Evaluation of the Career Connected Pathways Project | Final Report

December 2025

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Introduction

In early 2020, the Center for the Future of Arizona (CFA), in partnership with Jobs for the Future (JFF), Lead Local, and multiple Arizona school districts and community colleges, launched the Career Connected Pathways (CCP) project. Funded by the U.S. Department of Education's Education Innovation and Research (EIR) program, the CCP project sought to expand opportunities for high school students to enter high-wage, high-demand careers in computer science and cybersecurity (CS/Cy) and help meet the need for a qualified workforce to sustain Arizona's economic growth.

The CCP project emerged in response to the ongoing challenge of ensuring effective college and career advising in U.S. public high schools. Counselors play a pivotal role in helping students understand and navigate their college and career pathways but have little time to devote to this role. In a 2023 nationally representative survey, nearly all (91%) of school leaders reported that regular, one-on-one meetings with counselors were one of the top three ways that students learn about different college and career pathways (Schmitz & DeBaun, 2024). High school student-to-counselor ratios, however, limit their ability to provide individualized guidance. In Arizona, the student-to-counselor ratio in 2019–20 was 848 to 1, well above the national average of 424 to 1 and the American School Counselor Association's (n.d.) recommended ratio of 250 to 1. These numbers highlight the challenges schools face in ensuring all students have access to high-quality information to plan for their future careers.

At the same time, digital skills and computational thinking now underpin success in a wide range of industries, not only within traditional technology sectors. Further, computer science itself remains a growing and well-paid career, at least for those with advanced degrees. The U.S. Bureau of Labor Statistics (2025) projects that between 2024 and 2034, employment in computer and information technology occupations will grow much faster than overall job growth across the economy. Not all students in Arizona have access to computer science coursework, however, with 57% of Arizona high schools offering no computer science courses (Code.org, 2024).

To understand the impact and implementation of the CCP project, CFA engaged SRI to conduct an independent evaluation of the project. This report presents findings from SRI's comprehensive evaluation, offering insights into the project's outcomes, the conditions that supported or hindered implementation, and key lessons to inform future efforts to strengthen career-connected learning pathways across Arizona and beyond.

Overview of the Career Connected Pathways Project

The CCP project aimed to meet the state's growing CS/Cy workforce needs by increasing the number of high school students prepared to pursue these family-sustaining careers. CFA partnered with eight public school districts in Arizona to implement the project. The project logic model (Exhibit 1) lays out the theory of change by which the project would lead to desired system and student outcomes.

Project Model

The project had four key components that supported this goal: **co-advising development** designed to foster collaboration and coordination between high schools and community colleges to guide students through educational pathways that lead to CS/Cy careers; structured career exploration for 10th-grade students through **Career Connected Toolkit** lessons; a **student-directed design process** in 11th grade to develop career planning activities and resources; and integration of **student voice** into project design through a deliberate continuous improvement process. These key components were designed to lead to several actions on the part of educators and students, shown under **direct components** in the logic model.

Co-Advising Development. The co-advising development activities were meant to foster communication and collaboration between high school and community college educators, engaging high school counselors, teachers, and community college educators in coordinated planning activities to develop robust student postsecondary planning and advising. Through this component, the project sought to build shared responsibility for postsecondary planning across community college and high schools, increasing the coherence of career advising in high school. This work was guided by JFF's co-advising framework, which defines the responsibilities of "co-advisors" from secondary and postsecondary education, emphasizing opportunities for cross-system collaboration. These co-advisor responsibilities include supporting the development of individualized student advising plans, for example, by identifying course sequences for individual program of studies that span high school through college. Another responsibility is embedding rigorous academics, such as strategically expanding access to dual enrollment through new course agreements and offerings.

The co-advising development component included co-advising work sessions, convenings, and office hours that brought together representatives from participating high schools and school districts, community colleges, and employers. This component also included industry speed dates to build participants' capacity to advise students about CS/Cy career opportunities and their required qualifications.

Since 2008, Arizona has required that each student in ninth through 12th grade develop an individualized student advising plan called the Education and Career Action Plan, or ECAP. The co-advising component sought to leverage this existing requirement by encouraging schools to

Exhibit 1. Career Connected Pathways logic model

Project Model

Key (Support) Components

Co-Advising Development
Activities to build joint career advising capacity of community college and high school educators related to CS/Cy careers

- **Co-advising work sessions, convenings, and office hours** on cross-systems collaboration to share best practices
- **Industry speed date** experiences to build educator awareness of CS/Cy careers (Y1)

Career Connected Toolkit
Career exploration lesson modules

- **Professional development** for high school educators on toolkit implementation

Student-Directed Design Process
Development process for career planning resources

- **Professional development** for community college and high school partners on facilitating a student-led career planning design process

Student Voice
Data collection activities to support project design and improvement

- Collection of feedback from students on career advising needs and offerings

Direct Components

Co-Advising Development

- Community college and high school educators increase communication and collaboration related to CS/Cy course pathways and careers

Career Connected Toolkit

- 10th-grade students complete **at least three toolkit activities** before making 11th-grade course selections

Student-Directed Design Process

- High school and community college educators engage 11th-grade students in a collaborative design process culminating in a career planning resource for students at their school

Student Voice

- There is systematic use of student feedback data to shape project implementation

Mediators

High school and community college educators:

- Increase **awareness and knowledge** of dual enrollment and CS/Cy courses needed for postsecondary credentials, industry certifications, and careers
- **Share responsibility** for student success across high school and community college systems
- Help students align **self-awareness, CS/Cy career interests, and course enrollment**

Students, particularly underserved students:

- Increase **awareness and interest in CS/CY careers**
- Increase **understanding** of dual enrollment and CS/Cy courses needed for postsecondary credentials, industry certifications, and careers
- Increase **enrollment and persistence** in CS/Cy courses and in dual enrollment math and writing courses

Outcomes

Short/Medium-Term

Increased student completion of:

- CS/Cy courses
- Dual enrollment math, writing, and CS/Cy courses
- CS/Cy industry credentials

Long-Term

Increased student:

- High school graduation
- Enrollment in community college CS/Cy pathways
- Participation in STEM careers

Better **alignment between high school and community college advising** to support ALL students with successful access, enrollment, persistence, and attainment in STEM courses, course pathways, and careers

Contextual Moderators

Grant resources: educator training stipends, online platform for toolkit resources, access to local industry expertise and labor market information
External factors: community college and district MOUs; state, college, and district dual enrollment policies; dual enrollment financial aid

offer career exploration and planning activities that support students in creating authentic and informed ECAPs. These activities included the **Career Connected Toolkit** in 10th grade and a **student-directed design process** in 11th grade.

Career Connected Toolkit. CFA worked with Lead Local to develop a series of eight activities designed to be integrated into 10th-grade math or science courses—four classroom activities and four advising activities (Exhibit 2). These activities fell into four categories: career awareness, career awareness advising, career exploration, and career exploration advising. CFA provided professional development on using the toolkit to implementing teachers and counselors. By participating in **at least three toolkit activities** before making 11th-grade course selections, 10th graders in the CCP schools would increase their awareness and interest in CS/Cy (mediators).

Exhibit 2. Career Connected Toolkit units

Purpose	Activities	Objectives
Awareness		
Classroom activities	What Is Cyber?	• Define cybersecurity • Identify ways students' lives are impacted by cybersecurity (e.g., cybercrime, personal privacy) • Reflect on potential job or career opportunities
	Ambassador Link	• Relate to individuals pursuing careers in cyber • Learn more about jobs and careers in cyber
Advising activities	College in High School	• Students will know the benefits of dual enrollment (DE), understand what DE courses build skills in IT, and be able to create a computer literacy SMART goal
	Who You Know	• Students will know about social networking, understand the value of networking, and be able to practice speed networking
Exploration		
Classroom activities	Future Self	• Understand how students' own interests align with different career opportunities • Test out decision-making skills around personal finance and budgets
	Getting Ahead	• Identify the skills and qualifications needed for cyber careers • Research educational options to pursue cyber-related careers
Advising activities	Career in High School	• Students will know about the high growth of IT careers; understand the knowledge, skills, and competencies needed in IT careers; and be able to create an IT career literacy SMART goal
	Four Friends Find Jobs	• Students will know the definition of middle-skill jobs; understand the difference between lifetime jobs, springboard jobs, and static jobs; and be able to explore how this informs future decision-making

Student-Directed Design Process. CFA introduced community college and high school partners to a student-directed career planning design process. Specifically, this professional development prepared educators to engage 11th-grade students in a collaborative design process culminating in a career planning resource for students at their school. Although these processes varied by school, CFA modeled this design process on IDEO's (n.d.) five-phase Design Thinking for Educators toolkit (Exhibit 3).

Exhibit 3. Five phases of the Design Thinking for Educators toolkit

Phase	Description
Discovery	Research and understand the problem
Interpretation	Connect the dots in your research
Ideation	Generate and refine ideas on how to solve the problem
Experimentation	Test your ideas, collaborate with others, get feedback
Evolution	Draw conclusions, evolve your ideas, move forward

Student Voice. The final project component was the deliberate collection and use of feedback from students to guide project design and implementation. This feedback data included a student survey that CFA conducted in Years 1 and 3, exit tickets following toolkit lessons, and a student advisory group in Year 3. CFA used student feedback to reevaluate and revise the project design at key points.

Mediators

The logic model specifies several factors that **mediate the relationship** of these project components with student and systemwide outcomes. The first set includes increased educator awareness and knowledge of these pathways, shared responsibility for advising across the high school and community college systems, and stronger advising. The second set involves increased student interest in CS/Cy careers, understanding of the educational pathways to enter them, and enrollment and persistence in these courses. These mediators, in turn, would lead to short/medium-term student outcomes such as increased CS/Cy credit and certificate attainment and dual credit in English or math. Long-term outcomes include high school graduation, continued postsecondary education in CS/Cy, and entry into STEM careers. At a systems level, the project aimed to improve alignment in student advising across high school and community colleges.

Short- and Long-Term Outcomes

The ultimate goal of the CCP project was to increase the number of students enrolling in and successfully completing the core coursework required for IT and cyber certifications and degrees: CS/Cy courses and dual enrollment coursework in English and/or math. The project also sought to make lasting improvements to the alignment between high school and community college CS/Cy pathway offerings and advising through increased collaboration between these institutions.

Study Timeline, Research Questions, and Data Sources

SRI's study began in early 2020, at the beginning of the CCP project. Throughout the project, the SRI research team met monthly with the project team to learn about the evolution of the project design and implementation, discuss implementation challenges and successes, and define implementation fidelity metrics and thresholds. The project was awarded in late 2019, and CFA held the initial kickoff meeting with partners in January 2020. Toolkit development began in early 2020. The project involved two pilot years of the toolkit and then a toolkit implementation year during which CFA also piloted the near-peer mentor program. SRI's evaluation focused on implementation fidelity and project impact on student outcomes on the three full implementation years of the study, beginning in the 2022–23 school year and continuing through 2024–25 (Exhibit 4).

Exhibit 4. Timeline of CCP project key components

Development and Pilot Years			Implementation Years		
Year 1* 2019–20	**Year 2 2020–21**	**Year 3 2021–22**	**Year 1 2022–23**	**Year 2 2023–24**	**Year 3 2024–25**
Toolkit development	Toolkit pilot (limited to two high schools)	Toolkit pilot	Toolkit implementation Near-peer mentor pilot Student voice survey and toolkit exit tickets	Student-directed design process implementation	Student voice survey
Co-advising activities (ongoing)					

*Project launch in January 2020

SRI's evaluation was designed to address research questions related to both implementation and impact.

Implementation Research Questions

1. To what extent was CCP implemented with fidelity?
2. What contextual barriers or facilitators impeded or enhanced implementation?
3. What lessons emerged from CFA's implementation of the project that could inform successful implementation of other secondary school career planning initiatives?

Impact Research Questions

4. What was the impact of CCP on dual enrollment credit attainment for high-school students?

5. What was the impact of CCP on computer science credit attainment for high-school students?
6. What was the impact of CCP on graduation status for high school students?

The study data sources, described below, enabled SRI to measure fidelity of implementation and estimated impact and to describe the project implementation and lessons learned.

Document Review. The project team at CFA provided SRI with access to CCP resources, including the JFF's co-advising framework, the Career Connected Toolkit units, the "See Me" student survey instrument and aggregate student responses, and meeting agenda and materials for convenings that the SRI researchers did not attend and observe.

Convening Observation. SRI researchers attended and observed several project convenings, both during the initial development and pilot years and during the project implementation phase. Researchers observed six events during the initial development year (2020–21), including two trainings to introduce a co-advising framework to guide collaboration, two workshops to support local design of the near-peer mentoring program, and two trainings on the Career Connected Toolkit for two pilot schools. In the subsequent pilot year, SRI researchers observed 12 events, including an initiative-wide fall convening and industry speed date, three Career Connected Toolkit training sessions for implementing teachers, three near-peer mentoring workshops, and four work-sessions to support implementation of co-advising activities. During the project implementation years, SRI researchers observed one initiative-wide convening in Year 2 and five focus groups in Year 3 led by CFA in which local partners were asked to reflect on their experiences, learnings, and successes in supporting students with education and career planning. Across all years, all observed events except one were virtual.

Student and School Administrative Data. SRI established data sharing agreements with the project districts, enabling the research team to receive student- and school-level data to estimate the CCP project's impact on student outcomes.

Toolkit Log. SRI developed an electronic form for educators implementing the Career Connected Toolkit units to record details about their use of the units. SRI sent the form to educators each month during the second pilot year and first implementation year.

Interviews. In spring 2025, the SRI research team conducted interviews on project implementation and perceived outcomes. These included four interviews with project staff at CFA and Lead Local, four interviews with school-level educators such as principals or teachers, one interview with partner district staff, and three interviews with community college partners. These interviews focused on the challenges and successes of the project related to career exploration and planning and expanded course offerings and enrollments.

To measure implementation fidelity, SRI developed metrics and defined implementation thresholds in collaboration with CFA for each of the four key components of the model. The research team examined project schedules, attendance records, and documents related to project participation of the 12 CCP schools. These data enabled the team to determine whether the implementation thresholds were met each year. To estimate the impact of the CCP project on student outcomes, the team collected student-level data from the eight CCP districts and used a within-district comparison design.

Implementation Fidelity and Impact Study Findings

SRI's independent evaluation of the CCP project measured the fidelity with which the project model was implemented and estimated the impact of the project on student outcomes.

Implementation Fidelity Findings

SRI collaborated with CCP project staff to identify indicators and thresholds for adequate implementation of CCP's three key components during the first three years of project implementation, the 2022–23 through 2024–25 school years. The thresholds set represent the hypothesized level of implementation that would ultimately result in the improved student outcomes specified in the logic model (Exhibit 5).

Across the project's four key components, SRI found that the project implementation met fidelity criteria only twice: for the toolkit implementation in Year 1 and the student-directed design process in Year 2, the only years for which SRI measured these components. Project implementation did not meet fidelity for either of the other two key components in any year. It did not meet fidelity for co-advising development in any of the three relevant implementation years and did not meet the implementation threshold for student voice in either of the two relevant implementation years.

Co-Advising Development. SRI identified two indicators for co-advising development during the first implementation year: (1) partner attendance at two CCP events each year and (2) number of CFA office hours and work session offerings. In the second and third implementation years, the co-advising development metric was based on partner event attendance only.

- To meet fidelity for **CCP event attendance**, a school needed a high school educator (e.g., teacher or counselor), a high school or school district administrator, and a representative from the partner community college to attend each event.
- To meet fidelity for **CFA offerings**, CFA needed to offer four **office hours or work sessions** to the CCP community in the first year.

Career Connected Toolkit. Each school was expected to develop a plan for implementing the Career Connected Toolkit lessons for 10th graders. To meet fidelity, a school needed to develop and share a toolkit implementation plan with CFA at the beginning of the first implementation year (2022–23).

Exhibit 5. Implementation fidelity metrics and thresholds

Key Component	Year 1 (2022/23)	Year 2 (2023/24)	Year 3 (2024/25
Co-Advising Development			
CCP event attendance	75% of CCP schools meet both breadth and depth thresholds for attendance at two events each year. **Breadth:** At least 1 educator from the high school and their community college partner attend **Depth:** At least 1 educator from the high school and the high school's district office attend		
CFA offerings	CFA holds four optional office hours and work sessions	NA	NA
Career Connected Toolkit	75% of CCP schools submitted toolkit implementation plan	NA	NA
Student-Directed Design Process	NA	• 75% of schools participated in orientation meeting • 75% of schools submitted design process plan	NA
Student Voice	75% of schools have at least 20 student survey respondents per school	NA	75% of schools have at least 20 student survey respondents per school

Student-Directed Design Process. As an extension of co-advising, high school and community college educators were asked to engage 11th-grade students in a collaborative design process that culminated in a career planning resource for students at their school. To meet fidelity, a school needed to create and share an implementation plan for this design process with CFA at the beginning of the second implementation year (2023–24) and participate in a kickoff meeting with the CFA project manager.

Student Voice. To capture student voice, schools collected feedback and input from students through surveys once during 10th grade and once at the end of 12th grade. To meet fidelity, at least 20 students at each school needed to complete a survey.

For indicators measured at the school level, to meet fidelity at the project level, 75% of high schools needed to meet fidelity for a given metric.

The CCP project met fidelity for the Career Connected Toolkit and student-directed design process, both of which were based on plan submission. The project did not meet fidelity thresholds for co-advising development or student voice (Exhibit 6). Most schools (83%) created a Career Connected Toolkit implementation plan and submitted a plan for the student-directed design process as well as attended a kickoff meeting for the process (also 83%). For co-advising development, CFA met fidelity for project offerings in Year 1 (optional office hours and work sessions), but few schools had the breadth and depth of participation in CCP events identified as necessary for effective collaboration and co-advising. For example, in Year 1 only three high schools had a high school educator, school district or high school administrator, and a community college partner at both events. Attendance at CCP events was higher in Year 3, but the project still did not meet the fidelity threshold for co-advising in the final year because of low participation of district staff (see Appendix A for additional details on event attendance by year). For student voice, even though survey participation improved over time, with 42% of high schools meeting fidelity in Year 1 and 67% of schools meeting fidelity in Year 3, the project still fell short of the threshold for meeting fidelity.

Exhibit 6. CCP component-level implementation fidelity by year

Key Component	Year 1 (2022–23)	Year 2 (2023–24)	Year 3 (2024–25)
Co-Advising Development	Did not meet	Did not meet	Did not meet
Career Connected Toolkit	Met	N/A	N/A
Student-Directed Design Process	N/A	Met	N/A
Student Voice	Did not meet	N/A	Did not meet

Impact Study Findings

SRI's analysis of the impact of the CCP project on student outcomes found no evidence that students at CCP schools had stronger outcomes than their peers. This finding is based on the project implemented with lower than planned levels of fidelity, as reflected in the implementation fidelity findings above. Because the CCP project was designed to motivate high school completion and attainment of computer science as well as college credit while in high school, SRI examined three end-of-high-school student outcomes: high school graduation, computer science credit attainment, and dual credit attainment in English, math, or computer science while in high school (Exhibit 7).

Exhibit 7. Student outcomes examined in impact study

Student Outcome	Definition
Graduation	Earned a regular high school diploma within four years of starting high school (i.e., by summer 2025 for the study cohort).
College credit	Earned college credit in English, math, or computer science during the 2023–24 or 2024–25 school years (i.e., the expected 11th- and 12th-grade years for the study cohort) through a dual enrollment course.
Computer science credit	Earned credit in a computer science, networking, or cybersecurity course during the 2023–24 or 2024–25 school years (i.e., the expected 11th- and 12th-grade years for the study cohort). Includes credit in any course type, including career and technical education (CTE), Advanced Placement (AP), and dual enrollment.

Sample and Setting

The SRI research team examined outcomes for the cohort of high school students who entered ninth grade in 2021–22 and were enrolled at a study school in 2022–23. This corresponds to the cohort of expected 10th graders during the first year of toolkit implementation. The team compared outcomes for students in the 12 CCP schools to those of students in 23 comparison schools in the same districts. To construct the analytic sample, the team excluded specialty schools such as alternative schools, magnet schools, STEM schools, designated career and technical education (CTE) high schools, and schools that were high-performing relative to the CCP schools. The team excluded students who were missing ninth-grade baseline data and students who transferred out of the district, suggesting that they continued their high school education elsewhere, but their final graduation or credit status is unknown. The majority of students in the analytic sample (73%) were Hispanic. Ten percent were designated as English learners and 11% as special education students. More information about the sample and setting is available in Appendix B.

Baseline Equivalence

The final analytic sample of CCP students had slightly lower mean unweighted ninth-grade GPAs than comparison students did—the baseline prior achievement measure identified for the study (Exhibit 8). The CCP and comparison samples were similar in their demographic composition, including the percentage of students designated as English learners. CCP students were slightly more likely than comparison students to be Hispanic. Because differences in prior achievement and demographic composition on the predefined key variables were less than 0.25 standard deviations, the SRI research team did not apply any additional matching or weighting techniques to make the CCP and comparison samples equivalent, although the team did include these variables in the final analytic models.

Exhibit 8. Baseline descriptives for the analytic sample (2021–22)

Characteristic	CCP	Comparison	Difference	Standardized Difference	Sig.
School *n*	12	23			
Student *n*	4730	8496			
Prior achievement					
Mean ninth-grade GPA (unweighted)	2.42	2.54	-0.12	-0.12	***
Standard deviation	(0.98)	(0.99)			
Ninth-grade ACT Aspire scores (standardized)	-0.04	0.02	-0.06	-0.06	***
Standard deviation	0.85	0.96			
Ninth-grade math					
Advanced ninth-grade math	11%	15%	-4%	-0.21	***
Basic ninth-grade math	86%	83%	3%	0.15	***

Characteristic	CCP	Comparison	Difference	Standardized Difference	Sig.
Demographics					
Female	47%	49%	-2%	-0.05	
English learner	10%	10%	-1%	-0.05	
Special education	12%	11%	1%	0.06	
Black	3%	7%	-4%	-0.52	***
Hispanic	76%	72%	5%	0.14	***
White	15%	14%	1%	0.03	

Source: District-provided student data.
***$p < .001$.

Analytic Model

The SRI research team estimated the impact of CCP on student outcomes using a two-level hierarchical linear model in which students are nested within schools. The model accounts for the student baseline demographic characteristics in Exhibit 8 as well as ninth-grade unweighted GPA and a binary variable indicating advanced math course-taking in ninth grade. The team also included several school-level covariates: mean ninth-grade ACT Aspire score; percentage of students eligible for free or reduced-price meals; and three binary indicators for baseline course offerings in computer science, dual enrollment English, or dual enrollment math. Finally, the team included a binary district block indicator.[1] The team also conducted a sensitivity analysis using the ninth-grade ACT Aspire scores as a measure of prior achievement in lieu of ninth-grade unweighted GPA, with similar results. More details on the models, including full results, are available in Appendix B.

Project Implementation

The CCP project launched in early 2020, with a kickoff meeting with partners in January 2020 and the intention to co-develop the toolkit that spring and pilot it during the following school year. These efforts had to be delayed or reimagined in April when the threat to public health posed by the COVID-19 pandemic shifted instruction online for most of the state's K–12 schools. Launching the project during a global pandemic had profound effects on implementation. School districts were left with little capacity to engage with outside partners and try out new practices as they first scrambled to shift instruction online and then focused on resocializing students to the classroom when in-person instruction resumed.

CFA initiated the project with plans to engage 24 high schools across 12 school districts in the state. Several district partners that had expressed interest in the project during the proposal phase did not participate once the project was funded. For those that did, district staff were

[1] Two districts contained a single treatment school each with no comparison schools. Each of these single treatment schools was blocked with schools in another district with high schools that had similar graduation rates in 2021–22.

preoccupied with other efforts such as student connectivity to access online course platforms and teacher professional development related to online learning, limiting their ability to engage with CCP. One CCP project leader described the unprecedented challenges faced by schools during the pandemic, and by extension implementing with school partners:

> Even though I've worked with teachers and developed curriculum and all kinds of stuff for years and years, I don't think that I realized the types of pressure that that kind of remote learning … COVID was not a small thing or a simple thing. That shift just threw everyone and everything that they understood out the window.

In several school districts, primary involvement with CCP was limited to an individual teacher or counselor, without the support and coordination of a district-level administrator. This limited capacity persisted into the 2021–22 school year, as schools and districts worked to address the lingering academic and mental health challenges resulting from the prolonged disruption to instruction.

For the purposes of the project evaluation, the CCP project's full implementation was originally slated to begin in 2021–22 with toolkit implementation in 10th-grade classrooms. Because of the challenges in engaging educators with the project in the 2021–22 school year, project staff applied for a project extension with the U.S. Department of Education. The extension enabled the SRI research team to treat the 2021–22 school year as a second pilot year, focusing the implementation fidelity and impact study on the 2022–23 through 2024–25 school years when the repercussions of extended online learning had abated somewhat.

Partner Engagement and Co-Development

One foundational challenge the CCP project encountered was keeping high schools engaged. By the first year of full implementation, 12 schools across eight districts remained, a significant reduction from the original plan. One district with three participating high schools left the project after the 2021–22 school year. Other districts had fewer high schools participate than originally proposed. The original proposal for 24 high schools was driven by the number of schools needed for robust statistical power in the impact evaluation and was higher than CFA had initially envisioned when designing the project. Given the additional challenges presented to schools by the pandemic, one project leader noted that it was tough to keep even 12 high schools engaged in the work. CFA used a variety of strategies to engage schools and educators in the work, with varying levels of success.

Having a local champion for the work was key. One educator at a school that started a new computer science program at the beginning of the project described how pivotal site leadership was for the project. He explained, "A lot of it has to do with leadership at a school. Having the right principal that has the right mindset to be able to see the imagination of what can happen and then be willing to go down that road."

Aligning the project with local needs and goals can facilitate uptake. Reflecting on strategies to keep partners engaged, one project leader noted the importance of understanding partners' needs and goals. He noted that "CFA has a deep understanding of the individual partners from their goal standpoint," which enabled CFA to say to partners, "I see how this could connect into goals that you have." This sentiment—that CFA understood partners' needs and was effective at connecting them with the resources and connections they needed to meet those needs—came up in multiple partner interviews. Another project leader explained how connecting the project to the Arizona ECAP requirement was an intentional strategy to link to an existing school need, pitching it as "just providing additional strength to what they're already executing on their campus around career pathways."

Educators did not want to be involved in co-designing the project, limiting the effectiveness of this strategy to engage partners and potentially limiting their understanding and implementation of the project as well. Another planned strategy for engaging partners—involving them in collaboration and co-design—proved unsuccessful. CFA and Lead Local had planned to co-develop the toolkit with educators, and the co-advising component of the project was based on a collaborative framework. Further, CFA planned pilot years for the toolkit and for what became the student-directed design process but was envisioned as a mentoring program in the original project design. CFA expected the pilot to be a way to engage partners and elevate educator voice but found that most school administrators and educators did not want to be involved in development. One project leader explained,

> We designed a pilot wanting to engage schools to get their feedback, but what really surprised me is that a lot of the schools just … didn't want to be involved in development aspect of it, or maybe with the pandemic just couldn't find the time … it was, "just give us, just tell us what we need to do."

In the end, the project relied on a small group of engaged partners to develop these components. The lack of involvement of a wider group of educators in co-design and development during the pilot years may have hindered implementation, as broader engagement could have led to a deeper understanding of the toolkit in particular.

Initial Implementation Year: 2022–23

The first year of the CCP project focused on fostering co-advising development among the 12 high school and seven community college partners and supporting delivery of the Career Connected Toolkit to 10th graders. The project also gathered student feedback through exit tickets and surveys and used these data to reshape one original project component.

Co-Advising Development

To support co-advising, CFA hosted initiative-wide events that brought together all partners to plan and build capacity for CCP implementation, as well as provided structures to support regional collaboration between high schools and their local community college partners. These activities included the two convenings and the work sessions CFA offered that factor into the implementation of fidelity metrics. CFA also held partner check-ins in early 2022 and at the end of the school year.

At the first full CCP convening in August 2022, CFA high school and community college partners worked in regional groups to create a two-year plan for how current 10th-grade students could accumulate nine college credit hours in math, English, or computer science by 2025. These plans were also supposed to identify one dual enrollment course for increased enrollment and identify potential community engagement activities to increase student and family interest in CS/Cy pathways and dual enrollment. The second convening CFA held was an industry speed date event in September that brought together industry professionals and partners and students to build their knowledge of CS/Cy career fields. The CCP project did not meet fidelity because high schools did not have broad representation of stakeholders including high school educators, district administrations, and community college educators at either event. For example, only 42% of high schools had both a district or high school administrator and an educator at the industry speed date.

In November 2022, CFA hosted an optional initiative-wide co-advising work session for all regional partners, to provide a forum for specifying goals related to the two-year plan from the August convening. CFA initially planned a second initiative-wide co-advising work session but shifted to hosting virtual open office hours starting in February 2023 to provide technical assistance to partners on furthering the goals identified during the November session. In part, CFA made the shift from a large co-advising convening to open office hours because each set of high school and community college partners needed specific and unique support and planning time. The majority of CCP high schools took advantage of this support, with staff from eight of the 12 high schools attending at least one of the co-advising sessions or office hours. However, only half of high schools attended a session where their community college partner was also present.

Finally, CFA hosted mid-year and end-of-year partner check-ins with high school and community college partners. All high schools except one had a participant attend both check-in activities, and four of the seven community colleges attended the mid-year check-in. For the end-of-year check in, CFA presented data from students and educators to support reflection and inform the implementation for the following year.

Career Connected Toolkit

To launch the toolkit for the first full implementation year, CFA offered professional development on the toolkit and asked each high school to submit a toolkit implementation plan at the beginning of the year. A total of 42 staff from 11 high schools attended the toolkit training, and 10 high schools submitted toolkit implementation plans specifying how the toolkit would be implemented. The training framed the purpose of the toolkit activities, introduced teachers to the toolkit activities, and asked teachers to begin thinking about how to integrate the activities into their courses. However, the project encountered stronger resistance than expected from educators to integrating the toolkit units into their courses. As one project leader noted, "The big challenge that we faced with the toolkit was that teachers didn't want it in their classrooms … If they weren't computer science teachers, they didn't think it was their job to implement the toolkit."

The toolkit log, sent monthly to educators over six months during the 2022–23 school year, provides insight into educators' impressions and use of the toolkit activities. The log was sent to 27 teachers and 19 counselors or other school staff responsible for implementing toolkit units, with an average response rate of 64% across the six months. On average, educators reported they were satisfied with the toolkit materials and agreed the toolkit increased their awareness of CS/Cy careers. One educator commented on how helpful it was to have community college students come to the classroom to work through a toolkit unit, although this was not common practice. In other comments, educators noted the high quality of the materials, including feedback that "everything in the toolkit is doable and necessary." Educators' reports of how the toolkit impacted their students' interest in CS/Cy careers and awareness of college credit opportunities were slightly lower but still positive, falling between "somewhat agree" and "agree." Despite these high average ratings, some educators reported trouble accessing the resources or expressed concerns that the materials were too general and not interesting to students. For example, one educator commented that the "tools are not specific enough to help students understand what they would learn in an IT/Cyber program." Another wrote, "Most of the tools do not look interesting to 10th graders."

Despite these misgivings and the reported resistance to teaching toolkit units, the log suggests that the majority of 10th graders in CCP schools were exposed to content from at least one toolkit lesson. Most log respondents (79%) reported implementing at least one toolkit activity, reaching approximately 4,041 tenth graders or an estimated 67% of the 10th-grade students in the study cohort. The *Awareness* unit "What Is Cyber?" was the most commonly offered unit, implemented in a total of 87 classes. On average, educators reported leading 2.5 different toolkit units with slightly more than four classes. Fewer than a third (31%) of educators reported leading four or more toolkit units. Toolkit units were most commonly offered in math courses, as planned, but were also implemented in science or computer science courses or during advisory. In January, as counselors prepared students to select their 11th-grade courses, toolkit units were most commonly used in other forums, such as presentations for 10th graders at student assemblies using the *Awareness Advising* unit "College in High School."

Project leaders had several reflections on toolkit rollout. One leader noted that they needed to do a better job of building understanding of the toolkit among educators and showing how it would benefit students. She commented,

> There wasn't this lack of buy-in for the grant, the theory of the grant, the idea that it would be good for more students to take computer science courses and good to have more computer science opportunities in our school. I don't think the teachers were

> resistant to that, but I think it was … the connection of the toolkit [to these goals] that we might have approached differently.

Another project leader noted that having a better understanding of what educators were doing before introducing the toolkit might have facilitated greater traction. She noted, “If I were to replicate this at another high school, I would start with data at the center. So, understanding, what is it that students want? What do they need?”

Reflecting on the toolkit rollout, one project leader wondered if a more prescriptive approach that took into account the needs and constraints of educators might have been more effective. The project left it entirely up to individual teachers to determine which units to offer and when to offer them. Without the understanding of the toolkit goals that would have been built through the development process, some educators were resistant to using the units. Learning about the educators’ schedule and curricular constraints, and then defining a scope and sequence for implementing the toolkit units based on this information, might have resulted in greater uptake and fidelity to the model.

Student Voice

CFA supported schools in collecting feedback on their experiences with career guidance and planning to shape CCP project design and implementation. In Year 1, CFA provided educators implementing the toolkit with a short exit ticket for students to fill out following each unit and with an end-of-year “See Me” student survey for 10th-grade students. The exit tickets asked students whether the unit activities increased their knowledge of and interest in computer literacy, IT careers, and dual enrollment, as well as their beliefs about the importance of developing their computer science and technology-related skills. The exit tickets also included an open-ended question asking students how the unit might be improved. The See Me survey was designed to gather broader feedback from students on their participation in and satisfaction with career connected learning activities (e.g., guest speakers, career fairs, CTE course), interest and self-efficacy in dual enrollment and computer science courses, perceptions of the usefulness of cybersecurity, and plans immediately after high school and hopes for the future. The survey also included an open-ended question for students to share additional comments about their experiences with career-connected learning.

The student input was pivotal to how the project evolved, driving, for example, the redesign of the near-peer mentoring program as described below. Fundamentally, these data prompted CCP project leaders to rethink what they were doing. As one project leader explained,

> Because of the student voice data, I was like, wait a minute, we’re doing this backwards. We shouldn’t start with the adults in the system and the collaboration opportunities to drive student action. We need to start with the students … elevating student voice and providing opportunities for students to drive their own ECAP process.

Near-Peer Mentoring Pilot and Redesign

In addition to implementing three of the project's key components during the 2022–23 school year (co-advising development, the toolkit, and student voice), CFA also piloted one of the original project components, near-peer mentoring. CFA chose the original near-peer mentoring program design because of research linking the approach to student success. The plan was for community colleges to hire and train college students as mentors who would support high school students to persist in 11th- and 12th-grade computer science courses. These mentors would attend computer science courses at the partner high school twice each semester. Because the colleges would hire college students with similar backgrounds as the high-need students in the CCP schools, the mentors would model a pathway forward, supporting motivation and persistence through academic challenges.

The near-peer mentoring pilot in 2022–23 revealed unexpected challenges in recruiting and scheduling community college mentors, which prompted CFA to redesign this project component. Although the mentor positions were paid, these positions did not offer enough hours to replace the need for other employment. Further, college students' combination of classes, family commitments, and other employment meant they were not available for visits to schools during the school day at varying hours. Given the number of challenges, one project leader reflected that she wished they had piloted the program earlier. CFA redesigned this component using the student feedback gathered through the project's student voice component.

Rather than the intended model of one or two community college mentors pushing into high school classrooms to support CS/Cy career-related activities, CFA proposed a student-directed design process. Small groups of high school students would engage in a structured design process to create an "advancement plan" showing high school students the possible pathways of nine dual credits and industry certifications they could earn and how they could leverage them after graduation. The redesign of this 11th-grade project component was guided by data from the See Me surveys and Career Connected Toolkit exit ticket discussed above. Based on the open-text responses, students experienced career exploration, including the toolkit modules, as disconnected. They requested more coherent guidance in creating their postsecondary plans. The project manager envisioned a process that would provide students with a role in shaping their school's career support. She modeled this on her observation of a design thinking challenge led by a team from the Arizona State University (ASU) with a cohort of high school students.

Implementation Years 2 and 3: 2023–24 and 2024–25

In Years 2 and 3, CFA provided continued support for co-advising and collaboration between high schools and their community college partners to foster student success. The CCP project directed community college and high school partners to collaborate on identifying and implementing co-advising activities based on their local assets and needs, including launching a student-directed design process in 2023–24. CFA also continued the student voice component with a survey of 12th graders in spring 2025.

Co-Advising Development

To support co-advising, CFA's focus on co-advising continued through annual partner convenings (Exhibit 9) and offering optional co-advising work sessions.

Exhibit 9. Co-advising activities in Implementation Years 2 and 3

School Year	Event 1	Event 2	Additional Events
2023–24	Fall convening *September 2023*	EIR Open House, mid-year reflection *February 2024*	
2024–25	Beginning-of-year partner check-ins (in lieu of convening) *August 2024*	End-of-project celebration *May 2025*	Optional co-advising sessions (3) *September/October 2025* Co-advising focus groups *February 2025*

At the beginning of Year 2, CFA hosted a fall convening that introduced partners to resources to inform the design of co-advising activities. These included state dual enrollment and workforce data exploration tools available through the ASU Decision Theatre to identify local dual enrollment and workforce trends and alignment, and opportunities for developing educator and student cybersecurity knowledge and skill through hands-on bootcamps offered by AZCyber. The first event also included regional breakout groups of community college, school district, and high school educators to introduce and begin the planning process of the student-directed design process.

A mid-year EIR Open House event served as a reflection and check-on-progress for CCP for Year 2. The overall purpose of the event was to pause from doing project activities and explore the impact of those activities on students, teachers, and systems. The main objectives of the day were to (1) gather stories about the impact of the grant activities on educators, students, and systems through a prism of systems change; (2) dig deeper into the co-advising framework; and (3) look for connections between the grant activities and the Arizona ECAP process. Participants also role-played as high school students, analyzed data, viewed student photos, and shared stories about the impact and outcomes at their individual campuses. The event allowed for networking and collaboration across participating school systems and community colleges.

In Year 3, CFA held partner check-ins at the beginning of the year to discuss and plan the upcoming school year. Throughout the year, CFA hosted optional co-advising sessions to support partner planning, with session content driven by participant need. Staff from 10 of the 12 high schools and five of the seven community colleges attended at least one co-advising session. In addition, CFA led five focus groups, most clustered by region (i.e., community college with high school partners), asking local partners to reflect on their experiences, learnings, and successes in supporting students with education and career planning. In May, CFA hosted a culminating event to bring all partners together to celebrate progress and reflect on learnings from their collective work to support student engagement in education and career planning, dual enrollment, and computer science. As part of centering student voice, high school students were invited and presented to the group on the value, impact, and areas of improvement related to career development opportunities for students.

Student-Directed Design Process

In addition to the collaboration related to dual enrollment and student pathways, the CCP project also asked high school and community college partners to engage students in a design process to create career planning resources for their schools.

At the beginning of 2022–23, CFA hosted kickoff meetings with each high school to introduce the student-directed design process. CFA also provided templates and resources to support schools with the design process and set the expectation that each high school would create an implementation plan. Each high school leadership team was expected to schedule six sessions, each corresponding to approximately one class period, with a group of 11th-grade students to guide them through a design thinking process (Exhibit 10). The goal of these sessions was for students to explore career fields and design a career advancement pathway. Additionally, rather than hosting a series of open office hours throughout the school year (as CFA did in 2022–23), CFA held a single session in September and then joined in the many planning meetings around implementing student-directed design process that participating high schools held.

Exhibit 10. Phases of the CCP student-directed design process

Phase 0: Overview	Phase 1: Discovery	Phase 2: Interpretation	Phase 3: Ideation	Phase 4: Experimentation	Phase 5: Evolution
Overview of Design Process	Students select the career fields for their advancement pathway design	Industry Speed Date Students interview experts from the field such as dual enrollment advisors, CTE industry professionals, community college students	College 101 Field trip to partner community college	Pitch the Path Students select and design how they will Pitch the Path they've designed	Debrief Students plan next steps

High schools were encouraged to tailor the student-directed design process to their students and school context. CFA emphasized the power in leveraging partner schools' preexisting career-focused events or programs and incorporating them into the student-directed design process rather than trying to create all new content. For example, at many CCP schools, one phase of the student-directed design process involved industry speed dates for students or activities in which students interview experts or industry professionals. In interviews, teachers were enthusiastic about these activities, such as the industry speed dates at which students asked questions of industry professionals and college advisors from a local community college. For example, one teacher described the value of the college field trip for his students:

> Last year, we actually took a field trip to [community college] on the east campus where our kids were able to go through a like a boot camp, a super cyber boot camp … I think that was huge. I don't know how many of my kids have ever been to east campus before. So being able to have them get on campus and see the computer program or the cybersecurity program that they have was huge … it was really like a first time that they got to see outside of the high school where this could get them.

Most schools (10 of 12) implemented the student-directed design process. CFA attributed the lack of engagement from two schools to major changes in school leadership. Of the 10 schools that implemented the student-directed design process, there was a drop in the implementation in the final phase, with two schools not completing Phase 5.

In the final implementation year, schools spent their remaining funds in a variety of ways, guided by the student-directed design process from the prior year. Supports for 12th graders varied by school and included continued career exploration opportunities and strengthened advising about the high school and college course pathways. Many schools included some form of support for postsecondary planning, such as hosting postsecondary planning workshops for seniors, revitalizing an existing college and career meeting and student center, piloting career planning conversations with STEM club students, and bringing students to a career fair. In addition, a handful of schools planned trips or hands-on experiences for students. For example, three schools created a simulation help desk for students to learn how to provide IT support. A few schools also focused on supporting dual enrollment access through varying means, including promoting a math bootcamp to ensure readiness to access the dual enrollment curriculum and supporting students in the dual enrollment course application process. As one teacher described, "I think the amount that we were able to receive, and what we were able to do with it has just been very powerful."

The CCP project's prioritization of student voice and commitment to student-directed design and supporting local goals was an important factor in enabling some schools to offer these powerful opportunities to a subset of 12th-grade students in Year 3. The project's flexibility can be viewed as supporting adaptation as a way to facilitate adoption (Morel et al., 2019). Without a clear set of core design principles that guide these experiences, however, it is difficult to assess whether the local adaptations enhanced or weakened the project's impact—in other words, whether they were productive adaptation of CFA's original model (Debarger et al., 2013).

Student Voice

In Year 3, CFA convened a student advisory group and provided high schools with a survey for 12th graders focused on their use of education and career planning. The survey asked students to rate their level of use of 20 career planning activities, including developing a college and career plan, meeting with an advisor to discuss post-graduation options, mapping out a course transferability plan, participating in labor market exploration, and enrolling in dual enrollment and CTE courses. The survey also asked students about their plans after high school and their hopes for the future, as well as whether they completed dual enrollment, CTE, or work-based learning opportunities. In addition to collecting feedback through this survey, CFA convened a student advisory group consisting of seven students, which met six times in March through April to reflect on their experiences with career-connected learning activities and participate in guided data analysis of the 12th-grade student and educator surveys. Students shared their findings and insights at the final May end-of-year celebration.

Project Impacts on Schools and Systems

The CCP project's co-advising development component focused on systems change, both to improve the guidance students receive in navigating educational pathways to CS/Cy careers and to build the robustness of the pathways themselves through increased computer science and dual enrollment offerings. Interview data point to some of the challenges in expanding and sustaining dual enrollment and computer science offerings as well as some of the project's successes in this area.

Dual Enrollment Offerings

The main barriers to expanding dual enrollment were related to high school staffing and the logistics of working across two education systems. Staffing was a challenge because community colleges in Arizona typically only accept a high school teacher with a discipline-specific master's degree to offer a course for college credit. Rural schools in particular struggled to find staff with these qualifications, and even some nonrural schools struggled to continue these offerings when a qualified teacher left. One district tried to offer college credit to high school students by having college instructors come to the high school, but found the college and high schools schedule did not align. The challenge of working across secondary school and community college systems was more profound in other places. Project leaders noted that some community college staff did not want to take responsibility for dual enrollment: "The real struggle was to get buy in from some of the dual enrollment staff. Nobody saw it as their job. Nobody really wanted to claim it, even though there was this [grant] commitment."

Despite these challenges, project leaders thought the work resulted in logistical improvements such as streamlined registration processes for dual enrollment in some sites as well as more systems-level improvements. One school was able to expand access to dual enrollment without expanding course offerings by using grant funds to pay for the college enrollment fee. A teacher explained that "because we put such a huge awareness and assistance on getting enrolled, that's the biggest piece we were able to increase." Importantly, one project leader thought that project had been successful in building a foundation for more intentional dual enrollment offerings in the CCP schools, with schools attending to the courses that would count toward a degree or credential rather than determining offerings based on teacher availability. She remarked, “We’ve shifted how dual enrollment is perceived on campuses and [are] really seeing it as more a programmatic approach versus just seeing it as a course that’s offered because a certain teacher is qualified.” Finally, another project leader viewed the connections made between high school and community college partners as one of the greatest successes of the grant.

Computer Science Offerings

Expanding CS/Cy course offerings was another CCP project goal. At the beginning of the implementation period, the 12 CCP schools were slightly more likely to offer at least one computer science course than the comparison schools were (83% of CCP schools compared with 74% of comparison schools; see Exhibit B1 in Appendix B). This trend makes sense given that schools with existing computer science offerings may have been more receptive to participating in a project aimed at building CS/Cy pathways. The project supported the establishment of new CS/Cy pathways at least three schools, but as with the dual enrollment offerings, staffing was a challenge for greater expansion. One high school brought in a new teacher to start a cybersecurity program in 2020–21, at the beginning of the grant, and two more schools added programs in 2023–24. As one computer science teacher explained, “The computer classes would not exist in the form they do [without the grant]. It made a lot of lasting impressions.” As with dual enrollment offerings, however, some computer science offerings were highly dependent on a single teacher. For example, one high school developed a computer science program unlikely to be sustained past the end of the grant because of a teacher departure. As one project leader explained,

> The really effective computer science program that was developed is going away, and it’s all because … [the teacher] is retiring and they haven’t replaced him with anybody … the teacher there feels that because of the EIR grant he was able to create that course that provided six college credits and pull in a lot of cyber content into that course.

One lesson of the CCP project is that sustaining these programs requires commitment from school and district leaders, not just teachers. One project leader described how she saw computer science teachers get excited about the project but noted that “even though we tried to not make it anchored in those people, that’s really just how the high school systems are set up.” Another leader identified the need for district and school leaders to develop staffing plans to guarantee access to both dual enrollment and computer science course offerings: “What are the guarantees that we’re going to provide our students, are we going to offer long term a computer science program … or set of dual enrollment courses?” One strategy that emerged for developing this kinds of commitment was through student voice data.

Data Capacity and Student Voice

CCP project leaders credited the grant with building their knowledge and understanding of both research and evaluation and of the power of student voice.

One unexpected benefit of the grant for CFA was the elevation of data and student voice within the organization. As one project leader explained,

> The work that we have done to elevate student voice in all of this process has been significant success. And that has really permeated our pathways work outside of the EIR project. I see our project managers talking about that more. In fact, I am going into meetings. with that top of mind and being able to say, "Here's work that we have done to hear from students. And how are we going to be responsive? How are we going to put students at the center of this work?"

Gathering input from students began as a way to improve project design, but elevating student voice soon emerged as a core project strategy to drive deeper collaboration. As the project encountered resistance from partners, either to changing dual enrollment practices or to adopting project components, student voice proved to be the most powerful lever for overcoming it. One project leader described the power of "getting students to tell the adults what's really happening in their worlds and then just constantly driving towards people to think about the student experience." Another project lead noted that "when we saw that when students started to feel like they had agency like they had a voice, and they felt comfortable asking for help. That's where we started to see more adult collaboration around what students asked for."

Conclusion

The CCP project unfolded within the difficult implementation context of the COVID-19 pandemic. The project encountered challenges in engaging districts and educators in co-developing the project, hindering implementation. The project did not meet the majority of implementation fidelity thresholds, and the impact study showed no significant impacts of the project as implemented on the hypothesized student outcomes.

Nonetheless, educators, administrators, and project leaders pointed to numerous positive impacts of the grant in providing new opportunities for students, improving collaboration between some high school and community college partners, and building organizational capacity. From the perspective of CFA, the lead organization, the CCP project expanded organizational capacity related to research and data use. CFA strengthened its ability to use data for continuous improvement and to elevate student voice as a driver of design and decision-making. In addition, several participating community colleges and high schools developed their capacity to support career-connected learning. These successes ranged from a variety of new career-related learning opportunities for students—including establishment of new CS/Cy programs at several schools—to a more strategic approach to dual enrollment planning for some partners. Several lessons emerged from CFA's experience implementing CCP that may be useful to other educators working to increase student awareness and opportunities related to CS/Cy career pathways.

Connecting the CCP project to local needs and goals was critical to sustaining partner engagement. CFA's existing partnerships with school districts and community colleges meant it went into the project able to connect the overall project goals to local priorities. In retrospect, however, project leaders thought spending more time understanding the existing landscape of career-connected learning in each district might have helped the project hone the pitch for the work, especially the Career Connected Toolkit. This understanding would have enabled the project to connect the toolkit and other project components to activities already underway. In the end, understanding and connecting to local needs proved more important than engaging partners in co-development, as schools and districts did not have the capacity or interest in significantly contributing to the design.

The lack of partner engagement in co-design may have precluded deep project understanding and inhibited implementation. Co-design was a strategy to ensure understanding of the project's core components and goals by engaging partners in the development process. However, educators declined to participate in the co-design process. Without this opportunity to develop understanding, some educators struggled to see how and why the toolkit units made sense to integrate into their courses. They reported implementing, on average, less than three of the eight toolkit units. As an alternative, project leaders wondered if a more prescriptive scope and sequence for toolkit implementation, built around the needs and constraints of the participating educators, would have led to stronger implementation.

Systems change requires sustained engagement and support from a broad set of stakeholders. The co-advising approach centers cross-system collaboration as the mechanism for providing students with career-connected learning experiences. CFA sought to bring together high school educators implementing the work on the ground (e.g., teachers and counselors) with school and district leaders and community college educators. However, the project struggled to consistently engage school and district leaders and community college partners who could champion the work and create the conditions for change. For example, principal turnover was cited as a reason for the drop-off in engagement at two schools and for the success of a new CS/Cy program at another. Project leads cited elevation of student voice as the most effective strategy for building momentum for sustained action.

Student voice is a powerful driver for change and action. An unexpected but powerful lesson of the project was the elevation of data use and student voice. Project leaders reported that engaging students directly not only improved project design but also transformed the organization's broader approach to pathway development. Student feedback became a catalyst for adult collaboration and a means of overcoming resistance to change, as educators and leaders increasingly centered decisions on the student experience.

These lessons may be useful for other schools and districts seeking to expand opportunities for students through the introduction of new programs and increased cross-sector collaboration.

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Appendix A: Implementation Study Methodology

This appendix provides additional details on the implementation measures, metrics, and Career Connected Toolkit log.

Implementation Measures

Exhibit A1 details the Career Connected Pathways (CCP) implementation fidelity indicators, school- and project-level thresholds, and data sources for each component for each implementation year.

To measure fidelity, SRI relied on two main sources of data: (1) Center for the Future of Arizona (CFA) attendance records and (2) review of documents provided by CFA. For co-advising development component indicators, SRI requested annual attendance records for events organized and offered by CFA as part of the CCP project. Attendance records included information on attendee role and organizational affiliation, as well as dates for all events. To understand whether each high school provided a toolkit implementation plan and design thinking challenge plans, SRI reviewed school plans but did not assess the quality of each plan. To assess the student voice component, SRI reviewed aggregate school-level survey data to determine whether the survey was administered and how many students responded to the survey.

Exhibit A1. CCP implementation fidelity indicators, thresholds, and data sources by component

Component	Indicator	School-Level Threshold	Project-Level Threshold	Year(s) Measured	Data Source
Co-Advising Development	Attendance at two CCP events by community college, school district, and high school staff	Breadth: At least one educator from the high school and their community college partner attend AND Depth: At least one educator from the high school and the high school's district office attend	75% of high schools meet both the breadth and depth thresholds for event attendance	Year 1 (2022–23) Year 2 (2023–24) Year 3 (2024–25)	Attendance records
	Office hours and work sessions to support collaboration	N/A	CFA holds four optional office hours and work sessions	Year 1 (2022–23)	Attendance records
Career Connected Toolkit	Toolkit implementation plan created by high school	High school submits a toolkit implementation plan	75% of high schools submitted toolkit implementation plans	Year 1 (2022–23)	Document review
Student-Directed Design Process	Orientation meeting attendance	At least one high school staff member attends orientation meeting	75% of schools participated in orientation meeting	Year 2 (2023–24)	Attendance records
	Design process plan created by high school	High school submits a DTC plan	75% of schools submitted DTC plan	Year 2 (2023–24)	Document review
Student Voice	High school collects student voice through survey	At least 20 students at high school respond to the student voice survey	75% of high schools	Year 1 (2022–23) Year 3 (2024–25)	Document review

Implementation Metrics

To assess implementation fidelity, SRI calculated whether each indicator was met at the school level (if relevant) and the project level. For components made up of more than one indicator, all indicators needed to be met for the CCP project to meet fidelity. Exhibit A2 provides additional details on the indicator-level calculations.

Exhibit A2. CCP project-level implementation fidelity metric details

Year	Metric	Co-Advising Development					Career Connected Toolkit	Student-led Design Process		Student Voice
		CCP Event 1		CCP Event 2		Co-Advising Sessions	Implementation Plan	CTC Plan	Kickoff Meeting	Student Survey
		Breadth	Depth	Breadth	Depth					
Year 1 2022–23	% of high schools meeting threshold	75%	58%	50%	42%	N/A	83%	N/A	N/A	42%
	Project-level fidelity	Did not meet				Met	Met	N/A	N/A	N/A
Year 2 2023–24	% of CCP high schools meeting threshold	67%	33%	17%	8%	N/A	N/A	83%	100%	N/A
	Project-level fidelity	Did not meet				N/A	N/A	Met	Met	N/A
Year 3 2024–25	% of CCP high schools meeting threshold	83%	83%	92%	33%	N/A	N/A	N/A	N/A	67%
	Project-level fidelity	Did not meet				N/A	N/A	N/A	N/A	Did not meet

Toolkit Log

SRI administered the CCP instructional log monthly to educators in the 12 CCP schools in the eight districts from October 2022 to March 2023.

From October 2022 through December 2022, the log dissemination list grew as participating schools finalized their rosters of participating educators. Two schools started implementation of the toolkit in November. In January 2023, the log was sent to the finalized sample of 46 educators: 27 teachers and 19 counselors or “other” staff.

The overall response rate across for the log was 64%. However, there was a general downward trend from the start of the log administration to the end. October had the highest response rate at 77%, and February had the lowest at 54%. Table A3 provides more details on response rates by month. Response rates also varied by district. One district had the highest average response rate across the entire six months (100%), while a different district had the lowest (21%) response rate. While the instructional log data provide useful insights into the toolkit implementation, the data may not be fully representative of the experiences of all teachers.

Exhibit A3. Summary of response rates by month

Oct			Nov			Dec			Jan			Feb			March			6-Month Average
N	*n*	RR	*N*	*N*	RR	*N*	*n*	RR	*N*	*n*	RR	*N*	*n*	RR	*N*	*n*	RR	RR
39	30	77%	47	27	56%	47	32	68%	46	3	67%	46	25	54%	46	28	61%	64%

Note. *N* = number of participating educators; *n* = number of log responses; RR = response rate.

Appendix B: Impact Study Methodology

SRI conducted an independent evaluation of the Career Connected Pathways (CCP) project. SRI collected and analyzed extant student- and school-level data directly from the eight school districts participating in CCP.

Sample and Setting

The Center for the Future of Arizona (CFA) partnered with eight public school districts in Arizona to implement the CCP project—three suburban districts and five districts with a city locale code (National Center for Education Statistics, n.d.). Of the 12 CCP schools, nine had a city locale code, five had a suburban code, and one had a rural code.

The sample of schools used in the analysis included all schools serving ninth through 12th grade in the eight partner districts, with some exclusions. SRI excluded virtual schools, STEM-themed or dedicated career and technical education (CTE) schools, selective magnet schools, and alternative schools. As a final step, SRI excluded five schools that were high-performing relative to the CCP schools based on 11th-grade proficiency rates in math and English language arts (ELA) on the 2021–22 state assessment. In total, SRI excluded 13 schools across the eight districts, resulting in a final school-level sample of 35 schools: 12 CCP schools and 23 comparison schools.

The student-level analytic sample included all 10th graders enrolled in the study schools during the 2022–23 school year for whom SRI received 2021–22 (ninth grade) baseline data, indicating they were enrolled in the district the prior year. SRI dropped records for all students missing baseline or outcomes data. This includes students with exit codes suggesting they may have continued their high school education outside of the district, meaning that their final graduation status is unknown. These exclusions include students who transferred out of the district.

Sample Descriptives

Across the 35 schools in the analytic sample, the mean percentage of students eligible for free or reduced-price lunch (FRPM) was 66%. The mean school-level ninth-grade ACT Aspire score was 418.7. SRI also collected data on whether the schools offered computer science or dual enrollment courses in English or math before the project began. A slightly higher percentage of CCP schools than comparison schools offered at least one computer science course at baseline. This trend was reversed for dual enrollment course offerings, with all comparison schools offering at least one dual enrollment math course at baseline, compared with three quarters of CCP schools (Exhibit B1). In 2020–21, 77% of the schools in the sample offered at least one computer science course, 89% offered dual enrollment courses in English, and 91% offered dual enrollment courses in math.

Exhibit B1. School characteristics

School Characteristic	Full Sample	CCP	Comparison
Mean ninth-grade ACT Aspire score	418.7	418.7	418.7
Standard deviation	2.20	2.08	2.31
Mean percentage of students eligible for FRPM in 2021–22*	66%	67%	71%
Standard deviation	.25	.20	.28
Course offerings, 2021–22			
Computer science	77%	83%	74%
Dual enrollment English	89%	83%	91%
Dual enrollment math	91%	75%	100%
School *n*	35	12	23

*Percent FRPM is from 2022–23 for schools in one district because 2021–22 data were not available.

In terms of student demographics, 73% of the students in the sample were Hispanic, 15% were white, and 6% were Black, and 10% were classified as English learners. Fourteen percent of students in the sample took an advanced math course in ninth grade, meaning a course level above Geometry or Algebra I (e.g., Algebra II or Precalculus; Exhibit B2). See Exhibit 8 in the main body of this report for baseline equivalence for all student-level variables used in the final analytic models.

Exhibit B2. Student characteristics

Student Characteristic	Percentage
Advanced ninth-grade math	14%
Basic ninth-grade math	84%
Female	49%
English learner	10%
Special education	11%
Black	6%
Hispanic	73%
White	15%
Student *n*	13,226
School *n*	35

The 13,226 students in the analytic sample had a mean unweighted ninth-grade GPA of 2.5. SRI also received ninth-grade ACT Aspire scores, but these scores were missing approximately half of the students in one of the districts, possibly because of low testing participation during the COVID-19 pandemic. The 11,147 students for whom SRI received scores had a mean score of 419.5 (Exhibit B3).

Exhibit B3. Student prior achievement

Student Characteristic	Mean	Standard Deviation	Student n	School n
Unweighted ninth-grade GPA	2.49	0.99	13,226	35
Ninth-grade ACT Aspire score	419.46	6.94	11,147	35

Within the student analytic sample, 85% of students graduated within four years of starting high school. Only 7% earned computer science credit in high school, and 21% earned dual enrollment credit in math or English (Exhibit B4).

Exhibit B4. Student outcomes

Student Outcome	Full Sample	CCP	Comparison
Earned computer science credit	7%	9%	5%
Earned dual enrollment math credit	13%	11%	14%
Earned dual enrollment English credit	13%	12%	13%
Earned dual enrollment math or English	21%	18%	22%
Graduated in 4 years	85%	85%	85%
Student *n*	13,226	4,730	8,496
School *n*	35	12	23

Analytic Approach

SRI estimated the impact of CCP on student outcomes using a two-level hierarchical linear model in which students are nested within schools. The model accounts for student baseline characteristics (X_{ij}) including student race/ethnicity and English learner status, gender, and unweighted high school GPA (all variables shown in Exhibit 8 except for ninth-grade ACT Aspire scores, which we included only in a sensitivity analysis due to a high percentage of students with missing data). SRI also included an indicator for advanced ninth-grade math course-taking, with standard math course level (Algebra I or Geometry or lower) as the reference group. The final analytic model is:

Level 1 (student): $Y_{ij} = \beta_{0j} + \beta_{1j}X_{ij} + \varepsilon_{ij}$

Level 2 (school): $\beta_{0j} = \gamma_{00} + \gamma_{01}T + \gamma_{02}W_j + \gamma_{03}D_j + u_{0j}$

$\beta_{1j} = \gamma_{10}$

In this model, Y_{ij} is the outcome of interest for student i in school j; T is the treatment indicator for CCP; W_j is a vector of 2021–22 school-level variables, including eligibility rates for FRPM, indicators for dual enrollment and computer science course offerings, and student achievement (Exhibit B1); D_j is a vector of district indicators;[2] and ε_{ij} and u_{0j} are normally distributed errors

[2] Two districts contained a single treatment school each and no comparison schools. Each of these single treatment schools was blocked with all schools in another district that had high schools with similar 2021-22 graduation rates.

with mean 0. The parameter estimate for γ_{01} provides a covariate-adjusted estimate of the effect of T. SRI determined whether attending a CCP school has a statistically significant impact on the given outcome using a hypothesis test for this estimate.

SRI's student-level treatment and comparison samples were similar (within 0.25 standard deviations) on the baseline prior achievement measure, unweighted GPA. Further, the demographic composition of the treatment and comparison samples was similar on key variables, including percentage of English learners, percentage Hispanic, and percentage white (see Exhibit 8 in the main body). As a result, SRI did not make any further adjustments to achieve baseline equivalency, such as through matching or weighting techniques, although SRI did include these variables in the final analytic models.

Results

Main Analysis

The final contrasts from the main models are shown in Exhibit B5.

Exhibit B5. Final contrasts from main analysis

	CCP		Comparison					
Student Outcome	Model-Adj %	*SD*	%	*SD*	Treat-Comp Diff	*SE*	Standard Diff	*p*
Graduation	87%	0.34	85%	0.36	0.18	0.20	0.11	.37
Computer science credit	10%	0.31	5%	0.22	0.74	0.44	0.45	.09
Dual enrollment credit	24%	0.43	22%	0.42	0.10	0.33	0.06	.76
Student *n*	12		23					
School *n*	4,730		8,496					

Note. Model-Adj = model-adjusted; Treat-Comp Diff = treatment–comparison difference; Standard Diff = standardized treatment-comparison difference.

Exhibits B6 through B8 show the full output for the three models. Because all outcomes are binary, the coefficients are in logits.

Exhibit B6. High school graduation

Characteristic	Coefficient	*SE*	*p*
Intercept	0.22	0.98	
Treatment status (CCP)	0.18	0.20	.37
Ninth-grade GPA	1.05	0.03	<.01
Advanced ninth-grade math	0.42	0.12	<.01
English learner	-0.45	0.08	<.01
Black	-0.19	0.11	.09

Characteristic	Coefficient	SE	p
White	-0.54	0.09	<.01
Others	-0.45	0.11	<.01
Female	0.10	0.06	.06
Special education	-0.19	0.08	.01
School-level covariates			
Mean ninth-grade ACT Aspire score	0.03	0.06	.65
Percent FRPM	-0.54	1.30	.68
Offered computer science	-0.24	0.26	.34
Offered dual enrollment English	-0.22	0.28	.43
Offered dual enrollment math	-0.13	0.33	.69
District grouping			
Block 1	0.75	0.41	.07
Block 2	0.39	0.47	.41
Block 3	-0.04	0.34	.90
Block 4	-0.35	0.45	.43
Block 5	0.80	0.43	.07
School *n*	35		
Student *n*	13,226		

Exhibit B7. Computer science credit attainment

Characteristic	Coefficient	SE	p
Intercept	-6.90	2.39	
Treatment status (CCP)	0.74	0.44	.09
Ninth-grade GPA	0.19	0.04	<.01
Advanced ninth-grade math	0.28	0.10	.01
English learner	-0.38	0.16	.01
Black	0.03	0.17	.84
White	0.16	0.10	.10
Others	0.48	0.13	<.01
Female	-1.32	0.08	<.01
Special education	-0.36	0.13	.01
School-level covariates			
Mean ninth-grade ACT Aspire score	0.39	0.16	.01
Percent FRPM	2.10	3.11	.50
Offered computer science	2.48	0.61	<.01
Offered dual enrollment English	-0.35	0.60	.56
Offered dual enrollment math	0.21	0.68	.76

Characteristic	Coefficient	*SE*	*p*
District grouping			
Block 1	0.45	0.86	.60
Block 2	-0.43	1.05	.68
Block 3	-0.89	0.72	.22
Block 4	-2.02	1.11	.07
Block 5	1.45	0.98	.14
School *n*	35		
Student *n*	13,226		

Exhibit B8. Dual enrollment credit attainment in math or English

Characteristic	Coefficient	*SE*	*p*
Intercept	-7.13	1.61	
Treatment status (CCP)	0.10	0.33	.76
Ninth-grade GPA	1.41	0.04	<.01
Advanced ninth-grade math	0.81	0.07	<.01
English learner	-1.26	0.15	<.01
Black	-0.06	0.12	.60
White	-0.06	0.08	.43
Others	-0.17	0.11	.13
Female	0.40	0.05	<.01
Special education	-1.52	0.14	<.01
School-level covariates			
Mean ninth-grade ACT Aspire score	-0.01	0.10	.92
Percent FRPM	-1.04	2.10	.62
Offered computer science	-0.09	0.43	.84
Offered dual enrollment English	0.92	0.46	.04
Offered dual enrollment math	0.82	0.55	.14
District grouping			
Block 1	-0.07	0.67	.92
Block 2	1.49	0.78	.06
Block 3	1.02	0.58	.08
Block 4	0.23	0.74	.76
Block 5	0.43	0.73	.55
School *n*	35		
Student *n*	13,226		

Sensitivity Analysis

SRI also conducted a sensitivity analysis using ninth-grade ACT Aspire scores as an alternative measure of prior achievement to ninth-grade GPA. These scores were missing for 15.7% of students in the analytic sample. SRI used mean replacement and included a flag to indicate missing cases to allow comparison across the models for the same analytic sample. The results of this sensitivity analysis, shown below in Exhibits B9 through B12, were not substantively different from the main models using unweighted ninth-grade GPA.

Exhibit B9. Final contrasts from sensitivity analysis

	CCP		Comparison					
Student Outcome	Model-Adj %	*SD*	%	*SD*	Treat-Comp Diff	*SE*	Standard Diff	*p*
Graduation	85%	0.35	85%	0.36	0.05	0.16	0.03	.74
Computer science credit	10%	0.30	5%	0.22	0.72	0.44	0.44	.10
Dual enrollment credit	22%	0.41	22%	0.42	-0.03	0.33	-0.02	.92
Student *n*	12		23					
School *n*	4,730		8,496					

Note. Model-Adj = model-adjusted; Treat-Comp Diff = treatment–comparison difference; Standard Diff = standardized difference.

Exhibit B10. High school graduation

Characteristic	Coefficient	*SE*	*p*
Intercept	2.79	0.80	
Treatment status (CCP)	0.05	0.16	.74
Aspire score	0.64	0.04	<.01
Aspire score imputation flag	-1.43	0.09	<.01
Advanced ninth-grade math	0.75	0.12	<.01
English learner	-0.41	0.07	<.01
Black	<0.01	0.11	.97
White	-0.44	0.09	<.01
Others	-0.47	0.10	<.01
Female	0.31	0.05	<.01
Special education	0.10	0.07	.17
School-level covariates			
Mean ninth-grade ACT Aspire score	0.01	0.05	.86
Percent FRPM	-1.00	1.06	.34
Offered computer science	-0.07	0.21	.72
Offered dual enrollment English	-0.14	0.23	.53

Characteristic	Coefficient	*SE*	*p*
Offered dual enrollment math	-0.22	0.27	.42
District grouping			
Block 1	0.61	0.34	.07
Block 2	0.47	0.38	.22
Block 3	0.04	0.28	.88
Block 4	-0.47	0.36	.20
Block 5	1.56	0.36	<.01
School *n*	35		
Student *n*	13,226		

Exhibit B11. Computer science credit attainment

Characteristic	Coefficient	*SE*	*p*
Intercept	-6.33	2.74	
Treatment status (CCP)	0.72	0.44	.10
Aspire score	0.26	0.05	<.01
Aspire score imputation flag	-0.41	0.14	<.01
Advanced ninth-grade math	0.13	0.11	.23
English learner	-0.29	0.16	.07
Black	0.08	0.17	.64
White	0.11	0.10	.26
Others	0.45	0.13	<.01
Female	-1.29	0.08	<.01
Special education	-0.19	0.13	.15
School-level covariates			
Mean ninth-grade ACT Aspire score	0.38	0.16	.02
Percent FRPM	1.93	2.95	.51
Offered computer science	2.51	0.61	<.01
Offered dual enrollment English	-0.38	0.60	.52
Offered dual enrollment math	0.23	0.68	.74
District grouping			
Block 1	0.43	0.85	.61
Block 2	-0.41	1.02	.69
Block 3	-0.87	0.72	.23
Block 4	-2.08	1.08	.05
Block 5	1.69	0.96	.08
School *n*	35		
Student *n*	13,226		

Exhibit B12. Dual enrollment credit attainment in math or English

Characteristic	Coefficient	*SE*	*p*
Intercept	-2.89	1.67	
Treatment status (CCP)	-0.03	0.33	.92
Aspire score	0.80	0.03	<.01
Aspire score imputation flag	-0.35	0.09	<.01
Advanced ninth-grade math	0.91	0.07	<.01
English learner	-1.05	0.14	<.01
Black	0.03	0.11	.82
White	-0.12	0.08	.11
Others	-0.17	0.11	.11
Female	0.65	0.05	<.01
Special education	-1.03	0.14	<.01
School-level covariates			
Mean ninth-grade ACT Aspire score	-0.05	0.11	.62
Percent FRPM	-1.59	2.20	.47
Offered computer science	-0.02	0.43	.96
Offered dual enrollment English	0.83	0.46	.07
Offered dual enrollment math	0.71	0.55	.20
District grouping			
Block 1	-0.25	0.68	.71
Block 2	1.55	0.80	.05
Block 3	0.87	0.57	.13
Block 4	0.08	0.76	.92
Block 5	0.72	0.74	.33
School *n*		35	
Student *n*		13,226	

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