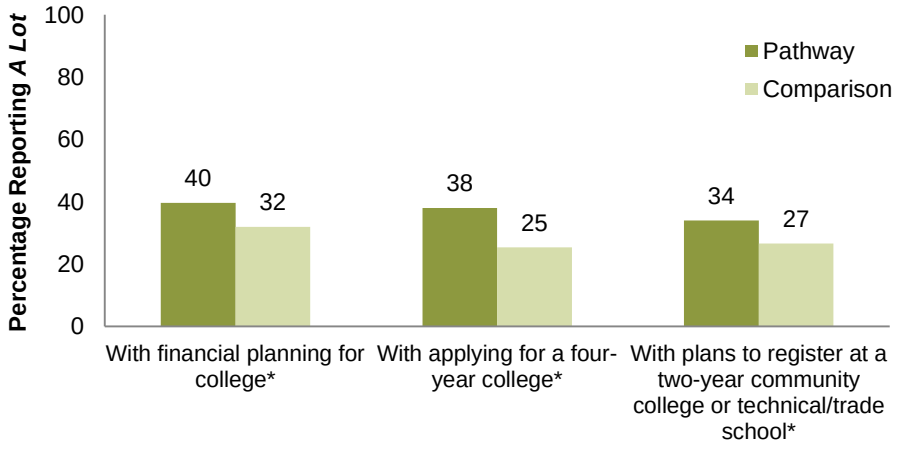
Pathway students reported understanding that college presents some significant obstacles academically, emotionally, and socially.

Pathway students reported that they were getting substantial assistance in navigating some of the critical steps to college entry.

An increasing number of studies highlight how important it is for students to understand how the postsecondary system operates—for example, how to choose among colleges, how to apply to college and for financial aid, and how to interact with professors and peers in college. For most students, going to college is like entering a new culture. Colleges vary in whether and how they support students' social adjustment, how they provide academic resources and support, and how the campus climate is organized to support positive interactions with peers. These institutional characteristics of colleges impact college retention and postsecondary success. The transition to college can be particularly difficult for students from communities that have little prior experience with postsecondary education (Conley, 2010). Pathways are helping to overcome some of these social capital deficits by helping students plan for college.

Not only did pathway students receive the substantial support cited earlier in this report around selecting high school courses necessary for college admission and choosing the appropriate college, but pathway students were also more likely than comparison students to report that adults at their school provided them with assistance regarding college entrance activities. Among students who were planning to continue their education, greater percentages of pathway students than of comparison students reported getting "a lot" of help from an adult at their school to discuss financial planning for college (40% versus 32%), apply to four-year colleges (38% versus 25%), and register at a two-year college (34% versus 27%) (Exhibit 7-4). Student focus groups revealed that counselors and pathway teachers were a source of information regarding college requirements.

Exhibit 7-4
Students Reporting Extent of Adult Support with College Application Process



*Difference between pathway and comparison students is statistically significant at $p < .05$.
Source: Spring 2014 12th-Grade Student Experience Survey.

Students' Plans for College and Career

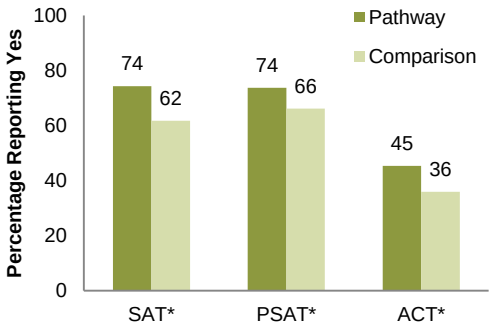
Linked Learning's emphasis on rigorous academics and real-world experiences is designed to improve high school graduation rates and to increase successful transitions to a full range of postsecondary education opportunities, particularly for low-income and disadvantaged youth. Student survey and focus group data indicate that pathway students are planning to pursue both college and careers once they leave high school. Although we do not yet have data on the success of pathway students' transitions to life after high school, we report on their plans immediately upon high school graduation and the steps they have taken to enter college as early indicators of what the future holds for these students.

Similar to traditional high school students, pathway students reported that they planned to pursue a variety of options once they leave high school.

Pathway participation has supported students' pursuit of a full range of options after high school graduation, as evidenced by student survey responses. Greater percentages of pathway students than of comparison students reported plans to continue their education full time (74% versus 68%) and work part time (66% versus 63%) after they graduate, whereas a greater percentage of comparison than pathway students (23% versus 19%) planned to continue their education part time in fall 2014. Although statistically significant, the magnitudes of the differences between the percentages of pathway and comparison students are small.

All seniors (pathway and comparison students) expressed high aspirations in response to questions about their future education levels, but survey data suggest that pathway students were more likely than comparison students to have taken steps to attend a four-year college right after high school. Such actions include taking the SAT (74% versus 62%) and PSAT (74% versus 66%) (Exhibit 7-5), and—among students who planned to continue their education in fall 2014—submitting an application to a CSU or UC campus (Exhibit 7-6). If pathway students are to be ready to attend these four-year colleges, then their pathway course of study must meet the CSU/UC a–g requirements—a pathway goal yet to be realized, as described earlier in this chapter.

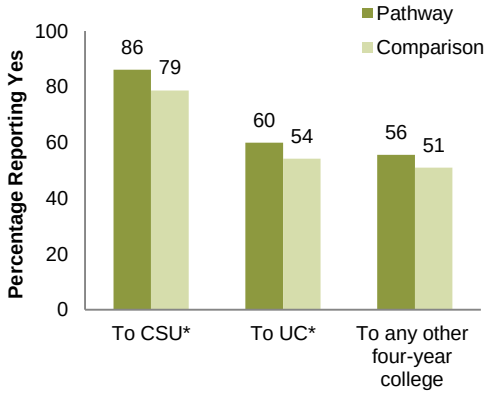
Exhibit 7-5
Students Reporting Taking College Entrance Tests



*Difference between pathway and comparison students is statistically significant at $p < .05$.

Source: Spring 2014 12th-Grade Student Experience Survey.

Exhibit 7-6
Students Reporting Submitting College Applications



*Difference between pathway and comparison students is statistically significant at $p < .05$.

Source: Spring 2014 12th-Grade Student Experience Survey.

Although the college aspirations of pathway students are promising, college enrollment and persistence are harder to realize. Beyond academic readiness (in terms of both achievement and academic behaviors), district administrators and pathway teachers cited a number of obstacles that pathway students face in completing college. Obstacles included a lack of financial resources, lack of confidence as first-generation college goers, students' immigration status, getting stuck in remedial coursework, and an inability for some students to access the classes they need to complete a two- or four-year college degree.

Implications

Policymakers and education practitioners agree that all students should graduate from high school "college and career ready," but there is little clarity on what this term actually means. Nationally, there continues to be a large gap between how high school teachers perceive the college readiness of high school graduates and how college instructors perceive the readiness of their incoming first-year students (ACT, Inc., 2013). This discrepancy in perceptions suggests a continuing lack of curricular alignment between the K–12 and postsecondary education systems. If K–12 educators and college faculty cannot achieve consensus on what it means to be college and career ready, it will be difficult to measure progress on the achievement of readiness goals.

The districts recently adopted graduate profiles that reflect what students should know and be able to do by the time they graduate from high school. These graduate profiles may contribute to conversations about different ways to measure college readiness. State policy initiatives may also influence this dialogue. In California, SB 1458, passed by the State Legislature in 2012, broadens the components of the Academic Performance Index (API) score by capping tests scores to 60% of a school's API and

introducing measures of student preparedness for postsecondary education and careers. State policymakers are working on incorporating measures of career and college readiness into the API that will focus much more attention on what it means to be college and career ready.

Our interview and focus group data suggest a need to improve pathway rigor and expose students to college-level work in their pathway courses of study. These changes are necessary to support the development of productive dispositions, behaviors, and academic mindsets that research points to as predictors of school success. The role of noncognitive factors in students' academic performance has gained increasing attention of researchers and practitioners, but the development of actionable strategies for classroom use still lags behind the research. Pathway teachers have expressed an interest in learning how they can better support their students to become effective learners, but they will require assistance in realizing this goal.

Chapter 8: Sustaining Linked Learning Systems

Key Findings

- Implementation of the Linked Learning approach has proceeded more quickly in some districts than in others. However, all nine districts have demonstrated a commitment to maintaining and even expanding district-level structures to support ongoing Linked Learning implementation.
- The nine districts intend to expand the number of students enrolled in pathways and/or the number of certified pathways, and are aggressively seeking local and external funding sources for continued support of the work.
- To develop their capacity for supporting a growing number of Linked Learning pathways, district leaders plan to continuously improve pathway operations using grant funds—most notably those from the California Career Pathways Trust.

As districts shift their focus to sustainability of the reforms launched through the initiative without Foundation support, the lessons observed in our fourth-year report (Guha et al., 2014) on essential district structures and practices remain pertinent for consideration. In particular, Linked Learning can succeed and be sustained as a district-level initiative only when it is positioned and supported as a long-term priority and aligned with other key initiatives. In this chapter, we discuss the centrality of Linked Learning to district high school improvement strategies and alignment with Common Core State Standards implementation (introduced in Chapter 3, "Curriculum, Instruction, and Assessment"), district plans for pathway expansion and/or sustainability, and the capacity of the districts to support pathways adequately over time.

Implementation of the Linked Learning approach has proceeded more quickly in some districts than in others. However, all nine districts have demonstrated a commitment to maintaining and even expanding district-level structures to support ongoing Linked Learning implementation.

District administrators in eight of the nine districts reported that Linked Learning continued to be their districts' signature high school reform effort. The Linked Learning approach has become central to how high schools do business, in part because of the support and active involvement of superintendents and school boards. Pathway teachers have grown increasingly confident that their districts will sustain Linked Learning implementation, as evidenced by the inclusion of Linked Learning in district strategic plans as a key driver for achieving college and career readiness, the alignment of graduate student profile outcomes with Linked Learning goals, and the alignment of the Linked Learning approach with the Common Core State Standards.

Linked Learning directors are increasing support for Linked Learning implementation across district departments, strengthening the work of pathway teams (e.g., improving Communities of Practice, distributing leadership among school administrators to support pathway implementation, improving instruction through a focus on the Behaviors of Learning and Teaching and the Common Core standards), and expanding district-level support to Linked Learning pathways. Examples of district efforts to create structures that will support and sustain pathways include the following:

- In LAUSD, Linked Learning priorities include deeply embedding Linked Learning in the district's broader work with a major focus on the graduate profile—ensuring that the graduate profile is part of the district's strategic plan and developing systems that will support the graduate profile (e.g., through senior defenses of portfolio work). LAUSD administrators have also focused on improving

pathway quality by creating a site-based leadership team that is strong in its ability to lead both organizationally and instructionally.

- In Porterville, administrators have been strengthening pathway Communities of Practice through a combination of coaching on distributed leadership and improving pathway teacher skills (e.g., externships with industry partners, a new teacher contract that includes a stipend for Linked Learning pathway teachers for every Linked Learning certification course taken from San Diego State University and a requirement for twice-monthly collaborative meetings).
- West Contra Costa considers Linked Learning implementation to be the district's signature secondary school reform initiative. The district has sought out cooperation, staff time, and resource investment from all of its administrative departments, hired a full-time work-based learning coordinator, and adopted a new internal coaching structure to support Linked Learning pathways.

These examples are quite typical of strategies that districts are employing to institutionalize and take local ownership of reforms initially introduced and supported by Foundation funds and participation in the initiative.

The nine districts intend to expand the number of students enrolled in pathways and/or the number of certified pathways, and are aggressively seeking local and external funding sources for continued support of the work.

In our fourth-year report, we broached the issue of the districts' capacity to expand the number of pathways and adequately support them over time. Whether district staff are able to support an increasing number of pathways with a wide array of needs remains an open question, but districts are marshalling both internal and external resources to meet district expansion goals, including committing local funds to Linked Learning, seeking out external funding sources, collaborating with a broader group of stakeholders, and building internal coaching support.

Several districts are focused on extending the reach of Linked Learning pathways to larger numbers of high school and even middle school students. The majority of districts target a goal of increasing the number of students participating in pathways—participation targets range from 50% to 100% of district secondary students—although district expansion timelines vary and a number of districts will require steeper growth trajectories. For example, if Oakland is to move from 40% current enrollment to 100% of high school students enrolled in pathways, the district must develop new pathways and substantially increase enrollment in existing pathways, while actively recruiting students. Toward this end, the district recently adopted a plan to implement wall-to-wall pathways in all of its high schools. Linked Learning districts like Pasadena and West Contra Costa are working to extend their career pathway efforts down to middle schools.[39] For example, Pasadena is using an $8 million magnet school grant to open three STEM pathways and one visual arts pathway at the elementary and middle school levels (two pathways at each level).

The Linked Learning districts are well aware that expansion of student enrollment in pathways is not simply a numbers game; pathway development processes are also important. Thus, LAUSD has established a more comprehensive process for recruiting new pathways to better ensure their successful launch. For the 2013–14 school year, LAUSD selected pathways based on an application, then engaged the new pathway cohort in an "onboarding process" that required pathway staff to collaboratively design a range of deliverables (e.g., student outcomes, planning documents) prior to the summer Linked Learning professional development session so that their teams were fully ready to benefit from the training. Sacramento, which has no current plans to increase the number of pathways beyond the 22 that currently operate at different stages of development, aims to strengthen and certify all 22 pathways by 2017.

As the districts think about expansion and sustainability of pathways, leaders are aware that they must rely on multiple sources of financial support. Grant funding has created a great deal of momentum for

[39] Research shows that attendance patterns and engagement at the middle school level are among the strongest predictors of high school graduation and college-going culture—see Balfanz (2009) and ACT (2008).

expanding the number of Linked Learning pathways. At the same time, the districts have also committed local and regional resources to support Linked Learning. Each financial package appears to be unique. Thus, Montebello supports its three pathway coaches primarily from the district's general fund and promised, as part of its California Career Pathways Trust (CCPT) grant, to commit $7 million to $8 million in local funds to sustain Linked Learning. Sacramento and Pasadena tapped ROP funds to support Linked Learning (e.g., avoid layoffs of CTE teachers, maintain pathway counselors, modify the role of school ROP technicians to support work-based learning coordination). Oakland's strategy to tap into public funding may be the most ambitious and creative of all. To fund Oakland's pathway expansion plan, the district has proposed placing a parcel tax measure on the November 2014 ballot that would support an infusion of Linked Learning staff at all of its high schools. The parcel tax would provide $10 million of dedicated Linked Learning funding over a 10-year period and, if successful, would first become available in two years. In the interim, the Oakland school board will commit $5 million in Local Control Funding Formula (LCFF) money to begin funding new Linked Learning school-level positions.

One of the eight Local Control Accountability Plan (LCAP) funding priorities is focused on college readiness measures, but at the time of our site visits, most districts were still developing their LCAPs to establish how LCFF funds will be allocated. A few districts, like Oakland and West Contra Costa, indicated they had plans to use some of their LCFF money on Linked Learning–related activities to enhance efforts to graduate students who are college and career ready. For example, West Contra Costa intended to spend $3.2 million on counselors and programs to create a "college-going culture," including allocating a college and career counselor to any district school with a 70% enrollment of special population students (Reid, 2014).

All nine districts have sought external funds to replace Foundation funding for Linked Learning implementation. For example, LAUSD committed some of its $15 million CCPT money to support 45 pathways and will use its $7 million Youth Career Connect (YCC) grant to create six model pathways. Long Beach is a partner in a combination of three successful CCPT and Career Technical Education Pathways Program (SB 1070) grants to develop new pathways in advanced manufacturing and health, and the district will use some of its $7.5 million Bill & Melinda Gates Foundation grant to create online Linked Learning Tier 2 performance mapping professional development modules for training pathway teachers. Overall, the current evidence is that the initiative districts will be entrepreneurial about finding the resources they need to keep expanding and improving their local systems of pathways.

To develop their capacity for supporting a growing number of Linked Learning pathways, district leaders plan to continuously improve pathway operations using grant funds—most notably those from the California Career Pathways Trust.

Pathway coaching has been instrumental in moving pathway development along toward certification, and, consequently, internal coaching has been a high district priority. To cope with the growth in the number of pathways, districts have differentiated their coaching support or targeted support based on pathway readiness or needs. Districts plan to use CCPT grant funding, with its focus on workforce and economic development, to support a broad range of activities related to work-based learning (e.g., create and support intermediary organizations to expand and coordinate work-based learning opportunities for pathway students, increase collaboration with Workforce Investment Boards [WIBs] and local colleges, pay for career specialists/work-based learning coordinators, and fund college and career centers) as well as improvement of district coaching capacity. LAUSD, for example, will use some of its CCPT funds to support in-school instructional coaching positions, and Sacramento will also use some of its $6 million CCPT grant to fund three career specialists/internal coaches to work with pathways in Sacramento and Elk Grove (the Sacramento Employment and Training Agency will supply two additional coaches) in five industry sectors.

CCPT, YCC, and SB 1070 grants embrace a regional approach with a diverse set of partners and require greater strategic thinking about how to align multiple systems including industry, WIBs, postsecondary institutions, and other school districts.[40] Participation in these collaborative grant efforts has changed the

[40] The Career Technical Education Pathways Program includes $2 million in state funds (authorized under SB 1070) and additional funding from the California Community College system and the Irvine Foundation. The grant

mindset of Linked Learning administrators regarding the group of stakeholders necessary to sustain and grow Linked Learning pathways. One Linked Learning director shared how working on the CCPT grant influenced her thinking about how to sustain the district's Linked Learning efforts:

> What I'm learning as I do the Career Pathways Trust work…[I'm] finally learning what a Workforce Investment Board does.… The resources they have and what they know, that's what will institutionalize everything.… And the community colleges know all these things.… So I would say the connection [with the community college and WIB], the resources and connections they have, I see this as whether we get the money or not, it [has] built a relationship for us. They bring resources that are deeply rooted in the economic development of the region that we don't have access to because it is not my expertise. I don't know [workforce development]. So that's what I'm realizing for us will be the powerful push.

Implications

There is much to be hopeful about concerning the sustainability of the Linked Learning approach in the nine districts. Pathway teachers are less concerned about the longevity of Linked Learning pathways and more focused on how to adapt their pathways to the implementation of the Common Core. District leaders are actively making plans to support growth in the number of pathways or the number of students participating in pathways, buoyed by a surge in external funding opportunities. The growing interest in the Linked Learning approach by policymakers and other districts, as evidenced by CCPT and YCC grants and strong competition to become a Linked Learning Pilot district, is a testament to the perceived success of the districts in making Linked Learning central to their high school reform efforts. The ongoing work to improve pathway development will continue to challenge district capacity to assess and target support where it is most needed; the inclusion of regional partners to the implementation mix will also challenge districts to reassess how to move forward with sustaining Linked Learning systems of support.

program requires the Chancellor of the California Community Colleges and the Superintendent of Public Instruction to assist economic and workforce regional development centers and consortia, community colleges, middle schools, high schools, and regional occupational centers and programs to improve linkages and career technical education pathways between high schools and community colleges.

Chapter 9: Conclusions

This fifth-year annual report on the evaluation of the Linked Learning District Initiative represents a significant implementation milestone for a substantial investment in secondary school reform by The James Irvine Foundation. Prior to the initiative, the Linked Learning pathway approach was adopted and adapted by a small number of individual high schools and regional career centers in California. The initiative placed Linked Learning in a district system context, testing the premise that linking multiple new and existing pathways within districts could become a core strategy for improving both student school experiences and high school outcomes overall. As Linked Learning spreads throughout California, and to some extent to other states and localities, the initiative is intended to serve as a demonstration of how Linked Learning pathways can become a strategy for systemic change. At the same time, the initiative provides many more examples of the issues involved in establishing high-quality individual pathways and improving the personal educational experiences of many more high school students. In 2014, 37 pathways in the initiative had achieved certification of high quality and fidelity to the Linked Learning approach, and many more pathways were being developed in the nine districts that consider Linked Learning the cornerstone of high school improvement districtwide. In this chapter, we summarize the lessons learned and issues raised in the previous chapters of this report.

The discussion in this chapter is organized as follows:

- Fidelity to the key attributes of the Linked Learning approach involving curriculum, instruction, assessment and work-based learning experiences
- Attention to issues of equity and access and supports for students enrolling in pathways
- Indicators of positive student outcomes as a result of enrollment in a pathway

The major themes that have emerged from this year's data collection reflect a message presented in previous reports—implementation of the Linked Learning approach has proceeded incrementally in the nine districts. Each district has progressed at a different pace—for some, progress has been steady and promising; for others, progress has been considerably slower. However, all districts have made some positive change as a result of connections to the initiative. As districts consider future sustainability of the reforms without Foundation support and a whole new group of Linked Learning Pilot districts launch their pathways, this is an important moment to consider implementation strengths and weaknesses.

Developing Linked Learning Curriculum, Instruction, and Work-Based Learning

All nine districts have shown steady but incremental improvement in curriculum, instruction, and work-based learning. Knowing that Common Core standards would be introduced in earnest during the 2013–14 school year, ConnectEd and other technical assistance providers spent considerable effort during 2012–13 to ensure that initiative leaders would understand the close alignment between Linked Learning and Common Core instructional goals. District administrators also spent considerable effort preparing school staff for Common Core implementation by using the financial support offered by the state (a $1 billion infusion in 2013–14) to engage in extensive planning, teacher professional development, and development of model lessons. As described in Chapter 3, this preparatory work was partly successful, resulting in coherent alignment of the two initiatives in some districts this year while other districts struggled with alignment. Despite some initial missteps during the rollout of Common Core, district leaders are confident they will be able to leverage the synergies that exist between Linked Learning–aligned instructional practices and the Common Core through planned corrective steps at the district and classroom levels.

Systemically speaking, curricular and instructional reform will continue to shift slowly, although some individual pathways may move farther ahead than others. Because academic and technical curricula and the quality of instructional practice continue to vary by pathway across and within the nine districts, we anticipate that pathway students' content mastery, as measured by standardized tests, will also continue to vary across districts. We feel cautiously optimistic that the combined focus of Linked Learning and

Common Core resources on curriculum, and especially instruction, may eventually result in real change at the classroom level; over time, a stronger focus on curricular rigor and instructional quality can help improve student academic performance.

Previously, all Linked Learning districts have struggled significantly to implement the core Linked Learning component of work-based learning. This year, we are pleased to report that all districts have demonstrated solid progress in the development and implementation of a continuum of work-based learning experiences for students across high school grades. This systemic approach to work-based learning represents real change from Year 1 of the initiative, when work-based learning was largely absent from the districts' radar. All districts focused attention on expanding and improving their work-based learning systems, aided by new state- and federal-level funding opportunities. Pathway student access to and participation in work-based learning experiences at the lower end of the work-based learning continuum were strong across all districts, but the greatest work-based learning challenge for all the districts continues to be access to internships and practicums at the higher end of the continuum.

Given the perceived benefits that pathway students derive from their participation in work-based learning activities, it would seem prudent to ensure that all pathway students have access to the full continuum of work-based learning opportunities. To meet these challenges, districts must establish systems to support the limited capacity of pathway staff to generate internship opportunities and connect students to those opportunities, and to address any practical or policy constraints (e.g., transportation, industry regulations) on participation in higher-level work-based learning experiences. Success will also require the districts to develop stronger work-based learning systems in collaboration with regional partners (as required by the California Career Pathways Trust grants received by all nine districts), to track individual students' work-based learning activities, and to assess the quality of those experiences. To their credit, the districts grappled with—though they have not yet resolved—the difficult issues of how to collect and use data on work-based learning participation. The initiative should continue to provide districts with opportunities to share their pilot experiences with work-based learning data so that their ideas stimulate each other's progress.

Student Access to Pathways and Personalized Supports

To achieve equitable representation of all students in pathways, districts have focused on expanding pathways options and improving communication and recruitment strategies regarding students' high school options rather than changing district choice policies or transportation infrastructure. However, the growth of certified pathways in the initiative has been slow. As a result, the number of certified pathways in most districts is small, representing three or four different industry sectors in the majority of districts. Our analysis of enrollment of student subgroups in certified pathways suggests that disadvantaged students' access to certified pathways varies from district to district and by career theme. Special education students, English learners, and underachieving students are underrepresented in certified pathways in three districts, but in four other districts we see a higher percentage of underachieving students enrolled in certified pathways than in the district as a whole. The only consistent patterns in student enrollment across districts are the disproportionately low enrollment of females in certified pathways with an engineering career theme and disproportionately high female enrollment in certified pathways with a health science career theme—a gender imbalance that is similar to but not as extreme as the gender imbalance in engineering and health-related majors and degrees earned in postsecondary institutions. To help break the cycle of gender-stereotyped career trajectories, the districts should pay more attention to ways to make pathways equally appealing to male and female students in outreach and communication activities.

The districts have made progress with providing student supports to ensure pathway access, equity, and choice, as well as supports to prepare students for transitions to postsecondary education, but substantial challenges remain. Districts need to continue to develop policies and procedures that allow students to select pathway options based on their current interests, ensure equity in pathway placements, and minimize factors, such as lack of transportation, that prevent students' participation in the pathway

of their choice. In addition to initial pathway access and choice considerations, there is also the issue of students' opportunity to benefit from the full pathway experience.

Across the districts, we see that nearly 80% of students who enroll in the lowest grade level of a certified pathway remain in the pathway through the beginning of the 11th grade, and these retention rates are lower for English learners, special education students, and underachieving students. Retention rates are important in terms of interpreting the engagement and achievement outcomes presented in Chapter 6 because they indicate that a fifth of pathway students experience only one or two years of the pathway. In addition, our analysis of the pathway programs of study suggests that students in the upper grades have more course options within their pathways and tend to opt out of pathway courses more often after the 9th and 10th grades. Together, this means that the experiences of pathway students may vary greatly even within a single pathway.

In addition, the lower retention rates of English learners, special education students, and underachieving students reinforce the reports of district leaders and teachers that pathways struggle to serve these student populations fully when they do enroll in pathways. Addressing issues of adequate student support structures and flexibility in scheduling should be an integral part of the pathway curriculum and instruction dialogue. It may not make sense for districts to try to include the students who are most disabled or who have the most limited English skills. Similar to the larger educational landscape, finding ways to successfully support high-needs students in pathway programs will require each district's willingness to experiment to identify what works and what does not.

Generally speaking and based on data from multiple student focus groups and student surveys conducted over the years of this evaluation, the typical pathway student has not suffered from lack of personalized support services, such as guidance counselors. Even in years when budget cuts resulted in counselor layoffs, pathway students consistently reported that they got the advice they needed from their pathway teachers. As budgets become more normal, districts could consider redirecting whatever additional resources are gradually becoming available to pathways to support the students who would benefit the most; for example, the Local Control Funding Formula (LCFF) lends itself to this type of activity by requiring districts to expand or improve services for high-needs students in proportion to the additional funding that these students bring to the district.

Students' Transition from Secondary to Postsecondary Education

Despite the assurances from students that their pathway teachers provide vital information about transitions from high school to college or career, we were also interested to hear this year that some students and teachers are concerned about students' readiness for a college experience. To some extent, the lack of pathway cohort purity conflicts with other potential high school experiences that might build student confidence in their readiness (e.g., participation in Advanced Placement or dual/concurrent enrollment classes). Other challenges to increasing students' access to college-readiness experiences are institutional in nature. District delays with getting pathway CTE courses a–g approved can affect student eligibility to apply to the state's four-year higher education systems and suggests the need for greater attention on the part of districts to this process. In making dual enrollment opportunities available to pathway students, districts must also pay attention to systematically supporting student access by addressing logistical and policy considerations, such as transportation needs, an accessible registration process, fees, student support, staff qualifications, and transferability of course credit. As funding for postsecondary institutions begins to recover from the state's economic recession, colleges are beginning to restore their course offerings. However, dual enrollment may not rise to the top of colleges' priority list without some legislative support and/or incentives for these institutions to offer dual enrollment to high school students—an area where the Foundation and the Linked Learning Alliance can lend support.

The lack of a clear, common definition of college and career readiness between secondary and postsecondary systems continues to pose a significant barrier to ensuring smooth postsecondary transitions. Stakeholders on both sides need to expand their understanding of what it means to be college ready. Linked Learning staff point to research suggesting that student grades are better predictors of college readiness than test scores and are undertaking pilot efforts in their districts to employ alternate

measures to assess academic readiness.[41] In addition, this initiative evaluation has yielded two years of student survey data showing that pathway students are far more confident in their 21st century workplace skills than non-pathway peers. However, neither high schools nor colleges currently have any way of translating measures of these skills into assessments of postsecondary readiness. Beyond high school graduation, the low success rates for student persistence in college, particularly for the first-generation college goers that pathways target, point to the need for greater postsecondary partnerships and collaboration to provide the scaffolding and supports for successful transition to college. Districts could improve the transition process by more closely aligning pathway curricula with college expectations in order to better prepare high school students academically and mentally for college-level work. Close collaborations between pathways and colleges might give pathway students an advantage in successfully completing postsecondary education by starting students on the path to obtain an industry certification or a two-year college degree). The pilot programs developed under the California Community Colleges Linked Learning Initiative (CCCLLI) may offer collaboration models for other districts and colleges to emulate. Because much work remains in strengthening the transition from high school to college and careers, findings from the CCCLLI work should be deliberately shared with all the districts.

Student Outcomes

Three years of student outcome analysis point to the promise of the Linked Learning approach. This year's results reinforce previous findings that Linked Learning participation is related to student engagement and success in school. Students in certified pathways are more likely to stay in their district than their peers, and they accumulate more credits, putting them on track to graduate on time from high school. They also are just as likely as their peers to be on track to complete a–g requirements at the end of 9th and 11th grades, and even more likely at the end of 10th grade.

Yet there is still work to be done. Even when students are more engaged in school and complete more course credits, these positive outcomes do not appear to be translating into improved achievement outcomes, as measured by standardized test scores. As districts continue to develop and expand pathways, Linked Learning practitioners must be vigilant about improving the quality of instruction and providing all pathway students the supports necessary to ensure that they succeed in their classes. Implementation of the Common Core provides a real opportunity for changes in classroom practice that may lead to improved student achievement results.

Implications and Next Steps

Over the course of our evaluation, we have discussed the issue of adherence to the Linked Learning approach as defined by ConnectEd's certification criteria. Pathway expansion plans have raised some concerns among Linked Learning administrators and our research team regarding fidelity to the Linked Learning approach—that is, the extent to which a district can adapt the pathway approach before it is no longer appropriate to call the pathway a "Linked Learning pathway." Within the nine districts, there is already a range of such approaches—from districts with academies that do not meet Linked Learning pathway criteria of open-access options to districts that adhere closely to ConnectEd's definition of a high-quality Linked Learning pathway, supported and sustained through strong centralized control of implementation by the district Linked Learning office. District administrators point to the ConnectEd certification criteria as extremely valuable as a self-assessment tool—pathway teams are encouraged to rate themselves using the online certification/OPTIC tool to identify pathway strengths and identify areas in need of improvement—but are not certain that all the certification criteria are essential. Although pathways have achieved Linked Learning certification through ConnectEd and NAF certification teams,

[41] For example, the Promise Pathways program, launched in 2012, is a collaboration of the Long Beach Unified School District and Long Beach City College to allow the district's students to place out of remedial coursework based on their high school grades in certain classes, rather than the traditional college placement exam. Data from this pilot program showed that students placed by using student grades were more likely to take and pass credit-bearing, transfer-level courses than student cohorts placed by using results from the college entrance test. Sacramento is participating in a CSU initiative to train high school teachers to teach English and math courses for students who are "conditionally ready" on their EAP test. If students achieve a certain grade in the course, they will bypass the CSU placement exam and go straight into credit-bearing courses at Sacramento State University.

these teams use somewhat different criteria and do not require that all the ConnectEd or NAF criteria must be met in order to achieve Linked Learning certification. A few Linked Learning district administrators indicated they may not seek ConnectEd certification of their new pathways or recertification of existing pathways if certification requires, for example, eliminating pathways with student selection criteria or changing school choice policies.[42] In addition, a whole new crop of Linked Learning districts, through the California Linked Learning Pilot Program and the California Career Pathways Trust, will not receive the intense Linked Learning technical assistance or encouragement that the original districts received to adhere to the Linked Learning approach. If new Linked Learning pathways developed under these efforts fail to deliver, there is a danger that Linked Learning's positive image could be damaged and, as one district administrator shared, "the whole brand will suffer."

Additionally, the rapid growth of Linked Learning districts could test the scalability of the Linked Learning approach without extensive external supports. An essential element in district implementation of Linked Learning has been knowledge, expertise, prior experience, and other support from external partners. In particular, district leaders have found district-level coaching to be critical in supporting their ability to navigate initial planning and systems-building activities (e.g., support for district staff to understand and spread foundational knowledge of Linked Learning, getting key leaders on board, helping shift educators' and other stakeholders' mindsets to align priorities and supports with Linked Learning). The districts also experienced the advantage of a wide array of technical assistance from ConnectEd, Stanford's Center for Opportunity Policy in Education (SCOPE), the Los Angeles Small Schools Center, NAF, Envision, and others to implement a district system of Linked Learning pathways. New districts will have a much more limited support system, which could impact their approach to implementing Linked Learning pathways, specifically their focus on systems building.

The initiative takes a systems approach to promoting pathway development and growth that requires a long-term commitment to changing how stakeholders think about secondary education. The ConnectEd *Framework for Developing a System of Linked Learning Pathways* (2014) specifies the critical conditions necessary for establishing the infrastructure needed to support the design, implementation, and sustainability of a system of high-quality pathways, but Linked Learning certification activities are based primarily on the quality of school-level pathway implementation. Without processes for assessing a district's infrastructure to support and sustain the work of individual pathways, and without commitment by district leaders to change how they operate or engage with high schools, districts run the risk of developing "islands of excellence" rather than a scalable Linked Learning approach. Moving forward, Linked Learning funders, technical assistance providers, and the broader field will need to continue discussing this critical question of fidelity to the Linked Learning approach in terms of the essential elements of pathways *and* a district's system of support for Linked Learning implementation.

The evaluation of the initiative will continue for two more years. During this time, we will report on the progress of the nine districts as they transition to additional funding sources beyond The James Irvine Foundation and ConnectEd to support and sustain Linked Learning implementation (districts will receive one final round of grant funding form the Foundation through ConnectEd for the 2014–15 school year). We will look into districts' plans for sustaining and scaling Linked Learning, including the use of funds from the Local Control Funding Formula, the California Career Pathways Trust, and other resources to support Linked Learning. We also will examine the role of new regional partnerships in expanding work-based learning opportunities. Most importantly, during the next two years of the evaluation, we will provide new data on how well Linked Learning graduates fare compared with non-pathway students as they transition to postsecondary endeavors.

[42] ConnectEd made clear, through its *Linked Learning Essential Elements for Pathway Quality* (n.d.), that student equity, access, and choice are nonnegotiable in developing a system of high-quality pathways within a district. Linked Learning pathways should serve well all students regardless of their demographic or academic background.

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Appendix: Research Methods

The Center for Education Policy at SRI International has been contracted by The James Irvine Foundation to evaluate the Linked Learning District Initiative. The evaluation is a multiyear study designed to examine district-level implementation of a Linked Learning system and to assess student outcomes associated with district participation in the initiative. SRI is employing a multimethod research design that includes qualitative and quantitative data collection and analysis. Here, we describe our data collection methods and analytic approach.

Qualitative Methods

To understand the progression of the Linked Learning District Initiative and to gather information on students' experiences in career pathways, SRI researchers conducted a range of qualitative data collection activities in all nine districts that received implementation grants from ConnectEd in 2009 or 2010. The qualitative data collection consisted of observations of ConnectEd events that district and pathway staff attended; reviews of district documents, pathway certification reports, and relevant news stories; telephone interviews; and district site visits that included interviews and student focus groups. Here, we provide additional detail on these activities and analytic methods.

Observations of ConnectEd-hosted events: SRI research team members attended selected ConnectEd events that district teams attended. These included the 2013 Summer Institute, November 2013 and March 2014 district leadership series residencies, and the February 2014 Work-Based Learning Planning Group meeting. Researchers took notes on these meetings and talked informally with district and pathway staff.

Document and news review: The research team examined available district Linked Learning documents, and monitored local news for stories to support understanding of state and district contexts.

In order to collect additional detail on pathway programs of study and work-based learning opportunities, SRI attempted to systematically collect district- and pathway-level documents describing these programmatic elements. For the document review, we asked districts and pathways to submit district- and pathway-level documents describing the academic and technical programs of study and the work-based learning opportunities available to pathway students. The analysis focused on pathways that were certified prior to the end of the 2012–13 academic year. The purpose of the document review was to identify certified pathways' practices and policies that contribute to their success.

Of the eight districts with certified pathways, we received documents from six districts.[43] In total, we received 33 district-level documents and 66 pathway-level documents, representing 15 of the 33 certified pathways across the Linked Learning districts. Districts submitted as few as 1 and as many as 15 district-level documents and as few as 1 and as many as 18 certified pathway-level documents. See Exhibit A-1 for more detail about the documents received.

[43] Montebello was excluded from our collection because the district did not have any certified pathways as of the end of the 2012–13 academic year. In addition, Los Angeles and West Contra Costa are not represented in the document review because we did not receive any documents from either district.

Exhibit A-1
Documents Received, by District

District	Certified pathways represented	District-level documents received	Pathway-level documents received	Total documents received
Antioch	1	3	18	21
Los Angeles	0	0	0	0
Long Beach	5	3	13	16
Oakland	2	2	13	15
Pasadena	4	15	17	32
Porterville	1	1	3	4
Sacramento	2	9	2	11
West Contra Costa	0	0	0	0
Total	15	33	66	99

In addition to the variation in the number of documents received, the depth of content and detail provided also varied greatly by district and certified pathway. Because the number and quality of documents we received varied by district and certified pathway, our ability to make generalizations across districts and certified pathways was limited.

Analysis of the documents received began with coding information from each document into the following categories: curriculum (academic/technical sequence; alignment to common core; availability of advanced placement [AP], honors, and community college courses); work-based learning; pathway recruitment and selection; and pathway student outcomes. We then synthesized the data by district, with an eye towards identifying exemplars of pathway practice in each area. Lastly, we did a cross-district analysis to highlight key findings in each category across certified pathways. Report authors then drew on these data sources, both the district summaries and original files, to supplement their findings within relevant chapters as appropriate. Ultimately, we do not provide a stand-alone section within the report on the document review findings, but integrate the sources descriptively into various chapters.

Phone interviews and site visits: The research team conducted individual interviews in fall 2013 and spring 2014 to follow district implementation progress in all nine districts. The interview topics included pathway expansion and sustainability, development of internal leadership and coaching capacity, alignment of Linked Learning with other district initiatives, student access to pathways, interdisciplinary instruction and project-based learning, work-based learning, performance-based assessments, and support for students' transitions to postsecondary opportunities. We developed semistructured interview protocols covering these topics or a subset of them for key respondent categories (e.g., district leader, pathway lead). We tailored the protocols to each respondent's role type and experience with Linked Learning. Interviewers took notes and audio-recorded interviews for use during analysis.

In fall 2013, members of the SRI research team interviewed Linked Learning directors in all nine districts by phone. We conducted site visits to the nine Linked Learning districts in spring 2014. During these visits, we interviewed superintendents and/or assistant superintendents, Linked Learning directors, other key district administrators, and internal coaches. In consultation with the Linked Learning director from each district, we selected up to three pathways to visit with a focus on health and arts pathways to allow for comparable cross-district analysis. A team of two or three researchers visited each of these pathways. For each pathway we targeted pathway leaders, which typically included the pathway lead, and may have included the guidance counselor, assistant principal, or principal, depending on the pathway. In addition,

we tried to interview at least one English or math and one career and technical education (CTE) teacher in each pathway. We also conducted a focus group with students in each pathway (the majority 12th graders), for a total of 21 student focus groups across the nine districts. We also conducted telephone interviews with district and pathway coaches and selected staff members from the Los Angeles Small Schools Center.

In total, SRI researchers interviewed 105 individuals and conducted 21 student focus groups of 3 to 11 students in the spring 2014 data collection. Exhibit A-2 contains more detailed information about the spring interviews.

Exhibit A-2
Summary of Interviews and Focus Groups Respondent Types

Respondent Type	Spring 2014
District staff	40
School administrators	6
Guidance counselors	5
Pathway leads	22
Teachers (not pathway leads)	25
External coaches	7
Student focus groups	21
Total	126

Each site visit team completed a structured debriefing guide aligned with the study's research questions. During and after the period when interviews were conducted, the entire research team assembled to compare, contrast, and synthesize findings across interviewees; to identify overarching themes and initial hypotheses; to determine how these findings related to the quantitative data; and to refine analyses and assertions before writing this report.

Survey Methods

In spring 2014, the research team surveyed 12th-grade pathway and comparison students to provide an update on students' sources of support and advising, the skills they perceived to have gained in high school, their experiences with work-based learning and integrated instruction, and their postsecondary plans as well as their sense of preparation for college or career. Here, we provide details about the sample and response rates for the survey.

Survey Sample

For the spring 2014 survey, we sampled 12th-grade pathway and comparison students in the Linked Learning districts.

Pathway Sample: We surveyed 12th-graders in all pathways across the nine Linked Learning districts that were certified as of the 2012–13 school year (Exhibit A-3). Montebello was the only district that had no certified pathways as of the 2012–13 school year, so we surveyed 12th-graders there in the four pathways the district identified as being most developed. In all districts except Long Beach, we sampled all students enrolled in 12th grade in these pathways. Because of the large number of 12th-graders enrolled in the five certified pathways in Long Beach (656), we sampled half the students in each of those pathways.

Comparison Sample: We determined the number of comparison students to sample based on the number needed to achieve sufficient power (80%) to detect a difference in means of .30 standard deviations for a continuous outcome variable or a difference in proportion of .15 on a dichotomous outcome variable between pathway and comparison students. We sampled comparison students from the same school where the numbers of students not enrolled in pathways were sufficient. Otherwise, the team selected comparison schools based on their similarity to the size, achievement level, and demographics of the pathway schools. We avoided charter schools and schools with special themes or programs whenever possible. Where districts had implemented wall-to-wall pathways in all schools, we sampled comparison students from selected pathways or small learning communities that were in the earliest stages of development or least aligned with the Linked Learning approach. Within comparison schools, we selected a sample of students that were academically roughly similar to pathway students.

Exhibit A-3
Pathways Surveyed, by District

District	Pathways Surveyed, 2012–13
Antioch	Health Science and Medical Technology at Dozier-Libbey Medical High School EDGE Academy Law and Justice Academy
Long Beach	Architecture, Construction, and Engineering Academy (ACE) Jordan Media and Communications (JMAC) California Academy of Mathematics and Science Community of Musicians, Performers, Artists, and Social Scientists (COMPASS) PEACE Academy
Los Angeles	Los Angeles High School of the Arts (LAHSA) Los Angeles School of Global Studies New Media Academy
Montebello	Creative Arts and Technology School (CATS) Developing Resourceful Individuals who Value Education Now (DRIVEN) Culinary Hospitality Opportunities Pathway (CHOP) Innovation, Child Development, Academia, Resources for Family, and Education (iCARE)
Oakland	Education Academy Life Academy of Health and Bioscience Media College Preparatory
Pasadena	Arts, Entertainment, and Media Academy Business and Entrepreneurship Academy Engineering and Environmental Science Academy Creative Arts, Media, and Design Academy
Porterville	Engineering Academy Multimedia Technology Academy Partnership Academy of Business Partnership Academy of Health Science Performing Arts Academy Digital Design and Communication
Sacramento	Health Professions High School New Technology High School Johnson Corporate Business Academy Engineering and Sciences Academy The MET
West Contra Costa	Engineering Academy Law Academy Multimedia Academy Health Academy

Note: All surveyed pathways were certified as of the 2012–13 school year except those in Montebello.

Survey Administration

We worked with the Linked Learning director of each district to identify a district and/or school liaisons to help coordinate survey administration. We asked schools to provide us with enrollment numbers for pathway and for non-pathway classes. We then randomly sampled classrooms until we met our targeted sample size. We verified enrollment numbers with each teacher at the time of survey administration. Districts chose paper or online administration, and in some cases this varied by school within districts.

SRI researchers traveled to three of the nine districts to administer the surveys in person to reduce the burden on school staff. In the other six districts, we trained and supported district staff in administering the surveys using SRI protocols. We followed up with teachers wherever there were significant numbers of students absent on the day of administration to ensure a high response rate in all districts.

Survey Response Rate

SRI surveyed 2,067 12th-graders in certified pathways and 2,031 comparison students, excluding Montebello. We achieved an overall response rate of 84% of surveys fielded. Exhibit A-4 displays response rates for both pathway and comparison students in each district, as well as the overall response rate across the district

Exhibit A-4
Student Survey Response Rates

	Surveys Fielded	Response Rate (%)
Antioch		
Pathway	278	86
Comparison	199	88
Total	477	87
Long Beach		
Pathway	350	86
Comparison	176	78
Total	526	83
Los Angeles		
Pathway	189	88
Comparison	371	92
Total	560	91
Montebello[a]		
Pathway	93	87
Comparison	N/A	N/A
Total	93	87
Oakland		
Pathway	111	78
Comparison	500	79
Total	611	79

[a] Because Montebello did not have any pathways certified as of the 2012–13 school year, we did not survey comparison students there and do not include students from Montebello in the overall analysis of pathway and comparison students in the body of the report.

[b] Overall numbers do not include Montebello.

Exhibit A-4
Student Survey Response Rates (concluded)

	Surveys Fielded	Response Rate (%)
Pasadena		
Pathway	323	85
Comparison	163	95
Total	486	88
Porterville		
Pathway	321	89
Comparison	187	80
Total	508	86
Sacramento		
Pathway	266	87
Comparison	190	54
Total	456	73
West Contra Costa		
Pathway	229	83
Comparison	245	87
Total	474	85
Overall[b]		
Pathway	2,067	86
Comparison	2,031	82
Total	4,098	84

[a] Because Montebello did not have any pathways certified as of the 2012–13 school year, we did not survey comparison students there and do not include students from Montebello in the overall analysis of pathway and comparison students in the body of the report.

[b] Overall numbers do not include Montebello.

Survey Analysis

We compared the frequency with which pathway and comparison students reported participating in different activities and experiences related to core components of Linked Learning. Because Montebello did not have any certified pathways as of the 2012–13 school year, we did not include those students in the overall analysis of students in the body of the report. We used a chi-squared test of independence to determine whether differences between pathway and comparison students in the survey sample were likely to represent true underlying differences in the population of students (i.e., were statistically significant at the .05 level). We used univariate analysis such as frequencies and means when presenting responses for pathway students only. For overall means and frequencies that pooled data from across the districts, we weighted both pathway and comparison respondents so that the total number of respondents in each group equaled the number of pathway students in each district. This weighting was done to ensure that the number of comparison students by district was proportional to the number of pathway students in each district in calculations of overall frequencies.

High School Outcomes Analysis Methods

To estimate the impact of participation in Linked Learning pathways on students' engagement and achievement outcomes, SRI researchers obtained student-level data for all nine Linked Learning districts. In eight of the districts, these data enabled us to obtain a detailed picture of the outcomes of students in certified pathways compared with their peers with similar demographic characteristics and prior achievement in the district, as presented in Chapter 6 of the full report.[44]

In this section, we provide supporting detail to the analyses presented in Chapter 6 of the report. We describe the pathways and other academic programs available in the districts analyzed, detail the available data in each of the districts, and describe how we estimated the impact of certified pathway enrollment on student engagement and achievement outcomes. We looked at two engagement indicators — student absences and retention in district — and multiple indicators of school success and academic achievement: credit accumulation, course failures, a–g completion, and standardized test scores. We also provide an additional set of results, detailing the estimated differences between students in non-certified pathways and similar students in traditional high school programs.

Background and District Context

Each of the Linked Learning districts provides students with a variety of academic options for school and pathway enrollment, including certified pathways, non-certified pathways, traditional high schools, alternative schools, and charter schools.

To describe enrollment in these various academic options, we classified all program types in each district, although we focused on the outcomes of students in certified pathways. We also excluded any schools deemed out of district control (e.g., home school programs). All districts analyzed in Chapter 6 had the following program types:

Certified pathways: Because pathways develop throughout the students' time in them, we considered a student to be enrolled in a certified pathway if the pathway had passed certification before the end of that student's 10th-grade year. This classification means students enrolled in the same pathway in different cohorts may be considered to be enrolled in different program types. We considered pathways to be certified based on Linked Learning's classification and thus included those certified by the National Academy Foundation (NAF) in the 2012–13 school year.[45] Exhibit 2-1 shows the certified pathways in each district.

Non-certified pathways: We considered any program districts flagged as a pathway without the certified classification to be a non-certified pathway. These programs typically shared some important features with the certified pathways (e.g., small cohort, career theme) but varied in how closely they aligned with or aimed to replicate the full Linked Learning approach. This category included pathways deemed "in progress" toward certification.

Alternative schools: We classified schools for struggling students (e.g., credit recovery programs) or students with special needs (e.g., English learners) into one group. We exclude alternative schools from our analysis.

Non-pathway at wall-to-wall schools: Several districts have at least one high school where all students should be assigned a pathway designation (these schools are commonly referred to as "wall-to-wall schools"), but not all the students in the school had a flag identifying their pathway. We designated any students at these wall-to-wall schools without a pathway flag as "non-pathway at wall-to-wall schools." We exclude these students from the outcomes analysis.

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[44] Montebello, the ninth district, does not have any certified pathways. We included their data in the HLM analyses and present results for non-certified pathways from the same model later in this appendix.

[45] The 2012–13 school year was the first year in which ConnectEd accepted NAF certification in lieu of ConnectEd's certification process. This year corresponds with the year the Class of 2015 (our final cohort) was enrolled in the 10th grade, making it the last year during which certification impacted the classification of any students in our sample.

Traditional high school: We classified all other academic programs as "traditional high school" programs.

We assigned students to a particular pathway or school based on their 9th- or 10th-grade enrollment, depending on the lowest grade level served by certified pathways in the district. In Antioch, Los Angeles, Montebello, Sacramento, and Porterville, certified pathways begin in ninth grade. In Oakland and West Contra Costa, pathways begin in 10th grade. In Pasadena, a single certified pathway begins in the 10th grade. Several Long Beach pathways begin in the 10th grade.[46] We assigned students in these two districts into their ninth-grade program, with the exception of students who transferred from a traditional high school into this pathway.

Exhibit A-5 below lists all certified pathways included in the analysis by district. The column "First Cohort Certified" lists the first class of students for whom we classified the pathway as certified. We consider this class and all subsequent classes as having attended a certified pathway in the outcomes analysis.

[46] In Long Beach during the years these data capture, three high schools enrolled the majority of students in freshman academies, intentionally giving them a year of high school before choosing a pathway. We assigned students from these three high schools who began a pathway in their 10th grade year into their 10th grade pathway. These students were not included in analyses of 9th grade outcomes.

Exhibit A-5
Certified Pathways Included in Analysis, by District

District	High School (HS)	Certified Pathway	First Cohort Certified
Antioch			
	Dozier-Libbey Medical HS	Health Science and Medical Technology	Class of 2013
	Deer Valley HS	Law and Justice	Class of 2015
	Antioch HS	Engineering and Designing Green Environments (EDGE)	Class of 2015
Long Beach			
	California Academy of Math and Science	Engineering and BioScience	Class of 2013
	Jordan HS	Architecture, Construction, and Engineering Academy (ACE)	Class of 2013
	Jordan HS	Jordan Media and Communications (JMAC)	Class of 2015
	Millikan HS	Community of Musicians, Performers, Artists, and Social Scientists (COMPASS)	Class of 2013
	Millikan HS	PEACE Academy	Class of 2013
Los Angeles			
	Robert F. Kennedy Community Schools Complex	Los Angeles High School for the Arts (LAHSA)	Class of 2014
	Miguel Contreras Learning Complex	Los Angeles School of Global Studies	Class of 2014
Oakland			
	LIFE Academy	Life Academy of Health and Bioscience	Class of 2014
	Media College Preparatory	Media Academy	Class of 2014
	Skyline HS	Education Academy	Class of 2014
Pasadena			
	John Muir HS	Arts, Entertainment, and Media[a]	Class of 2013
	John Muir HS	Business and Entrepreneurship Academy	Class of 2013
	John Muir HS	Engineering and Environmental Science Academy	Class of 2015
	Pasadena HS	Creative Arts, Media, and Design Academy	Class of 2013
Porterville			
	Granite Hills HS	Digital Communication and Design	Class of 2015
	Harmony Magnet	Engineering Academy[b]	Class of 2013
	Harmony Magnet	Performing Arts Academy[b]	Class of 2014
	Monache HS	Multimedia Technology Academy	Class of 2014
	Porterville HS	Partnership Academy of Business	Class of 2013
	Porterville HS	Partnership Academy of Health Sciences	Class of 2014
Sacramento			
	A. A. Benjamin Health Professions HS	Health Professions	Class of 2014
	Hiram W. Johnson HS	Business Corporate Academy	Class of 2015
	New Technology HS	School of Design	Class of 2014
	School of Engineering and Sciences	Engineering and Science	Class of 2015
	The MET	Learning Through Internship	Class of 2015

Exhibit A-5
Certified Pathways Included in Analysis, by District (concluded)

District	High School	Certified Pathway	First Cohort Certified
West Contra Costa			
	Richmond HS	Engineering Academy	Class of 2014
	Richmond HS	Law Academy	Class of 2014
	Richmond HS	Multimedia Academy	Class of 2014
	De Anza HS	Health Academy	Class of 2015

[a] Includes students enrolled in the Graphic Communications pathway.

[b] Pathway flags were unavailable for Harmony Magnet for the 2010–11 and 2011–12 school year. Both pathways are modeled jointly in these two school years.

Data Sources and Descriptive Statistics

The research team received student-level data from a third party, the Institute for Evidence-Based Change (IEBC). The research team requested 7th- through 12th- grade data for the class of 2013 (students who started 9th grade in the 2009–10 school year) in Antioch, Long Beach, Pasadena, and Porterville, and 7th- through 10th- or 11th-grade data for the classes of 2014 and 2015, respectively (students who began high school in 2010–11 and 2011–12), in all nine districts. The data we received were used for all of the analyses described in this section.

Data Elements

The IEBC data included student demographics, course outcomes, graduation, and standardized test performance. In addition, the districts provided flags to indicate which pathway or program the student is a part of in each grade.

In Exhibit A-6, we describe each data element used in the outcomes analysis.

Exhibit A-6
Data Elements

Variable	Description
8th Grade ELA CST	8th grade English Language Arts (ELA) California Standards Test (CST) score
9th Grade ELA CST	9th grade ELA CST score
10th Grade ELA CST	10th grade ELA CST score
11th Grade ELA CST	11th grade ELA CST score
11th grade ELA EAP	Scored at least conditionally college ready on the California State University Early Assessment Program (EAP)
% Proficient or Higher, 7th Grade ELA CST	Equal to 1 if a student scored proficient or higher on the 7th grade ELA CST. Equal to 0 if a student scored below proficiency.
% Proficient or Higher, 8th Grade ELA CST	Equal to 1 if a student scored proficient or higher on the 8th grade ELA CST. Equal to 0 if a student scored below proficiency.
% Proficient or Higher, 9th Grade ELA CST	Equal to 1 if a student scored proficient or higher on the 9th grade ELA CST. Equal to 0 if a student scored below proficiency.
% Proficient or Higher, 10th Grade ELA CST	Equal to 1 if a student scored proficient or higher on the 10th grade ELA CST. Equal to 0 if a student scored below proficiency.
% Proficient or Higher, 11th Grade ELA CST	Equal to 1 if a student scored proficient or higher on the 11th grade ELA CST. Equal to 0 if a student scored below proficiency.
8th Grade Math CST	8th grade math CST score
9th Grade Math CST	9th grade math CST score
8th Grade Math CST: General Math	Equals 1 if student took the 8th grade general math CST test; equals 0 if student did not take 8th grade general math CST test and the value is non-missing.
8th Grade Math CST: Algebra I	Equals 1 if student took the 8th grade Algebra I CST test; equals 0 if student did not take 8th grade Algebra I CST test and the value is non-missing.
8th Grade Math CST: Geometry Test	Equals 1 if student took the 8th grade Geometry CST test; equals 0 if student did not take 8th grade Geometry CST test and the value is non-missing.
9th Grade Math CST: General Math	Equals 1 if student took the 9th grade general math CST test; equals 0 if student did not take 9th grade general math CST test and the value is non-missing.
9th Grade Math CST: Summative Math	Equals 1 if student took the 9th grade summative math CST test; equals 0 if student did not take 9th grade summative math CST test and the value is non-missing.
9th Grade Math CST: Integrated Math	Equals 1 if student took the 9th grade integrated math CST test; equals 0 if student did not take 9th grade integrated math CST test and the value is non-missing.
9th Grade Math CST: Geometry Test	Equals 1 if student took the 9th grade Geometry CST test; equals 0 if student did not take 9th grade Geometry CST test and the value is non-missing.
9th Grade Math CST: Algebra II	Equals 1 if student took the 9th grade Algebra II CST test; equals 0 if student did not take 9th grade Algebra II CST test and the value is non-missing.

Exhibit A-6
Data Elements (continued)

Variable	Description
% Taking Algebra or Higher in 8th grade	Equals 1 if student took the 8th grade math CST test for any of the following subjects: Algebra I, Intermediate Math I, Geometry, Intermediate Math II, Algebra II, or Intermediate Math III; equal to 0 if student took the 8th grade math CST test in general math or summative high school math and value is non-missing.
Number of Fs Received in the 9th Grade	The number of semester Fs received in the 9th grade
Number of Fs Received in the 10th Grade	The number of semester Fs received in the 10th grade
Number of Fs Received in the 11th Grade	The number of semester Fs received in the 11th grade
Number of Fs Received in the 12th Grade	The number of semester Fs received in the 12th grade
Number of Credits Accumulated in the 9th Grade	Sum of credits for all classes in which students received a passing grade by the end of 9th grade
Number of Credits Accumulated in the 10th Grade	Sum of credits for all classes in which students received a passing grade by the end of 10th grade
Number of Credits Accumulated in the 11th Grade	Sum of credits for all classes in which students received a passing grade by the end of 11th grade
Number of Credits Accumulated in the 12th Grade	Sum of credits for all classes in which students received a passing grade by the end of 12th grade
On Track to Complete a–g Course Requirements in 9th Grade	This variable equals 1 if, in the 9th grade, a student has received a C or better in two semesters each of a "b" class and a "c" class and four additional courses that count towards any a–g requirement. We use the grade-level classes suggested by Transcript Evaluation Services to determine what coursework students should have completed by the end of each grade. Our a–g on-track indicator does not include courses above the number required for UC admission (e.g., more than two semesters of “g” courses). We also exclude a–g courses taken in middle school since we lack consistent course data for grades prior to the 9th. We assume that students who consistently take math CSTs beyond Algebra I (i.e., Geometry, Algebra II) have successfully completed two semesters of math (c) curriculum in middle school.
On Track to Complete a–g Course Requirements in 10th Grade	This variable equals 1 if, by the end of the 10th grade, a student has received a C or better in four semesters each of a "b" class and a "c" class and six additional semesters that count towards any a–g requirement. We use the grade-level classes suggested by Transcript Evaluation Services to determine what coursework students should have completed by the end of each grade. Our a–g on-track indicator does not include courses above the number required for UC admission (e.g., more than two semesters of “g” courses). We also exclude a–g courses taken in middle school since we lack consistent course data for grades prior to the 9th. We assume that students who consistently take math CSTs beyond Algebra I (i.e., Geometry, Algebra II) have successfully completed two semesters of math (c) curriculum in middle school.

Exhibit A-6
Data Elements (continued)

Variable	Description
On Track to Complete a–g Course Requirements in 11th Grade	This variable equals 1 if, by the end of the 11th grade, a student has received a C or better in six semesters each of a "b" class and a "c" class, two semesters each of “a,” “d,” and “e” classes, as well as four additional a–g approved classes. We use the grade-level classes suggested by Transcript Evaluation Services to determine what coursework students should have completed by the end of each grade. Our a–g on-track indicator does not include courses above the number required for UC admission (e.g., more than two semesters of “g” courses). We also exclude a–g courses taken in middle school since we lack consistent course data for grades prior to the 9th. We assume that students who consistently take math CSTs beyond algebra I (i.e., geometry, algebra II) have successfully completed two semesters of math (c) curriculum in middle school.
Days Absent in the 9th Grade	Number of days absent in 9th grade
Days Absent in the 10th Grade	Number of days absent in 10th grade
Days Absent in the 11th Grade	Number of days absent in 11th grade
Days Absent in the 12th Grade	Number of days absent in 12th grade
Retention in District From 9th to 10th Grade	Equal to 1 if evidence of student retained in district from 9th to 10th grade. Students are considered present in the district if they have a non-missing value for 10th grade ELA CST, 10th grade GPA, or 10th grade school or pathway enrollment. This variable is only defined for students in the classes of 2013 and 2014.
Retention in District From 9th to 11th Grade	Equal to 1 if evidence of student retained in district from 9th to 11th grade. Students are considered present in the district if they have a non-missing value for 11th grade ELA CST, 11th Grade GPA, or 11th grade school or pathway enrollment. This variable is only defined for students in the class of 2013.
Retention in District From 9th to 12th Grade	Equal to 1 if evidence of student retained in district from 9th to 12th grade. Students are considered present in the district if they have a non-missing value for 11th grade ELA CST, 11th grade GPA, or 11th grade school or pathway enrollment. This variable is only defined for students in the class of 2013.
California High School Exit Exam, ELA	10th grade ELA California High School Exit Exam score (CAHSEE)
Passed California High School Exit Exam, ELA	Equal to 1 if student scored 350 or above on the ELA CAHSEE. Equal to 0 if student scored below 350 on the ELA CAHSEE.
California High School Exit Exam, Mathematics	10th grade Math CAHSEE score

Exhibit A-6
Data Elements (continued)

Variable	Description
Passed California High School Exit Exam, Mathematics	Equal to 1 if student scored 350 or above on the Math CAHSEE. Equal to 0 if student scored below 350 on the math CAHSEE.
Passed California High School Exit Exam	Equal to 1 if student passed both the math and ELA CAHSEE; equal to zero if student took both exams but did not pass one or both.
Female	Equal to 1 if student is female; equal to zero if student is male.
Low Socioeconomic Status (SES)	Equal to 1 if student is part of the National School Lunch Program or their parents' education level is not higher than high school graduate; equal to 0 if student is not part of the National School Lunch Program and their parents' education level is higher than a high school graduate and the value is non-missing.
White	Equal to 1 if student is white, non-Latino; equal to 0 if student is not white and the value is non-missing.
Latino	Equal to 1 if student is Latino; equal to 0 if student is not Latino and the value is non-missing.
African American	Equal to 1 if student is African American, Non-Latino; equal to 0 if student is not African American and the value is non-missing.
Asian	Equal to 1 if student is Asian; equal to 0 if student is not Asian and the value is non-missing.
Other Race/Ethnicity	Equal to 1 if student is American Indian, Alaskan Native, or ethnicity unknown; equal to 0 if student's ethnicity is known and is not American Indian or Alaskan Native.
Gifted and Talented	Equal to 1 if student is gifted and talented; equal to 0 if student is not gifted and talented and the value is non-missing.
Special Education	Equal to 1 if student is in special education; equal to 0 if the student is not in special education and the value is non-missing.
English Learner	Equal to 1 if student is classified as an English learner; equal to 0 if student is not classified as an English learner and the value is non-missing.
Redesignated Fluent English Proficient	Equal to 1 if student is reclassified as proficient in English; equal to 0 if student is not classified as reclassified as proficient in English and the value is non-missing.
Initially Fluent English Proficient	Equal to 1 if student has a home language other than English, but who is initially classified as proficient in English; equal to 0 if student was not initially classified as proficient in English and the value is non-missing.
Class of 2013	A student in the 9th grade in the 2009–10 school year (Class of 2013 if graduates on time)
Class of 2014	A student in the 9th grade in the 2010–11 school year (Class of 2014 if graduates on time)
Class of 2015	A student in the 9th grade in the 2010–11 school year (Class of 2014 if graduates on time)

Analytic Sample

In all districts but Los Angeles, the analytic sample for each model was determined by the number of cases with non-missing values for all treatment, control, and outcome variables required for that model. In Los Angeles, an additional restriction applied: only high schools that were originally in Local District 4 and ended up in the Intensive Support and Innovation Center after district reorganization were included, since the district reorganized during the period under study. Additionally, districts were able to provide middle school data for only those students who attended middle school within the district. This limitation excluded approximately half of the students in Porterville Unified, which has several feeder elementary districts.

The analytic sample varied across outcomes, even within the same district, for several reasons. When using retention in the district into the 10th grade as an outcome, the approximately 10% of students who left the district between 9th and 10th grade were included in this model but not in any other 10th-grade outcomes. Rather than exclude these programs from all analyses, we chose to allow the sample size of the estimates to vary slightly across models. We additionally dropped any programs with fewer than 20 students, as we deemed these programs too small to estimate an accurate outcome while controlling for all necessary variables. We also dropped any non-pathway students in wall-to-wall schools and students in alternative or continuation schools.

Exhibit A-7 shows the grades and cohorts for which we are missing data in each district by each outcome variable. Shading indicates that the data were missing by design: we did not request data for the 2013 cohort from Los Angeles, Montebello, Oakland, Sacramento, or West Contra Costa, and pathways in Oakland and West Contra Costa do not serve 9th graders. An "X" indicates that we either did not receive these data or received them but were unable to use them because they were not of sufficient quality. In addition to the systematically missing data, two key pathway flags were missing from the data. The students at Harmony Magnet did not have pathway flags for the class of 2014 and class of 2015 cohorts. As this school is a wall-to-wall pathway school, and both pathways were certified beginning with the class of 2014, we treated all students at this school as members of a single certified pathway for these two cohorts. Additionally, no students were flagged as enrolled at Antioch's certified pathway EDGE in the 2015 cohort, the first cohort for which this pathway was certified. We chose to include these students based on their 10th grade enrollment, rather than exclude the pathway from the analysis.

Exhibit A-7
Data Availability

Absences

Grade	*Graduation Cohort*	*Antioch*	*Long Beach*	*Los Angeles*	*Montebello*	*Oakland*	*Pasadena*	*Porterville*	*Sacramento*	West Contra Costa
9th	2013	X	X				X	X		
	2014	X								
	2015	X					X			
10th	2013	X								
	2014	X					X			
	2015	X		X						
11th	2013	X					X			
	2014	X		X						
12th	2013	X								

Retention in District from Ninth Grade

Grade	Graduation Cohort	Antioch	Long Beach	Los Angeles	Montebello	Oakland	Pasadena	Porterville	Sacramento	West Contra Costa
10th	2013									
	2014									
	2015									
11th	2013									
	2014									
12th	2013									

Exhibit A-7
Data Availability (continued)

Number of Fs

Grade	Graduation Cohort	Antioch	Long Beach	Los Angeles	Montebello	Oakland	Pasadena	Porterville	Sacramento	West Contra Costa
9th	2013	X								
	2014	X								
	2015	X								
10th	2013	X								
	2014	X								
	2015	X				X			X	
11th	2013	X								
	2014	X				X			X	
12th	2013	X								

Credits

Grade	Graduation Cohort	Antioch	Long Beach	Los Angeles	Montebello	Oakland	Pasadena	Porterville	Sacramento	West Contra Costa
9th	2013	X								
	2014	X								
	2015	X								
10th	2013	X								
	2014	X								
	2015	X				X	X		X	
11th	2013	X								
	2014	X				X	X		X	
12th	2013	X					X			

Exhibit A-7
Data Availability (continued)

a–g On-Track Indicator

Grade	Graduation Cohort	Antioch	Long Beach	Los Angeles	Montebello	Oakland	Pasadena	Porterville	Sacramento	West Contra Costa
9th	2013	X								
	2014	X								
	2015	X							X	
10th	2013	X								
	2014	X							X	
	2015	X				X	X		X	
11th	2013	X								
	2014	X				X	X		X	

Taking Algebra II by Eleventh Grade

Grade	Graduation Cohort	Antioch	Long Beach	Los Angeles	Montebello	Oakland	Pasadena	Porterville	Sacramento	West Contra Costa
11th	2013									
	2014		X							

Exhibit A-7
Data Availability (continued)

ELA CST

Grade	Graduation Cohort	Antioch	Long Beach	Los Angeles	Montebello	Oakland	Pasadena	Porterville	Sacramento	West Contra Costa
9th	2013									
	2014									
	2015									
10th	2013									
	2014									
	2015		X							
11th	2013									
	2014		X							

ELA EAP

Grade	Graduation Cohort	Antioch	Long Beach	Los Angeles	Montebello	Oakland	Pasadena	Porterville	Sacramento	West Contra Costa
11th	2013									
	2014		X	X						

ELA CAHSEE

Grade	Graduation Cohort	Antioch	Long Beach	Los Angeles	Montebello	Oakland	Pasadena	Porterville	Sacramento	West Contra Costa
10th	2013									
	2014									
	2015					X				

Exhibit A-7
Data Availability (concluded)

Math CAHSEE

Grade	Graduation Cohort	Antioch	Long Beach	Los Angeles	Montebello	Oakland	Pasadena	Porterville	Sacramento	West Contra Costa
10th	2013									
	2014									
	2015					X				

KEY	
X	= Data unavailable
	= Data intentionally excluded
	= Data included in analysis

Descriptive Statistics

In Exhibits A-8 through A-10, we display descriptive statistics for students by pathway type. These tables present the sample sizes, means (for continuous variables) or percentages (for dichotomous variables), and, for continuous variables, standard deviations for all students in all districts who were included in the analytic sample for any outcomes analysis. We provide these overall descriptive statistics to allow for an understanding of certified pathway enrollment in comparison to the non-certified and traditional high school enrollment within the analytic sample. The tables show student demographics, test score data, and non-test score outcome data, respectively. The sample for the demographics table excludes all students missing values on any of the covariates used in the models but not those missing values on any the outcomes, and is therefore greater than the number of students in any of the analyses. Note that sample sizes vary both by and within table due to the variation in available data between districts and cohorts. The sample size for the test and non-test score outcomes are based on the data available for a single outcome (10th grade ELA CST and 10th grade number of course failures, respectively, though the analytic sample for these will be slightly smaller due to dropping students enrolled in pathways smaller than 20). These numbers will vary due to students leaving the sample (i.e., leaving the district) or data availability (e.g., we did not include Antioch's course files). We provide this level of detail to allow readers to have an understanding of the composition of the analytic sample without having to navigate an untenable number of tables. We provide the number of students included in each analysis in the outcomes tables.

Exhibit A-8
Demographics

	Overall	*Certified Pathway*	*Non-certified Pathway*	*Traditional High School*
N[a]	42,430	4,745	19,641	18,044
% Class of 2013	18	18	19	18
% Class of 2014	43	35	42	47
% Class of 2015	39	47	39	35
% Female	50	52	51	48
% Low SES	78	77	79	76
% White	14	15	10	17
% Latino	53	59	54	50
% African American	15	14	15	16
% Asian Group	15	10	16	15
% Other Race / Ethnicity	3	2	5	2
% Gifted and Talented	8	6	6	11
% Special Education	7	6	6	8
% English Language Learner	20	18	22	18

[a] Sample size will differ by cell.

Exhibit A-9
Test Score Descriptives

	Overall	*Certified Pathway*	*Non-certified Pathway*	*Traditional High School*
N	32,619	3,852	14,034	14,733
7th Grade				
ELA CST	343	349	341	344
sd	(57)	(54)	(57)	(58)
% Proficient or Higher, ELA CST	46	50	43	47
8th Grade				
ELA CST	346	351	345	346
sd	(61)	(58)	(60)	(62)
% Proficient or Higher, ELA CST	46	50	45	47
9th Grade				
ELA CST	347	354	345	348
sd	(59)	(55)	(58)	(61)
% Proficient or Higher, ELA CST	48	53	46	49
10th Grade				
ELA CST	339	342	337	339
sd	(57)	(54)	(57)	(59)
% Proficient or Higher, ELA CST	43	45	41	44
Math CAHSEE	384	385	383	383
sd	(36)	(34)	(36)	(37)
% Passing, Math CAHSEE	82	86	82	80
ELA CAHSEE	381	384	380	381
sd	(35)	(33)	(34)	(37)
% Passing, ELA CAHSEE	82	86	82	81
11th Grade				
ELA CST	335	339	335	335
sd	(61)	(58)	(61)	(61)
% Proficient or Higher, ELA CST	41	44	41	41
% Passing, EAP ELA	32	35	31	32

[a] Sample size will differ by cell.

Exhibit A-10
Non-Test Score Outcomes Descriptives

	Overall	*Certified Pathway*	*Non-certified Pathway*	*Traditional High School*
N[a]	31,076	3,216	16,821	11,039
Number of F's Received				
9th Grade	1.80	1.42	1.86	1.83
sd	(2.77)	(2.55)	(2.78)	(2.80)
10th Grade	1.78	1.47	1.87	1.72
sd	(2.72)	(2.51)	(2.83)	(2.60)
11th Grade	1.20	0.98	1.25	1.20
sd	(2.14)	(1.97)	(2.21)	(2.06)
Number of Credits				
9th Grade	54	62	54	53
sd	(17)	(16)	(16)	(17)
10th Grade	55	62	56	53
sd	(17)	(16)	(17)	(18)
11th Grade	58	61	59	57
sd	(15)	(15)	(15)	(16)
% a–g On Track				
9th Grade	39	46	39	36
10th Grade	30	37	31	27
11th Grade	25	31	26	23
Absences				
9th Grade	6.54	5.71	6.75	6.46
sd	(9.05)	(8.17)	(9.46)	(8.65)
10th Grade	7.65	6.84	8.24	7.10
sd	(10.72)	(9.35)	(11.62)	(9.75)
11th Grade	8.10	6.85	8.71	7.62
sd	(11.69)	(10.36)	(12.15)	(11.34)
12th Grade	8.62	8.70	9.13	7.72
sd	(11.86)	(11.32)	(12.43)	(10.97)
Retention from 9th Grade				
to 10th Grade	92	96	92	92
to 11th Grade	87	92	86	86
to 12th Grade	86	90	87	82

[a] Sample size will differ by cell.

Analysis Methods

To estimate the differences between pathway students and similar peers in traditional high schools on continuous outcome variables (i.e., CST scores, CAHSEE scores, and credit accumulation), we used a Hierarchical Linear Model (HLM) with random effects at the student and pathway level. We used a vector of indicators for the student's district and cohort to control for fixed effects of each district and cohort. Outcome *Y* for student *i* in pathway *j* is given as:

$$Y_{ij} = \beta + (\mathbf{PW_{ij}})\boldsymbol{\pi} + (\boldsymbol{X_{ij}} - \bar{\boldsymbol{X}})\boldsymbol{\zeta} + \alpha_j + \varepsilon_{ij}$$

Where:

Y_{ij}= Outcome Y for student *i* in pathway *j*.

PW_{ij} = vector of dummies representing pathway classification (certified pathway and non-certified pathway, with traditional high schools omitted as reference).

X_{ij}= vector of controls, including district and cohort fixed effects, student prior achievement and demographics. Prior achievement variables consist of the student's math and ELA CST score from the year prior to entering the pathway, a vector of dummies indicating the math CST exam taken, and an indicator for the pathway beginning in the 10th grade. Demographic variables consist of a series of indicators for student gender, ethnicity, EL status, Special Education status, and low-socioeconomic status. All variables are grand-mean centered.

α_j= pathway random effect.

ε_{ij} = student random effect.

The π coefficients therefore provide the estimate of the difference between pathway students (in each certified and non-certified categories) and traditional high school students, controlling for all variables captured by.X_{ij}.

As all covariates are grand-mean centered, our estimates predict differences for an "average" student in the sample. We predicted models using a continuous outcome variable using Stata 13's *mixed* command. Models predicting binary outcomes (retention in the district, on-track to complete a–g, taking Algebra II by 11th grade, and at least conditionally ready on the EAP exam) used the *meqrlogit* command. For models predicting count data (absences and number of course failures), we began by testing the fit of a Poisson regression. The goodness-of-fit test was significant for this model ($p < .001$), however, indicating that this data exhibits overdispersion. We therefore used a negative binomial model, which models count data while allowing for an individual error term (Kennedy, 2003). We predicted these models using Stata 13's *menbreg* command and integrated these models using mode-curvature adaptive Gauss-Hermite quadrature (Stata 13's *intmethod(mcaghermite)* option). For both logistic and negative binomial models, we first transformed the estimates into probabilities or counts to report in the main text but provide untransformed results in this appendix for the overall outcomes, to allow for comparisons between the point estimates and standard errors of these estimates.

Results for Certified Pathways

We present all estimates for certified pathways in Exhibits A-11 through A-12, along with their significance level and the associated standard error and sample sizes at both student and pathway levels. Count data (absences, number of F's) and binary outcomes (retention in the district, on-track to complete a–g, taking Algebra II by 11th grade, and at least conditionally ready on the EAP exam) are presented without transformation to counts or probabilities to allow for comparisons to the standard errors of these estimates.

Exhibit A-11
Non-test Outcomes for Certified Pathways

	9th Grade	10th Grade	11th Grade	12th Grade
Absences				
Point Estimate[a]	0.00	-0.06	-0.10	-0.06
SE	(0.10)	(0.08)	(0.12)	(0.17)
Student *N*	21,677	29,799	15,015	5,698
Pathway *N*	101	152	91	49
Retention				
Point Estimate[a]		0.58 ***	0.56 ***	0.53 **
SE		(0.17)	(0.14)	(0.16)
Student *N*		33,630	25,844	7,753
Pathway *N*		115	149	53
Number of F's Received				
Point Estimate[a]	-0.04	-0.05	-0.06	
SE	(0.16)	(0.11)	(0.15)	
Student *N*	29,710	30,855	15,058	
Pathway *N*	108	156	98	
Number of Credits				
Point Estimate	7.35 ***	6.89 ***	3.32 **	
SE	(1.83)	(1.35)	(1.29)	
Student *N*	29,696	30,831	15,000	
Pathway *N*	108	156	98	
Takes Alg. II by 11th grade				
Point Estimate[a]			0.30	
SE			(0.24)	
Student *N*			17,476	
Pathway *N*			143	
a–g On Track				
Point Estimate[a]	0.47	0.43 *	0.46	
SE	(0.24)	(0.20)	(0.25)	
Student *N*	27,357	28,576	14,909	
Pathway *N*	105	140	97	

Note: *$p < .05$; **$p < .01$; ***$p < .001$

[a] Point estimates for absences, retention, number of F's, taking Alg. II, and on-track to complete a–g presented without transformations to allow for comparisons to standard errors of these estimates.

Exhibit A-12
Test Outcomes for Certified Pathways

	9th Grade	10th Grade	11th Grade
ELA CST			
Point Estimate	2.81	1.80	-0.08
SE	(1.85)	(1.54)	(2.15)
Student *N*	32,552	32,413	15,900
Pathway *N*	114	169	140
ELA CAHSEE			
Point Estimate		1.83 *	
SE		(0.90)	
Student *N*		36,422	
Pathway *N*		168	
Math CAHSEE			
Point Estimate		1.26	
SE		(1.07)	
Student *N*		36,392	
Pathway *N*		168	
ELA EAP			
Point Estimate[a]			0.13
SE			(0.19)
Student *N*			12,696
Pathway *N*			112

Note: *$p < .05$; **$p < .01$; ***$p < .001$

[a] Point estimate for ELA EAP presented without transformations to allow for comparisons to standard errors of these estimates.

Results for Subgroups in Certified Pathways

We present all estimates for subgroup students' outcomes in certified pathways in Exhibits A-13 through A-17. For these analyses, we limited the analysis sample used in the overall outcome estimates to those students in the subgroup of interest. Results can therefore be thought of as outcomes for subgroup students in certified pathways in comparison to outcomes for similar students of the same subgroup, when enrolled in a traditional high school. We estimated these models only for continuous outcomes. All certified pathway estimates are presented, along with their significance level and the associated standard error and sample sizes, at both student and pathway levels.

Exhibit A-13
Outcomes for Hispanic Students in Certified Pathways

	9th Grade	10th Grade	11th Grade
Number of credits			
Point Estimate	6.94 ***	6.80 ***	3.52 **
SE	(1.97)	(1.42)	(1.32)
Student *N*	16,680	17,825	9,097
Pathway *N*	108	156	98
ELA CST			
Point Estimate	1.25	1.95	-0.22
SE	(2.12)	(1.76)	(2.41)
Student *N*	17,592	17,668	8,794
Pathway *N*	114	169	140
ELA CAHSEE			
Point Estimate		1.08	
SE		(0.91)	
Student *N*		20,110	
Pathway *N*		168	
Math CAHSEE			
Point Estimate		1.33	
SE		(1.18)	
Student *N*		20,069	
Pathway *N*		168	

Note: *p < .05; **p < .01; ***p < .001

Exhibit A-14
Outcomes for African American Students in Certified Pathways

	9th Grade	10th Grade	11th Grade
Number of credits			
Point Estimate	10.75 ***	9.92 ***	4.01
SE	(2.31)	(1.65)	(2.08)
Student *N*	3,537	4,086	1,791
Pathway *N*	97	141	82
ELA CST			
Point Estimate	0.58	1.66	-0.48
SE	(2.27)	(2.45)	(3.79)
Student *N*	4,221	4,808	2,209
Pathway *N*	101	153	122
ELA CAHSEE			
Point Estimate		2.51	
SE		(1.37)	
Student *N*		5,226	
Pathway *N*		151	
Math CAHSEE			
Point Estimate		-0.53	
SE		(1.47)	
Student *N*		5,242	
Pathway *N*		152	

Note: *p < .05; **p < .01; ***p < .001

Exhibit A-15
Outcomes for Female Students in Certified Pathways

	9th Grade		10th Grade		11th Grade	
Number of credits						
Point Estimate	7.92	***	7.36	***	3.20	*
SE	(1.91)		(1.41)		(1.35)	
Student *N*	14,910		15,497		7,553	
Pathway *N*	108		156		98	
ELA CST						
Point Estimate	0.77		1.35		1.56	
SE	(1.77)		(1.61)		(2.22)	
Student *N*	16,374		16,238		8,029	
Pathway *N*	114		169		140	
ELA CAHSEE						
Point Estimate			2.62	**		
SE			(0.95)			
Student *N*			18,315			
Pathway *N*			168			
Math CAHSEE						
Point Estimate			1.29			
SE			(1.09)			
Student *N*			18,337			
Pathway *N*			168			

Note: *$p < .05$; **$p < .01$; ***$p < .001$

Exhibit A-16
Outcomes for English Learner Students in Certified Pathways

	9th Grade	10th Grade	11th Grade
Number of credits			
Point Estimate	6.62 ***	4.68 **	4.24 *
SE	(1.95)	(1.59)	(1.67)
Student *N*	5,599	6,270	2,792
Pathway *N*	107	155	97
ELA CST			
Point Estimate	4.83	1.41	0.01
SE	(2.49)	(1.97)	(3.04)
Student *N*	5,799	6,154	2,837
Pathway *N*	112	167	136
ELA CAHSEE			
Point Estimate		1.86	
SE		(1.26)	
Student *N*		6,849	
Pathway *N*		166	
Math CAHSEE			
Point Estimate		0.02	
SE		(1.51)	
Student *N*		6,813	
Pathway *N*		166	

Note: *$p < .05$; **$p < .01$; ***$p < .001$

Exhibit A-17
Outcomes for Students with Low Prior Achievement in Certified Pathways[a]

	9th Grade		10th Grade		11th Grade
Number of credits					
Point Estimate	9.03	***	7.45	***	2.69
SE	(2.13)		(1.62)		(1.94)
Student *N*	6,392		6,620		2,897
Pathway *N*	104		152		93
ELA CST					
Point Estimate	5.86	*	3.88		1.95
SE	(2.69)		(1.99)		(2.92)
Student *N*	6,831		6,869		3,175
Pathway *N*	110		164		134
ELA CAHSEE					
Point Estimate			4.35	***	
SE			(1.31)		
Student *N*			7,539		
Pathway *N*			164		
Math CAHSEE					
Point Estimate			3.19	*	
SE			(1.34)		
Student *N*			7,543		
Pathway *N*			164		

Note: *$p < .05$; **$p < .01$; ***$p < .001$

[a] Low prior achievement is defined as scoring below basic on the English Language Arts California Standards Test (ELA CST).

Results for Non-certified Pathways

Our results for non-certified pathways show that outcomes for students in these pathways differ very little from those of otherwise similar students in traditional high schools (Exhibits A-18 through A-19). As discussed above, we considered any program districts flagged as a pathway, but that was not certified, to be a non-certified pathway. These programs typically shared some important features with the certified pathways (e.g., small cohort, career theme) but varied in how closely they align with or aim to replicate the full Linked Learning approach. We included in the non-certified category those pathways deemed by ConnectEd as "in progress" toward certification.

These results indicate that, unlike for certified pathways, results for all non-certified pathways do not consistently indicate improved outcomes for students. These results could be driven by a number of factors. First, without having systematic data on every non-certified pathway, we do not know the extent to which the non-certified pathways replicate the Linked Learning approach (e.g., incorporate work-based learning). Some of these pathways may therefore share very little in common with certified pathways. Second, these newly developing pathways may attract a different group of teachers or students (above and beyond those student characteristics we are able to control for using demographic and prior achievement data) due to changes in reputation, the effort of going through certification, or several other reasons. Finally, the process of going through the certification process may also improve the quality of the pathway.

Exhibit A-18
Non-test Outcomes for Non-certified Pathways

	9th Grade	10th Grade	11th Grade	12th Grade
Absences				
Point Estimate[a]	0.10	-0.05	-0.05	0.06
SE	(0.09)	(0.07)	(0.10)	(0.17)
Student *N*	21,677	29,799	15,015	5,698
Pathway *N*	101	152	91	49
Retention				
Point Estimate[a]		-0.06	0.19	0.07
SE		(0.13)	(0.11)	(0.16)
Student *N*		33,630	25,844	7,753
Pathway *N*		115	149	53
Number of F's Received				
Point Estimate[a]	0.32 *	0.06	0.25 *	
SE	(0.14)	(0.09)	(0.13)	
Student *N*	29,710	30,855	15,058	
Pathway *N*	108	156	98	
Number of Credits				
Point Estimate	-0.52	2.62 *	2.58 *	
SE	(1.57)	(1.08)	(1.10)	
Student *N*	29,696	30,831	15,000	
Pathway *N*	108	156	98	
Takes Alg. II by 11th grade				
Point Estimate[a]			0.21	
SE			(0.19)	
Student *N*			17476	
Pathway *N*			143	
a–g On Track				
Point Estimate[a]	-0.25	0.02	-0.08	
SE	(0.20)	(0.17)	(0.21)	
Student *N*	27,357	28,576	14,909	
Pathway *N*	105	140	97	

Note: *$p < .05$; **$p < .01$; ***$p < .001$

[a] Point estimates for absences, retention, number of F's, taking Alg. II, and on-track to complete a–g presented without transformations to allow for comparisons to standard errors of these estimates.

Exhibit A-19
Test Outcomes for Non-certified Pathways

	9th Grade	10th Grade	11th Grade
ELA CST			
Point Estimate	1.96	1.05	0.61
SE	(1.59)	(1.29)	(1.74)
Student *N*	32,552	32,413	15,900
Pathway *N*	114	169	140
ELA CAHSEE			
Point Estimate		1.27	
SE		(0.76)	
Student *N*		36,422	
Pathway *N*		168	
Math CAHSEE			
Point Estimate		1.29	
SE		(0.91)	
Student *N*		36,392	
Pathway *N*		168	
ELA EAP			
Point Estimate[a]			-0.19
SE			(0.16)
Student *N*			12,696
Pathway *N*			112

Note: *$p < .05$; **$p < .01$; ***$p < .001$

[a] Point estimates ELA EAP presented without transformations to allow for comparisons to standard errors of these estimates.

Access and Equity Analysis Methods

In order to identify patterns in students' entry into and participation in pathways, we conducted three separate descriptive analyses, the results of which are presented in Chapter 2 of the report. These analyses draw on the same extant data obtained through IEBC for the high school outcomes analysis described above; however, the analytic sample is larger because we include students who are missing prior achievement data used in the outcomes analysis. Below, we describe each of our access and equity analyses.

All the analyses in this section relied on the same data from IEBC described early in the high school outcomes analysis.

Pathway Enrollment Analysis

This analysis explored differences in students' entry into pathways based on student demographic characteristics and prior achievement and by pathway theme.

Sample: The sample for this analysis includes students from the 2013 (where available), 2014, and 2015 cohorts. It is the same as the overall sample for the outcomes analysis except that it includes students with missing prior achievement data. Students' pathway assignment is based on their enrollment in the earliest grade level served by the pathways of interest (i.e., 9th grade in most places and 10th grade in Oakland, West Contra Costa, and select other pathways).

Approach: We first classified the 33 pathways certified by the start of the 2012–13 school year into the fifteen industry sectors defined by the California State Center Consortium (see http://statecenter.com/resources/industry-sectors).[47] The predominant career themes of 31 of the 33 certified pathways aligned with a total of 6 of the 15 industry sectors. Two certified pathways in Sacramento had no single predominant career theme, and we categorize them as "multi-sector." We then calculated the percentage of students who belonged to a particular subgroup (i.e., female, English learner, lower achieving, and special education) in all of the pathways and with a particular theme in each district. These results are displayed in full in Exhibits 2-2 and 2-3 in the report. Exhibits A-20 and A-21 provide the numbers of students enrolled in pathways by theme and subgroup that support those graphs. We also present numbers for the information on the results for English learner and low achieving students in Exhibits A-22 and A-23.

[47] California CTE defines 15 career pathway industry sectors that correspond to major industries offering employment in California. The 7 sectors not represented as predominant career themes among certified pathways are Agriculture and Natural Resources; Energy and Utilities; Fashion and Interior Design; Hospitality, Tourism, and Recreation; Manufacturing and Product Development; Marketing, Sales, and Service; and Transportation.

Exhibit A-20
Special Student Populations, by District[a]

	Special Student Population		English Learners		Low Prior Achievement[b]		Total Enrollment	
	Certified Pathway	Overall	Certified Pathway	Overall	Certified Pathway	Overall	Certified Pathway	Overall
Antioch								
N in subgroup	67	698	63	506	250	2,105	732	5,025
Non-missing *N*	732	5,025	727	4,886	625	3,839		
Long Beach								
N in subgroup	44	1,578	118	3,717	436	8,104	1,885	19,853
Non-missing *N*	1,885	19,853	1,884	19,806	1,364	16,459		
Los Angeles								
N in subgroup	13	484	139	2,236	251	3,671	403	6,387
Non-missing *N*	403	6,387	401	6,358	360	5,363		
Oakland								
N in subgroup	31	457	97	988	201	1,946	335	4,209
Non-missing N	335	4,209	325	4,111	288	3,197		
Pasadena								
N in subgroup	95	431	181	642	525	1,843	1,033	4,336
Non-missing *N*	1,033	4,336	1,022	4,221	843	3,448		
Porterville								
N in subgroup	5	206	86	945	124	1,227	876	5,264
Non-missing *N*	876	5,264	873	5,061	364	2,179		
Sacramento								
N in subgroup	51	639	105	1,247	233	2,392	556	6,067
Non-missing *N*	556	6,067	519	5,956	428	4,943		
West Contra Costa								
N in subgroup	54	454	233	1,017	351	1,980	496	3,884
Non-missing N	496	3,884	490	3,790	450	3,111		

[a] *N*s vary within districts for different subgroups because of missing data. Across all districts, district data was missing English Learner status for 836 students (1.5% of observations) and was missing prior achievement scores needed to derive the low prior achievement indicator for 12,436 students (23% of observations).

[b] Low prior achievement is defined here as scoring below proficient on the English Language Arts California Standards Test (ELA CST).

Exhibit A-21
Female Enrollment, by Career Theme and District

	Pathway Enrollment				District Enrollment
	Engineering	Health	Media	Total	Total
Antioch					
female	25	328	0	406	2,450
district total	109	528	0	732	5,025
Long Beach					
female	308	0	17	978	9,889
district total	742	0	41	1,885	19,853
Los Angeles					
female	0	0	89	219	3,090
district total	0	0	190	403	6,387
Oakland					
female	0	69	37	186	1,991
district total	0	135	96	335	4,209
Pasadena					
female	28	0	185	533	2,099
district total	91	0	310	1,033	4,336
Porterville					
female	26	109	59	194	2,529
district total	91	153	141	385	5,264
Sacramento					
female	20	146	0	189	2,965
district total	63	234	0	357	6,067
West Contra Costa					
female	9	49	54	174	1,764
district total	122	74	168	496	3,884

Exhibit A-22
English Learners Enrolled in Pathways, by Career Theme and District

	Pathway Enrollment				District Enrollment
	EL			Total	Total
	Engineering	Health	Media		
Antioch					
EL	13	47	0	63	506
district total	109	528	0	732	5,025
Long Beach					
EL	22	0	11	118	3,717
district total	742	0	41	1,885	19,853
Los Angeles					
EL	0	0	69	139	2,236
district total	0	0	190	403	6,387
Oakland					
EL	0	59	27	97	988
district total	0	135	96	335	4,209
Pasadena					
EL	14	0	19	181	642
district total	91	0	310	1,033	4,336
Porterville					
EL	6	17	13	36	945
district total	91	153	141	385	5,264
Sacramento					
EL	9	49	0	79	1,247
district total	63	234	0	357	6,067
West Contra Costa					
EL	77	11	76	233	1,017
district total	122	74	168	496	3,884

Exhibit A-23
Low Prior Achievement Student Enrollment, by Career Theme and District

	Pathway Enrollment				District Enrollment
	Low Prior Achievement			Total	Total
	Engineering	Health	Media		
Antioch					
low prior ach.	39	179	0	250	2,105
district total	109	528	0	732	5,025
Long Beach					
low prior ach.	86	0	29	436	8,104
district total	742	0	41	1,885	19,853
Los Angeles					
low prior ach.	0	0	118	251	3,671
district total	0	0	190	403	6,387
Oakland					
low prior ach.	0	83	63	201	1,946
district total	0	135	96	335	4,209
Pasadena					
low prior ach.	49	0	106	525	1,843
district total	91	0	310	1,033	4,336
Porterville					
low prior ach.	11	30	19	60	1,227
district total	91	153	141	385	5,264
Sacramento					
low prior ach.	25	120	0	175	2,392
district total	63	234	0	357	6,067
West Contra Costa					
low prior ach.	90	40	127	351	1,980
district total	122	74	168	496	3,884

Retention within Pathways

A second analysis in Chapter 2 of the report explored the extent to which students who start out in certified pathways remained in the same pathway. In order to examine this, we tracked student retention in certified pathways through 11th grade.

Sample: This sample for this analysis included students from the 2013 (where available), and 2014 cohorts; the data for this year's report does not yet contain 11th grade variables for the 2015 cohort. Data from four districts (Antioch, Pasadena, Long Beach and Porterville) are included in 2013 cohort data, and five districts (Antioch, Pasadena, Long Beach, Porterville, and Sacramento) are included in the

2014 cohort data. Montebello had no certified pathways during the study period. We excluded West Contra Costa and Oakland due to their pathways beginning in 10th grade, though analyses including these two districts provided similar results.

Approach: Because we only had 12th-grade data in a few districts, we chose to focus on retention to 11th grade, rather than to the end of high school. We classified students into four retention categories in 11th grade. In Exhibit 2-4 in the report, we present the percent of certified pathway students overall for and in a few subgroups that fell into each of four retention categories in the 11th grade:

- **No longer in the district:** Students are considered present in the district if they have a non-missing value for 11th grade ELA CST, 11th-grade GPA, or 11th-grade school or pathway enrollment.
- **No longer in a pathway, but in the same district:** The student is retained in the district, but has moved to a traditional high school or other high school program.
- **In a different pathway:** The student is retained in the district, but has moved to a different pathway.
- **In same pathway:** The student remained in the district from 9th to 11th grade and in the same certified pathway that they initially enrolled.

Exhibit A-24 presents the number of students retained through 11th grade in certified pathways overall and by subgroup. These data support Exhibit 2-4 in the body of the report.

Exhibit A-24
Retention to the 11th Grade in Certified Pathways Overall and by Subgroup

	No longer in the district	No longer in a pathway	In a different pathway	In same pathway	Total
English Learner	61	50	7	219	337
Special Education (SPED)	22	17	4	93	136
Low Prior Achievement[a]	112	134	14	620	880
Pathway total	250	268	48	2,008	2,574

Note: Montebello had no certified pathways during the study period. We excluded West Contra Costa and Oakland due to their pathways beginning in 10th grade, though West Contra Costa submitted data that did not allow students' pathway affiliation to be tracked past the 10th grade, analyses including these two districts provided similar results. Some pathway students are captured in multiple row categories (e.g., a student can be an English Learner and designated special education), and some pathway students are not in any of the listed categories, so the first three rows will not sum to the "All pathway students" row at the bottom.

[a] Low prior achievement is defined as scoring below proficient on the ELA CST.

Course-taking Analysis

In order to better understand the issue of variation in course of study within pathways that surfaced in the qualitative data analysis, we conducted an analysis of course-taking patterns in two pathways using student transcript data. Through the transcript data we were able to see which courses the majority of pathway students took in common, and when courses had more diffuse student enrollment. Below we describe in more detail the rationale for focusing this analysis on two pathways, the sample, and our analytic methods.

Sample: We chose to examine course-taking in two pathways instead of analyzing course-taking data for all certified pathways for several reasons. First, we decided that the most robust findings would come from examining course-taking over students' entire high school experience. We only obtained course-taking data through 12th grade for the 2013 cohort, and we are following this cohort in only 4 of the 9 districts, so our pool of potential pathways is limited to those in these four districts. Because only

10 pathways in these districts were certified when the 2013 cohort started high school, this limited our potential sample substantially. In addition, we excluded pathways in stand-alone small schools from our list of potential pathways because it is very unlikely that students in such pathways would take a course outside of their pathway. These constraints left us with a small sample of pathways that, taken collectively, would not accurately represent the range of pathway experiences. Therefore, we conducted a deeper analysis of course-taking in two pathways from different districts and career themes.

Within the subset of pathways meeting the criteria described above, we chose two pathways with relatively large enrollment and represented two of the most common career themes (Arts, Media, and Entertainment; and Engineering and Design). We did not sample small pathways because a handful of students taking classes outside of the course of study would show up as a large percentage-wise decrease in cohort purity. Additionally, we chose pathways from the two most common career themes to make the case studies more relevant. Finally, we wanted to choose pathways in two different districts, to account partially for district policies that may affect course-taking.

Approach: To understand the extent to which pathway students took the majority of their classes together, we examined the transcript data for a single cohort of students (class of 2013) from 9th through 12th. We calculated the percent of students enrolled in the most common class for their pathway in each subject area in each semester of their high school career. In order to arrive at these results, we first categorized the courses into subject areas. Most of this work was done for us: districts reported the a–g classification of their courses in the datasets we received and we used these classifications to determine subject areas. However, for courses without a–g certification and for some ”f” and “g” courses (which are often, but not always, technical courses), we assigned a subject area based on the course’s title. After categorizing the courses, we calculated the percent of pathway students enrolled in each course in each semester and ranked the courses in each subject area by these percentages. The results displayed in Exhibit 2-6 are the percent of pathway students in the highest ranked course. Exhibits A-25 through A-26 provides the numbers of students supporting the percentage calculations in Exhibit 2-5.

Exhibit A-25
Arts, Media, and Entertainment Pathway Concentration of Students in Most Common Course by Subject and Grade Level

	9th Grade		10th Grade		11th Grade		12th Grade	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
English	111	110	72	74	57	56	47	48
Math	106	108	43	43	37	37	23	23
Science	114	117	81	81	33	29	30	30
Social Studies	N/A	N/A	84	84	67	65	56	56
Technical	N/A	N/A	89	88	71	69	57	58
Total Pathway Enrollment	129	129	90	90	80	80	67	67

Exhibit A-26
Engineering and Design Pathway Concentration of Students in Most Common Course by Subject and Grade Level

	9th Grade		10th Grade		11th Grade		12th Grade	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
English	78	78	66	66	53	53	32	32
Math	39	39	22	21	10	9	14	11
Science	79	78	68	68	47	47	33	23
Social Studies	N/A	N/A	69	69	54	54	50	N/A
Technical	N/A	N/A	61	61	41	38	N/A	N/A
Total Pathway Enrollment	80	80	70	70	59	59	52	52