Summer of CS 2025 Survey and Focus Group Findings

Educator Workforce Investment Grant in Computer Science External Evaluation

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Executive Summary

The Educator Workforce Investment Grant in Computer Science (EWIG: CS) supported a series of workshops in summer 2025, known collectively as "Summer of CS." Offered through 17 different workshops across the state, these learning events sought to build the capacity of K–12 educators in California to deliver high-quality instruction in computer science. The American Institutes for Research® (AIR®) collected data about the workshop experiences through registration records, pre-workshop and post-workshop participant surveys, and focus groups as part of an external evaluation of EWIG: CS. The following key findings suggest that workshop participants had positive experiences with Summer of CS, including increases in self-reported confidence and beliefs about teaching computer science.

Key Finding #1: A total of 330 educators participated in a Summer of CS workshop in 2025, a third of whom had no prior experience with teaching computer science. The gender representation of these participants is similar to the overall California K–12 workforce.

Key Finding #2: Survey respondents and focus group participants reported positive impressions about Summer of CS workshop content, format, and usefulness. Focus group participants highlighted effective pedagogical strategies and opportunities to receive ongoing support as key features of their experience.

Key Finding #3: Survey responses reveal a positive and statistically significant change in participants' confidence in teaching computer science between the beginning and the end of Summer of CS workshops. Focus group participants reported that even when their growing skill set in computer science was incomplete, they felt more comfortable guiding students through their learning experience.

Key Finding #4: Educators with less prior experience teaching computer science reported a greater increase in their confidence to teach computer science compared with educators with more experience, even after accounting for other background characteristics. In addition, women reported greater change in confidence in articulating to students why computer science is important and answering student questions, even after holding other background characteristics constant.

Key Finding #5: Survey responses reveal a positive and statistically significant change in confidence to recruit and retain students in computer science; this change is of a greater magnitude when the survey items referred to all students than when the survey items referred to historically underrepresented students. We did not find statistically significant differences for these items based on respondent characteristics.

Key Finding #6: Survey responses reveal a positive and statistically significant change in beliefs about who can and should do well in computer science. These changes were smaller in magnitude than those for educator confidence, but the pre-workshop values were also higher, suggesting that educators who chose to participate in Summer of CS workshops already had strong beliefs about the importance of computer science and the ability of all students to succeed.

Key Finding #7: Focus group participants felt well prepared to apply their learning in classrooms and schools but also identified key obstacles such as inadequate administrator leadership, insufficient funding, and lack of state support for computer science. Common challenges with district and school leaders included misunderstanding about what computer science entails or why it is valuable and narrow views that see computer science exclusively as a stand-alone subject.

Taken together, these results provide encouraging evidence about the quality of the Summer of CS experience and its potential for improving the state of computer science education in California. These findings echo the experiences of 2024 Summer of CS participants as shared in their surveys last year. More educators participated in Summer of CS in 2024 than in 2025 (736 educators across 44 workshops vs. 330 educators across 17 workshops, respectively), which is primarily a reflection of the funding available to support the workshops in each year. However, both 2024 and 2025 Summer of CS survey respondents showed significant and positive changes in confidence in beliefs after attending their workshops.

We emphasize that this evidence is correlational; our study design does not enable us to make statements of causality with our conclusions. Moreover, self-reported data about participant confidence and beliefs may or may not translate into actual changes in educator behavior, learning opportunities, and student experiences. A follow-up survey to be administered in fall 2025 will enable the research team to explore the degree to which workshop experiences are associated with subsequent classroom practices.

Introduction

Through the Educator Workforce Investment Grant in Computer Science (EWIG: CS), the state of California has funded a statewide effort designed to increase educator capacity to deliver computer science education with an equity focus. [1] This report shares findings regarding a key component of the EWIG investment, "Summer of CS." [2] Summer of CS was a professional development series aimed at California educators interested in providing or expanding the computer science course offerings in public high schools. Educators participated in multi-day workshops held through regional offerings throughout the state, as well as an in-person event held in Anaheim known as "CSPDWeek." The American Institutes for Research® (AIR®) produced a previous report that shared findings on participant experiences at Summer of CS workshops in 2024. [3] This report presents evidence about educator perspectives from workshops held in June 2025.

AIR has partnered with the EWIG: CS lead agencies to serve as the external evaluator for the grant. To inform its evaluation approach, the AIR team organized a set of research questions on the four components of the CAPE framework, which highlights *capacity* to deliver, *access* to, *participation* in, and *experiences* with computer science education. [4] The CAPE framework directly addresses equity with each component and acknowledges the multiple layers of an educational approach required to equip students to thrive in computer science (Fletcher & Warner, 2021). Guided by this framework, the AIR evaluation seeks to address the research questions identified in Exhibit 1.

This report addresses Research Questions 1 and 2 by examining participant experiences with the 2025 Summer of CS workshops. It shares the results of pre-workshop and post-workshop surveys administered to workshop participants, demographic and participation information collected from workshop registration data, and focus groups conducted with a sample of workshop attendees. Taken together, these data add to a growing body of evidence on EWIG: CS efforts to improve computer science educator capacity.

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[1] The EWIG grant in computer science is one of multiple investments the state of California has developed to foster professional learning opportunities for educators. For more information about this program, see https://www.cde.ca.gov/ci/pl/ewig.asp.
[2] For more details about Summer of CS and the broader professional learning series to which it belongs, Seasons of CS, see https://www.seasonsofcs.org/.
[3] For findings about Summer of CS 2024 and other reports from AIR's EWIG: CS evaluation, please visit https://www.air.org/project/evaluation-educator-workforce-investment-grant-computer-science.
[4] See https://ecepalliance.org/resources/models/cape/.

Exhibit 1. EWIG: CS Evaluation Research Questions

Research question	CAPE dimension
1. To what extent have EWIG professional learning activities reached and included their target audiences? – To what extent does the pool of participants reflect the California K–12 teaching force? – To what extent is participation in Seasons of CS orientation workshops associated with subsequent participation in other EWIG professional learning activities?	Capacity
2. How do EWIG workshop participants describe the quality of their professional learning experiences? – What changes in knowledge and skills to teach CS do EWIG workshop participants report after their professional learning experiences? – What changes in beliefs and confidence to teach CS do EWIG workshop participants report after their professional learning experiences?	Capacity
3. To what extent do CS Champions believe that the training and support they receive has adequately prepared them to carry out their work? What insights do CS Champions have about their role in equitably expanding CS education?	Capacity
4. What is the nature and frequency of interactions among CS Champions outside formal professional learning activities?	Capacity
5. To what extent have the numbers of discrete CS courses increased during the time period of the 2021 and 2023 EWIG grants?	Access
6. To what extent has participation in discrete CS courses increased during the time period of the 2021 and 2023 EWIG grants? To what extent has participation increased for historically underrepresented populations?	Participation
7. To what extent have teachers' instructional practices changed after participating in EWIG professional learning activities?	Experience

Methods

The AIR research team administered a survey to all Summer of CS participants and conducted 12 focus groups with workshop attendees in June 2025 to collect data on the Summer of CS experience. This section explains the methods AIR used to collect data and produce this report.

Summer of CS Participant Survey

Repeating data collection and analysis procedures employed for the 2024 Summer of CS workshops, AIR administered a survey to all Summer of CS participants at the beginning and end of their workshop experience.

Survey Design

For the summer 2025 administration, AIR researchers used the same survey protocols as those administered to participants in the 2024 Summer of CS workshops; the research team originally developed those protocols in consultation with members of the EWIG: CS planning team from the Sacramento County of Education (SCOE), San Bernardino County Superintendent of Schools, the University of California at Los Angeles, and the Californians Dedicated to Education Foundation. Most questions appeared in both a pre-workshop survey and a post-workshop survey. Survey items focused on key areas that EWIG: CS planning team members identified as important for the workshops, including participants' confidence in teaching computer science and their beliefs about what students can and should learn.

In addition, the post-workshop survey asked respondents about the overall quality of their workshop experiences. Survey items asked respondents to provide responses to 5-point Likert scales ranging from *Strongly disagree* to *Strongly agree*. See Appendix A for a full list of survey items.

AIR's institutional review board reviewed the survey and data collection procedures to ensure that the survey data collection met high standards for human subjects participation.

Survey Data Collection

For the summer 2025 administration, AIR programmed and administered the pre- and post-workshop surveys using the online Verint Survey platform. AIR sent individualized survey links via email to participants on the first and last days of their workshop, using registration and contact information provided by SCOE. Each workshop provider designated time at the start of Day 1 for participants to complete the pre-workshop survey, as well as time at the end of the final day for the post-workshop survey. This approach was designed to reduce recall bias and ensure that any changes in participant perspectives could be more confidently attributed to the workshop itself rather than to intervening experiences or external influences. After the conclusion of each workshop, AIR sent a follow-up email to nonrespondents requesting that they complete the survey.

Response Rates

Across all Summer of CS workshops, slightly more than half of attendees (54%) completed both surveys. In addition, 25% of attendees completed the pre-workshop survey only and 11% completed the post-workshop survey only. A total of 10% of attendees did not complete either survey. See Appendix B for a more detailed analysis of survey response rates.

Survey Analysis

The AIR research team converted all Likert scale responses into numerical values ranging from 1 to 5, where *Strongly disagree* = 1 and *Strongly agree* = 5. By assigning each survey response a numerical value, we can then present the average change between the pre-workshop and post-workshop survey responses for each item. In addition, we conducted paired *t*-tests to understand within-person change scores and conducted significance tests for whether the mean change for all respondents differed from zero (Agresti, 2018). Analyses of change include only the respondents for whom we have both pre-workshop and post-workshop data; exhibits throughout the report include notes that list the number of respondents represented for each finding.

In addition, the research team conducted analyses to explore the relationship between respondent characteristics and the changes in self-reported confidence and beliefs. These analyses paid particular attention to aspects of participants' identities and professional history with computer science to explore the degree to which Summer of CS experiences might differ for respondents who have been historically underrepresented in the field. Using each measure of change as an outcome variable, analysts conducted multiple linear regression that included participant experience with teaching computer science, attendance at a previous Summer of CS workshop, gender, and racial identity as independent variables. The team selected this model because the dependent variable was continuous, and we wished to explore the relationship of multiple predictor variables simultaneously with the change in responses between workshops. We assessed statistical significance at the $p < 0.05$ level. Although the paired *t*-tests show whether within-person change occurred on average, regression analysis allows us to examine whether particular subgroups experienced changes significantly different from their counterparts after controlling for other characteristics. The text of this report highlights findings in which our regression models found the coefficients for any of these independent variables to be statistically significant. The research team conducted all survey analyses using the statistical software platform Stata.

Summer of CS Participant Focus Groups

To supplement survey findings on Summer of CS workshop experiences, AIR conducted 12 focus groups with workshop attendees in June 2025.

Focus Group Protocol Design

The AIR team developed the focus group protocol in consultation with the EWIG: CS leadership team and grounded the questions in Research Question 2. Questions asked participants about their workshop experience overall, any changes in confidence or beliefs that they attributed to the workshop, and the degree to which they felt prepared to apply what they learned when they returned to school in fall 2025. The focus group protocol is available in Appendix E.

Focus Group Data Collection

The research team conducted 12 focus groups with 69 participants from the 2025 Summer of CS workshops. All workshop registrants received an email invitation to participate in a focus group, with opportunities allocated based on specific participant characteristics and workshop formats.

To ensure representation across different workshop modalities and participant backgrounds, we employed a stratified purposive sampling strategy. Six focus groups were offered to individuals who attended workshops in Anaheim, California, at the centralized Computer Science Professional Development Week (known as CSPDWeek) and six groups to educators who attended regional workshops offered elsewhere in the state. Based on findings that suggest a relationship between teaching experience and self-reported participant outcomes (Lee et al., 2024), the research team further grouped registrants as follows based on their prior experience with Summer of CS and with teaching computer science:

- Two focus groups included participants who had attended a Summer of CS workshop in a previous year.
- Two focus groups included first-time Summer of CS workshop attendees with prior experience teaching computer science.
- Two focus groups included first-time Summer of CS workshop attendees with no prior experience teaching computer science.

Focus group invitations were sent to all eligible participants within each stratum, and participation was determined on a first-come, first-served basis. This approach allowed for targeted recruitment while maintaining voluntary participation and ensuring diversity across experience levels and workshop formats. The six focus groups involving CSPDWeek attendees took place in person during breaks in the workshop sessions. AIR staff facilitated the six focus groups involving regional workshop participants virtually using the Microsoft Teams platform.

Focus Group Analysis

To analyze data, the AIR research team developed a codebook (see Appendix F) to identify themes aligned with the study's research questions and the focus group protocol. A single member of the research team coded the focus group transcripts. Although single-coder approaches may introduce bias, AIR selected this method to ensure interpretive depth and consistency, drawing on the coder's extensive contextual knowledge of EWIG: CS and computer science education in California. The research team then employed thematic analysis paired with quantitative counting of similar responses to determine not just what was said but also how often it was said in focus groups (Braun & Clark, 2006).

Limitations

Any research approach features limitations that should shape the reader's interpretation of study findings. Here we highlight important implications of the methods employed for the EWIG: CS evaluation.

Self-Reported Data

First, the findings presented in this report rely heavily on self-reported data. The Summer of CS workshop participant survey and focus groups both ask individuals who have been part of the EWIG: CS grant to share their perceptions and memories of their experiences. The resulting data are therefore subject to factors, such as recall bias and social desirability bias, that might shape their responses to survey and focus group questions.

Statements of Causal Inference

Second, the study design does not permit causal inferences on the impact of the EWIG: CS program. No comparison group exists that would enable us to analyze differences in outcomes reported by program participants to individuals who have not received the same opportunities as those provided by the grant. Although the use of pre- and post-workshop surveys enabled a comparison of perspectives within the same individual before and after a workshop experience, we cannot claim that EWIG: CS *caused* the results we report here.

Limitations of Survey and Focus Group Data

Online surveys like those used to collect data from workshop participants provide several benefits. However, because the surveys use standardized language for all respondents, some respondents may interpret questions differently, and bounded response options may not fully capture the nuances of all interactions. On the other hand, the nature of a focus group that uses a semistructured data collection protocol can result in variation in data collected. The number of participants in a focus group, the conditions under which a focus group takes place (especially in person vs. virtual), and the backgrounds of focus group participants can all shape the conversation that takes place.

Findings About Workshop Participation

The Summer of CS effort supported through the EWIG: CS grant featured 17 different workshops delivered over the course of 3 weeks in a variety of locations in summer 2025. The flagship event among these offerings was CSPDWeek, a collection of concurrent workshops conducted June 23–27 in Anaheim, California. In addition, seven regional offerings enabled educators across the state to participate in professional learning about computer science. Workshops, which included anywhere from nine to 26 participants, ranged from 3 to 5 days in length. In some cases, workshops offer opportunities for ongoing engagement between facilitators and participants through follow-up workshops during the 2025–26 academic year. A total of 330 educators participated in one of the Summer of CS workshops in summer 2025.

Exhibit 2 displays the gender and racial identity of these educators, including a comparison with the overall, full-time equivalent (FTE) California K–12 teaching workforce. Workshop participants were more likely to be Asian and multiracial and less likely to be Hispanic or Latino and White than the statewide workforce.

Key Finding #1

A total of 330 educators participated in a Summer of CS workshop in 2025, a third of whom had no prior experience with teaching computer science.

Exhibit 2. Gender and Race of Summer of CS Participants and All California FTE Teachers

Category	Summer of CS participants (*N* = 330)	California FTE teachers 2023–24 (*N* = 312,219)
Woman	73%	73%
Man	24%	27%
African American	3%	4%
American Indian or Alaska Native	0%	1%
Asian, Filipino*	15%	8%
Hispanic or Latino	18%	26%
White	43%	55%
Two or More Racial Identities	12%	1%
Racial Identity Not Reported	8%	6%

Note. Percentages may not add to 100% due to rounding. Two percent of Summer of CS participants listed "Gender-fluid," "Non-Binary," or preferred not to state their gender identity. Source for Summer of CS Participant Data: SCOE attendance records. Source for California FTE Teachers Data: Commission on Teacher Credentialing (2025).

*Here and throughout the report, Asian includes individuals who identified as Filipino, East Indian, or Indian.

Additional details about Summer of CS participants may also be instructive even when comparable statewide data do not exist. Because the state's EWIG: CS investment recognizes the importance of fostering computer science learning opportunities at all grade levels, Summer of CS organizers designed workshops for educators of Grades TK–12. Exhibit 3 demonstrates that workshop participants serve students across a range of elementary, middle, and high school grades. The exhibit also illustrates the range of prior experience with CS instruction among workshop attendees. Approximately one third of Summer of CS participants reported no prior experience with teaching computer science, a noticeable change from 2024 Summer of CS participants, when most had no prior experience.

Exhibit 3. Teaching Assignments and Experience for Summer of CS Participants

Category	Summer of CS participants
Grade Level: 9–12	37%
Grade Level: 6–8	45%
Grade Level: TK–5	39%
Years teaching computer science: 0	34%
Years teaching computer science: 1–2	28%
Years teaching computer science: 3–5	20%
Years teaching computer science: 6–9	8%
Years teaching computer science: 10 or more	10%

Note. Percentages for grade level do not add to 100% because respondents can teach more than one grade level.

One important design feature of the EWIG: CS grant is a series of orientation workshops conducted throughout the 2024–25 school year designed to introduce educators to computer science content and spark their interest in learning more. Such workshops, if successful, could help to demystify the content area and decrease anxiety about engaging with computer science. They might also motivate educators to learn more about computer science through Summer of CS professional development offerings. Workshop enrollment data demonstrate that of the 324 educators who participated in an orientation workshop in 2024–25, 151 (47%) registered for a Summer of CS workshop and 85 (26%) attended the full workshop. Those 85 participants who attended both an orientation workshop and a Summer of CS workshop represent 26% of the total Summer of CS participants in 2025.

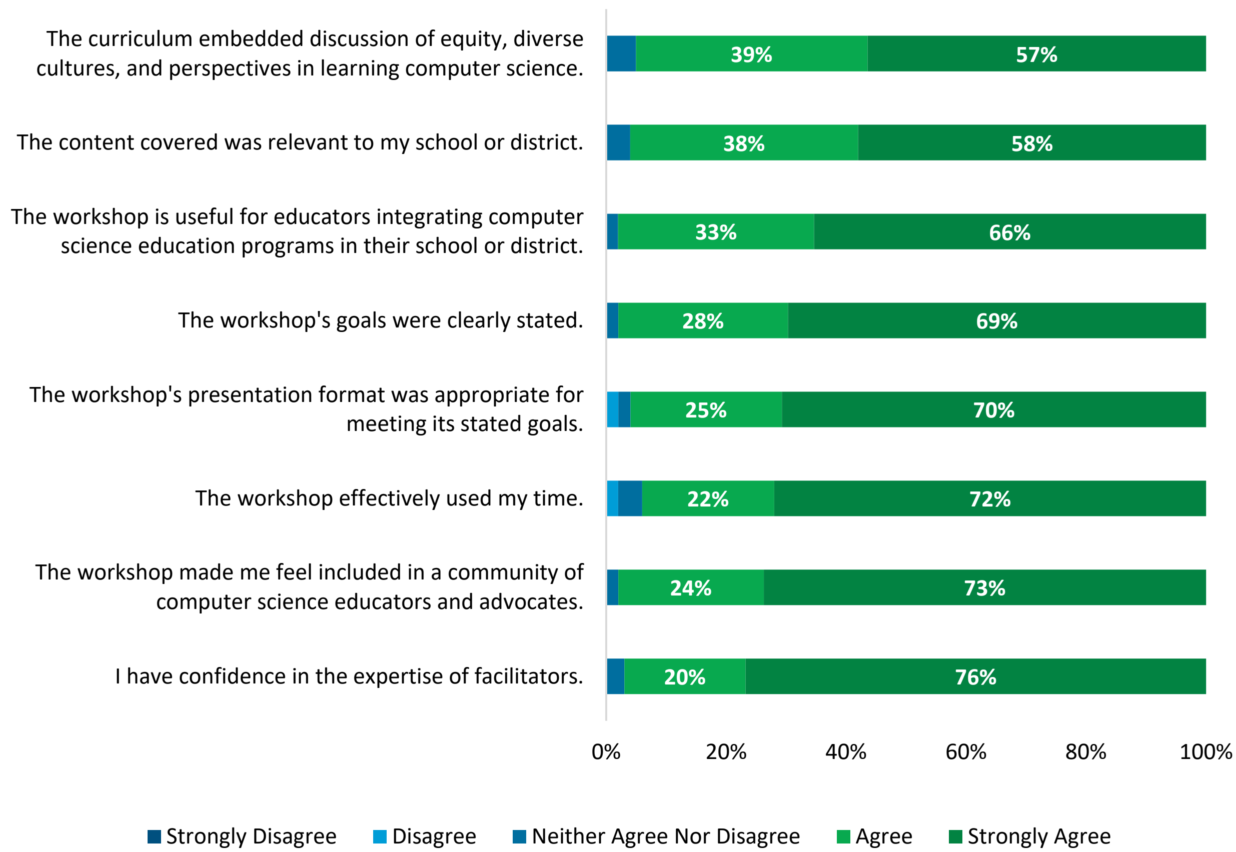
Findings About Overall Workshop Quality

Beyond overall participation levels, a key measure of success for Summer of CS is participants' perspectives about the quality of their workshop experiences. Exhibit 4 shows participant responses about workshop quality from the post-workshop survey. An overwhelming majority of respondents agreed or strongly agreed with statements that described the relevance, usefulness, and execution of their workshop. For example, 57% of respondents strongly agreed and 39% agreed that the curriculum embedded discussion of equity, diverse cultures, and perspectives in learning computer science. Similarly, 73% of respondents strongly agreed and 24% agreed that the workshop made them feel included in a community of computer science educators and advocates.

Key Finding #2

Survey respondents and focus group participants reported positive impressions about Summer of CS workshop content format, quality, and usefulness..

Exhibit 4. Participant Perceptions of Summer of CS Workshop Quality



*Note. n*s ranged from 212 to 214. Response categories with 5% or less do not have a data label. Categories may not add to 100% due to rounding.

High-Quality Pedagogical Strategies

Focus group participants offered their perspectives about aspects of the workshops that were valuable to them. The most frequent observations pointed to the quality of pedagogical strategies employed in their workshops. For example, multiple workshop attendees described the value of experiencing engaging strategies through the lens of a student. One CSPDWeek participant explained, “What I really like about it is we’re taught by teachers who make it engaging for us, so we could then turn around and make it engaging for our students.” An educator from a regional workshop added, “It felt really intimate, being able to walk through lessons and apply them like if I was a child … but also having that perspective of a teacher.” Some focus group participants further expressed appreciation for facilitators’ ability to differentiate their instruction and attend to a wide variety of background knowledge within the workshop. One regional workshop participant stated, “There’s no dumb question. They take all your skill levels into consideration when they’re planning, and so it’s almost like they’re differentiating with us what we do with our students, and that’s really awesome.”

Closely tied to the quality of instructional approaches were observations about the high quality of workshop trainers overall. “There are experts that I can ask questions to,” one participant reflected. Another shared, “The presenter was well prepared, they had all the materials, and overall, whenever we had to troubleshoot something, they were very knowledgeable about the content.” A third focus group member offered the following thought: “For me, what made it extra special was the presenters are very passionate about teaching computer science.”

Ongoing Sources of Support

An additional feature of some workshops that emerged in focus group conversation was the opportunity for ongoing support throughout the year. This support can take the form of the academic year workshops offered in the academic year after Summer of CS. One respondent who had attended a different workshop in the prior summer stated:

> Being able to meet with those people again and my presenters throughout the year really supported me in implementing what I learned last year. It kind of keeps you from going, “This is too hard,” as opposed to, “Well, this is hard, but I have somebody I can reach out to and somebody who I have to meet with and that’s going to check up with me,” and that really helped.

Focus group participants also mentioned the opportunities for continued communication with their peers and access to resources. One attendee shared, “It’s just that ongoing support. You feel like you’re in this together with someone else, not just by yourself.” Another teacher who had no prior experience with teaching computer science added, “It’s at least making me more comfortable knowing where to find resources.”

Additional Positive Workshop Features

Additional focus group responses focused on the format of the workshops. The opportunity for extended time with computer science content allowed for deeper engagement compared with many other professional learning opportunities. Some reflections suggested that the in-person nature of most workshops allowed for hands-on learning experience, although a small number of participants noted that having an option for virtual participation enabled them to attend learning opportunities that would otherwise have been impossible due to distance.

Opportunities for Improvement

The focus groups also created space for workshop participants to share recommendations for improvement. The volume of these responses was noticeably smaller and featured far less consensus versus the strengths. Nevertheless, some participants suggested that publicity and recruitment for the workshops could improve. Others noted that additional learning time, especially for the shorter regional workshops geared toward elementary teachers, could be helpful. One teacher explained, "Secondary [teachers] got five days. We only got three. I was just kind of curious on why the discrepancy on that one. Maybe having a couple of [extra] days would have been good."

Findings About Changes in Participant Perspectives

Although it is instructive to learn about workshop attendees' perceptions of quality, a positive experience alone is insufficient for gauging success. An effective professional development effort supported by EWIG: CS should help participants grow their knowledge, understanding, and skills to effectively meet students' computer science learning needs. An analysis of survey responses enables us to describe ways in which self-reported beliefs and levels of confidence increased from the beginning to the end of the Summer of CS workshops. Please note that all of the differences reported regarding pre- and post-workshop changes are statistically significant at an alpha level of 0.05.

Changes in Participant Confidence: Overall Results

The first set of survey items addresses participant confidence. Among these, participants reported the highest level of change for the statement, "I am confident in my ability to assess students' learning and performance in computer science." The difference of 0.91 indicates that respondents, on average, changed nearly a full response option between the beginning and the end of the workshop. The average level of confidence grew for each item in Exhibit 5, with the magnitude of change ranging from 0.60 to 0.91; all changes are statistically significant at the 0.001 level.

Key Finding #3

Survey responses reveal a positive and statistically significant change in confidence in teaching computer science between the beginning and the end of Summer of CS workshops.

Exhibit 5. Changes in Summer of CS Participant Confidence With Respect to Computer Science

I am confident in my ability to …	Pre-workshop mean	Post-workshop mean	Mean change
Teach computer science.	3.46	4.27	0.81
Articulate to administrators why computer science is important.	3.82	4.44	0.63
Articulate to students why computer science is important.	3.94	4.54	0.60
Answer student questions about computer science material.	3.33	4.17	0.84
Teach a stand-alone computer science class.	3.17	3.86	0.69
Incorporate computer science content into another subject area.	3.55	4.33	0.78
Teach in alignment with California computer science standards.	3.47	4.31	0.84
Assess students' learning and performance in computer science.	3.33	4.24	0.91

*Note. n*s ranged from 171 to 176. For this analysis, the research team assigned a numerical value to each response option (Strongly agree = 5, Agree = 4, Neither agree nor disagree = 3, Disagree = 2, Strongly disagree = 1).

Changes in Participant Confidence: Focus Group Findings

Focus group participants shared their perceptions of ways in which the workshop experienced shaped their confidence levels. “These workshops have been critical to just jump in and get the foundation and provide us with knowledge so we can see where our students should be,” one respondent explained. “Without these workshops, I don’t know where we would have gotten that experience or that hands-on confidence.” Another attendee shared, “I didn’t have a background in computer science. I had no real interest. I was intimidated by it, but now I feel confident about it.”

These reflections reinforce findings from the survey, but insights from the focus groups also reveal some nuance about the confidence generated through Summer of CS workshops. Some respondents noted that they gained valuable knowledge, but that part of their increased confidence came from growing more comfortable with an incomplete skill set. One person explained, “I think part of that is that you’re confident you don’t need to be the expert. You just need to bring that and let them explore and let them use the resource.” Another respondent shared a similar point of view: “I’ve achieved a level of comfort with being an idiot I didn’t have before. It's huge. I’m just a lot more comfortable with admitting, ‘Hey, I don’t have this now. Let’s figure it out.’” Other participants clarified that they were more confident in some areas but not all. One attendee without prior experience in teaching computer science noted, “I definitely feel like my confidence has gone up, and I’ll know how to navigate better. Am I 100% there? By no means … but I definitely feel like from [the start of the workshop], I felt a lot more comfortable using this.”

Changes in Participant Confidence: Subgroup Results

Just as efforts to support the equitable expansion of computer science seek to overcome historical trends of underrepresentation among students, so too do they aim to address the computer science teaching force. Computer science is a field primarily populated by men who identify as White or Asian (John & Carnoy, 2017; Zippia, 2023). Moreover, lack of preparatory privilege and confidence often create obstacles for people to pursue opportunities to learn and contribute to computer science education (Yadav et al., 2016). If EWIG: CS is to expand opportunities for historically underrepresented educators, it is important to understand the experiences of women, people of color, and educators who have not previously engaged with computer science.

Exhibit 6. Changes in Summer of CS Participant Confidence With Respect to Computer Science by Respondent Characteristic

I am confident in my ability to …	Pre-workshop to post-workshop mean change					
	Women	Men	Underrepresented racial group	White and/or Asian	CS teaching experience: 0 Years	CS teaching experience: 1+ Years
Teach computer science.	0.90	0.69	0.92	0.80	1.20	0.65
Articulate to administrators why computer science is important.	0.68	0.54	0.66	0.67	0.77	0.57
Articulate to students why computer science is important.	0.71	0.39	0.52	0.68	0.66	0.57
Answer student questions about computer science material.	0.98	0.65	0.96	0.87	1.17	0.69
Teach a stand-alone computer science class.	0.76	0.66	0.80	0.70	0.87	0.62
Incorporate computer science content into another subject area.	0.86	0.63	0.83	0.77	0.81	0.77
Teach in alignment with California computer science standards.	0.89	0.80	0.78	0.90	0.85	0.84
Assess students' learning and performance in computer science.	0.97	0.82	0.85	0.95	1.23	0.77

*Note. n*s ranged from 50 to 123. For this analysis, the research team assigned a numerical value to each response option (Strongly agree = 5, Agree = 4, Neither agree nor disagree = 3, Disagree = 2, Strongly disagree = 1). The underrepresented racial group includes any individual who identifies with a race other than White or Asian.

Exhibit 6 displays the changes in confidence from the beginning of the workshop to the end of the workshop by gender, race, and prior computer science teaching experience. For almost all eight survey items, the average change for the historically underrepresented educator group—that is, women, members of an underrepresented racial group, and participants without any prior computer science teaching experience—exceeds that of their peers. For example, the increase in confidence in a respondent's ability to articulate to students why computer science is important was 0.71 for women and 0.39 for men. The main exceptions are four survey items where White and/or Asian educators experienced slightly more change compared with their underrepresented racial group counterparts. All but one change in Exhibit 6 is statistically significant at the 0.001 level (the exception being men's confidence to articulate to students why computer science is important, which is significant at the 0.01 level).

Key Finding #4

Educators with less prior experience teaching computer science reported a greater increase in their confidence to teach computer science compared with educators with more experience, even after accounting for other background characteristics.

The results in Exhibits 5 and 6 indicate that on an individual level, educators tended to change their responses to greater levels of agreement between the pre- and post-workshop surveys. We also conducted regression analyses to understand the overall, average change across all respondents and whether any subgroups' changes were significantly different from another, holding all other factors constant. In addition to the groups shown in Exhibit 6, we also added a variable that indicated whether a participant had attended Summer of CS during summer 2023 and/or 2024, based on the rationale that the nature of an individual's learning experience might be different in their first workshop than in subsequent workshops. In our regression analyses, all confidence-related survey items had statistically significant levels of baseline change, but few predictors were significant. Thus, we found few survey items where any particular subgroup improved more or less than others or where respondents' background predicted how or if they changed. The two areas we did see significant results with subgroups were the following:

- Educators with less prior experience teaching computer science showed more change in their confidence to teach computer science compared with educators with more experience, even after accounting for other background characteristics.
- Compared with men, women increased their confidence to articulate to students why computer science is important and their ability to answer student questions, even after accounting for other background characteristics.

See Appendix C for the full regression output.

Changes in Participant Confidence: Variation in Results

The information presented in Exhibit 5 provides a useful overview of the individual-level change reported by workshop participants, but it does not tell us much about the *variation* in individual-level change. To illustrate the range of experiences reported by survey respondents, the *x*-axis of Exhibit 7 displays the number of points on the survey item Likert scale that a respondent's answer moved between the pre- and post-workshop surveys. If, for example, a respondent answered *Agree* to an item before the workshop and *Strongly agree* to the same item after the workshop, the value of the change would be 1. If they answered *Neither agree nor disagree* before the workshop and *Strongly disagree* after the workshop, the value would be –2. If they answered *Strongly agree* before the workshop and *Strongly agree* after the workshop, the value would be 0. The *y*-axis of Exhibit 7 shows the number of respondents that fall into each category.

Exhibit 7. Changes in Summer of CS Participant Confidence to Teach Computer Science

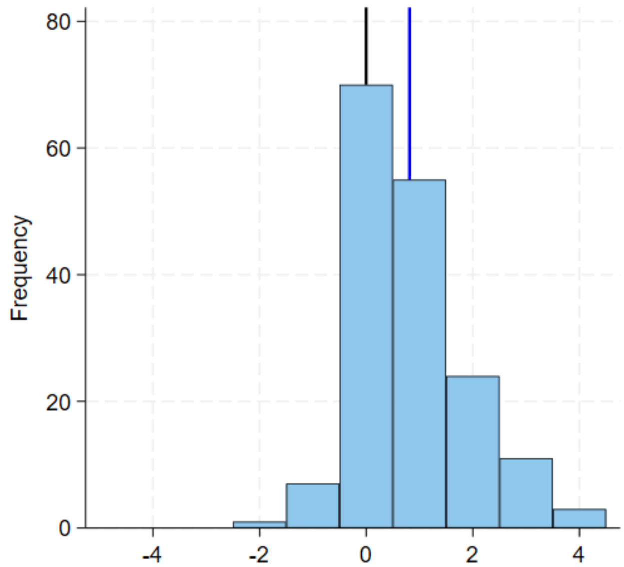


Exhibit 7 shows the changes in survey responses for the item, “I am confident in my ability to teach computer science.” The black vertical line is set at 0; 70 respondents reported no change from the beginning to the end of the workshop. The blue line represents the average change for this item; in this case, it matches the mean of 0.81 shown in Exhibit 5. This display demonstrates that 55 respondents reported an increase of 1 point on the Likert scale and 24 respondents reported an increase of 2. Very small numbers of participants reported changes as high as 4 or lower than 0. This exhibit shows that although the average change in participant response is slightly less than 1, most participants who reported a positive change had an increase of 1 point on the Likert scale, whereas smaller numbers of respondents indicated that their confidence grew by 2 or 3 points. A sizeable proportion of workshop attendees did not report any change in confidence for this item; very small numbers of participants reported a drop in confidence from the beginning to the end of the workshop. Similar histograms for all pre- and post-workshop survey changes are available in Appendix D.

Changes in Participant Confidence With All Students and With Historically Underserved Students: Overall Results

A second set of items asked about participant confidence in recruitment, retention, and creating a sense of belonging for students. The survey began with three questions about respondents’ level of confidence for *all* students. Exhibit 8 shows that between the pre- and the post-workshop survey, the average survey response increased by 0.61 points for the item, “I am confident in my ability to recruit more students to pursue computer science education.” All changes reported in the exhibit are statistically significant at the 0.001 level.

Exhibit 8. Changes in Summer of CS Participant Confidence With Respect to Serving All Students in Computer Science

Please indicate your level of disagreement or agreement with the following statements about ALL students in the school/organization where you work. I am confident in my ability to …	Pre-workshop mean	Post-workshop mean	Mean change
Recruit more students to pursue computer science education.	3.66	4.27	0.61
Encourage students to continue pursuing computer science education.	3.83	4.43	0.60
Create a sense of belonging for students in computer science education.	4.01	4.54	0.54

*Note. n*s ranged from 173 to 176. For the purpose of analysis, the research team assigned a numerical value to each response option (Strongly agree = 5, Agree = 4, Neither agree nor disagree = 3, Disagree = 2, Strongly disagree = 1).

The EWIG: CS grant seeks not only to expand computer science education opportunities overall but also to do so in a way that promotes equity and increases access for students who have not historically participated at high levels. To better understand ways in which Summer of CS might contribute to improving opportunities for students who are women/girls, who come from low-income backgrounds, who live in rural areas, who are English learners, and who identify as Black, Latino/a/e, and/or Indigenous, the survey asked the same set of questions specifically about these students. Exhibit 9 shows that between the pre- and the post-workshop survey, the average survey response increased by 0.51 points for the item, “I am confident in my ability to recruit more underrepresented students to pursue computer science education.” All changes reported in Exhibit 9 are statistically significant at the 0.001 level.

Key Finding #5

Survey responses reveal a positive and statistically significant change in confidence to recruit and retain students in computer science; this change is of a greater magnitude when the survey items referred to all students than when the survey items referred to historically underrepresented students.

Exhibit 9. Changes in Summer of CS Participant Confidence With Respect to Serving Historically Underrepresented Students in Computer Science

Please indicate your level of disagreement or agreement with the following statements about the historically underrepresented students in the school/organization where you work. I am confident in my ability to …	Pre-workshop mean	Post-workshop mean	Mean change
Recruit more underrepresented students to pursue computer science education.	3.83	4.33	0.51
Encourage underrepresented students to continue pursuing computer science education.	3.97	4.47	0.50
Create a sense of belonging for underrepresented students in computer science education.	4.09	4.55	0.47

*Note. n*s ranged from 174 to 175. For the purpose of analysis, the research team assigned a numerical value to each response option (Strongly agree = 5, Agree = 4, Neither agree nor disagree = 3, Disagree = 2, Strongly disagree = 1).

Changes in Participant Confidence With All Students and With Historically Underserved Students: Subgroup Results

As with the first set of items about participant confidence, we examined differences among subgroups of participants through regression analyses that included racial identity, gender identity, computer science teaching experience, and prior Summer of CS participation as independent variables. Items about all students (shown in Exhibit 8) and historically underserved students (shown in Exhibit 9) were all significant at baseline levels, but none of the respondent subgroups were significant. In other words, no particular subgroup improved more or less than others. Thus, all survey respondents seemed to feel that their workshops gave them greater confidence to work with all types of students, regardless of the educator's personal background. (See Appendix C for the full regression output.)

> **Key Finding #6**
>
> **Survey responses reveal a positive and statistically significant change in beliefs about who can and should do well in computer science.**

Changes in Participant Beliefs: Overall Results

Another dimension of equity in computer science concerns educator beliefs. Research suggests that conscious and unconscious bias shape views among adults and students about who can be successful in computer science (Ashcraft et al., 2017; Margolis, 2008; Scott et al., 2019). Success in an equity-focused effort to build capacity, therefore, might improve educator beliefs about who belongs in computer science and who can benefit from computer science. The next set of survey items, displayed in Exhibit 10, examines changes in respondents' attitudes about their students between the pre- and post-workshop surveys. For example, the average change was 0.16 for the item, “All students can do well on computing tasks with the right teaching and supports.” All of these changes are positive and statistically significant.

Note that all of the changes presented in Exhibit 10 are smaller in magnitude than the items shared in Exhibits 5, 6, 8, and 9. However, the pre-workshop average response is also higher; each exceeds 4, which places those responses between *Agree* and *Strongly agree* on the Likert scale. Thus, respondents came into their workshops already holding these beliefs, leaving less room for them to increase their agreement in their post-workshop surveys. These data suggest that survey respondents entered their workshop already having high levels of belief about what students can and should be able to do in computer science. Still, all changes reported in Exhibit 9 are statistically significant at the 0.01 level.

Exhibit 10. Changes in Summer of CS Participant Beliefs About Computer Science

Please indicate your level of disagreement or agreement with the following statements.	Pre-workshop mean	Post-workshop mean	Mean change
All students should learn the fundamentals of computer science.	4.43	4.64	0.21
All students can master the skills taught in computer science.	4.19	4.43	0.23
Learning computer science will help students succeed later in life.	4.47	4.60	0.14
All students can do well on computing tasks with the right teaching and supports.	4.39	4.54	0.16
All students can understand concepts underlying computer processes.	4.27	4.51	0.24

*Note. n*s ranged from 172 to 175. For the purpose of analysis, the research team assigned a numerical value to each response option (Strongly agree = 5, Agree = 4, Neither agree nor disagree = 3, Disagree = 2, Strongly disagree = 1).

Changes in Participant Beliefs: Focus Group Findings

Once again, contributions from group participants shed additional light on beliefs about who can participate in and be successful in computer science. Participants stated consistently across focus groups that all students can and should benefit from computer science education. One person shared, “It needs to be accessible to everybody and it should be an opportunity to learn.” Multiple respondents specified that computer science is beneficial to students who have historically had limited opportunities to participate. One workshop attendee noted, “I work with special education students, K through 5 in particular, and even our most delayed students, our autistic students, students that have challenges, they're all motivated by computer science." Another respondent shared a similar perspective: "Everybody needs it. Everybody can do it. The kids that are low-performing in some regards, are on the spectrum in some regards, excel at it. Then, on the other hand, I had an after-school program for more gifted kids. They excelled at it."

When asked about the degree to which the Summer of CS experience changed their beliefs, most respondents affirmed what we see in the survey results by noting that the workshop had reinforced preexisting views. "Inherently, my pedagogy and teaching is that all students deserve success at all levels, no matter what we're doing—if it's reading, if it's math, if it's computers. So I think I already had that," one participant reflected. "I guess the difference is I came in thinking that things needed to be equitable, but I didn't realize how important my role is in providing that to all my students." One attendee who did change their mindset about computer science explained the shift they experienced by saying, "I always thought computer science people were all these super geeky people that talk a bunch of code, and I know nothing about whatever that world is. I'm realizing that's really not what it is, and it really is an accessible thing to everybody."

Changes in Participant Beliefs: Subgroup Results

As with previous items, we conducted regression analyses to examine the connection between participant characteristics and changes in beliefs. Compared with first-time attendees, educators who attended Summer of CS in a previous summer showed more change in their beliefs that all students can do well on computing tasks and can understand concepts underlying computer processes, even after accounting for other background characteristics. Thus, repeated participation may strengthen educators' belief in students' ability to succeed in computer science.

Changes in Participant Perspectives: Comparing 2025 to 2024

The survey results reported here use the same survey instrument that AIR administered to Summer of CS participants in 2024 (see Lee et al., 2024, for full results). In this section, we describe key differences between 2024 and 2025 survey results.

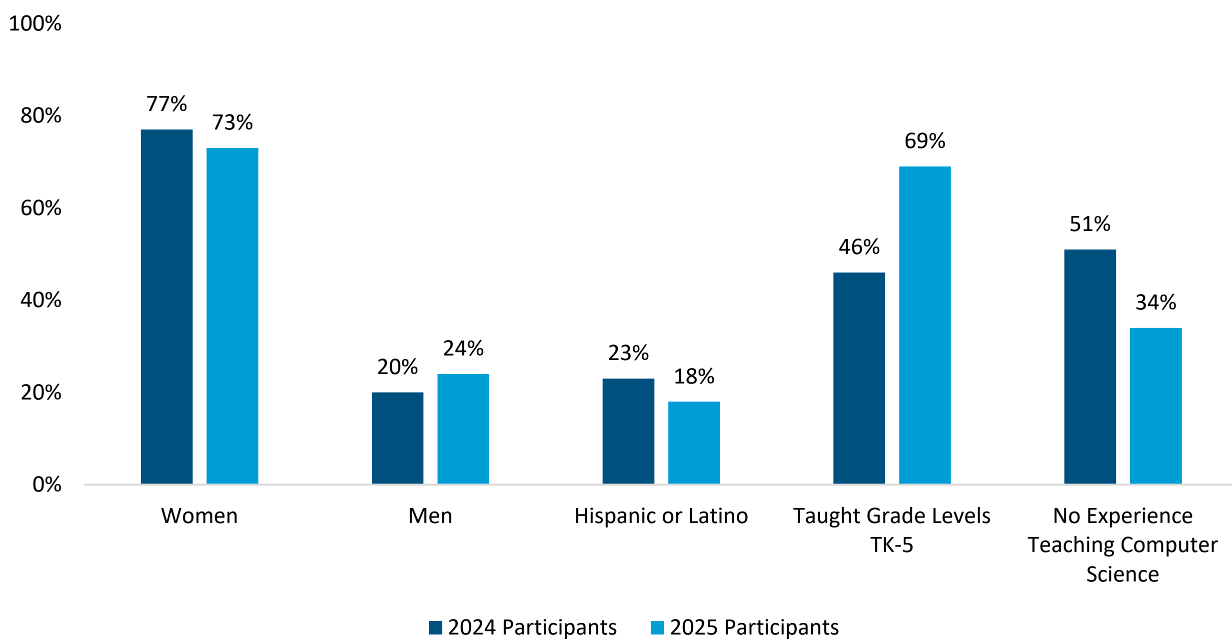
Workshop Participation

Summer of CS in 2025 featured fewer workshops (17) than in 2024 (44). Attendance also differed; 330 educators attended a 2025 workshop compared with 736 in 2024. This difference in overall workshop offerings—and therefore participation—is a direct reflection of the financial resources available to support Summer of CS in 2025, which were lower than in 2024. In addition, the following workshop participation data reveal differences among participants between the 2 years:

- Workshops in 2025 featured lower proportions of women and Hispanic or Latino educators. Almost three quarters (73%) of 2025 workshop attendees were women (compared with 77% in 2024), and 24% of 2025 attendees were men (compared with 20% in 2024). A slightly lower percentage of Hispanic or Latino educators attended workshops (18% in 2025 vs. 23% in 2024), but otherwise, racial identities of participants were similar.
- Attendees in 2025 were slightly less likely to work with elementary students. Slightly more than two thirds (39%) of attendees taught grades TK–5, whereas nearly half (46%) did the same in 2024.
- Educators' experience teaching computer science was also different between the 2 years. In 2025, a third of workshop attendees (34%) reported that they had never taught computer science. In 2024, more than half (51%) reported the same.
- Fewer educators took both pre- and post-workshop surveys this year. A total of 54% and 77% of attendees took both surveys in 2025 and 2024, respectively.

See Exhibit 11 for a visual representation of these differences.

Exhibit 11. Key Demographic Differences Between 2024 and 2025 Summer of CS Participants



Pre–Post Changes in Survey Responses

We also looked at how the mean change between pre- and post-workshop survey items changed between 2024 and 2025. Across all 19 survey items, mean changes were all statistically significant in both years. The magnitude of change was lower in 2025 than in 2024 for 16 of these items. However, these differences were very small; they ranged from 0.03 to 0.20.

Regression Results

We conducted similar regression analyses across both years using the same core model structure. This year's model included an additional predictor to capture prior workshop attendance; all other predictors remained the same. Readers may notice fewer statistically significant subgroup coefficients in 2025 than there were in 2024. However, we caution against making much meaning of differences between this year's and last year's regression results. Differences in results may reflect factors unrelated to the workshops, making direct comparisons potentially misleading. In addition, for items related to participant confidence, pre-workshop means were higher in 2025 than in 2024, meaning that there was less room to grow between the beginning and end of the workshop. Moreover, because the number of workshop participants—and therefore survey respondents—was smaller in 2025 than in 2024, our estimates may not be precise enough to detect statistically significant subgroup differences even if they do exist. We recommend further exploration of differential workshop experiences based on gender, race, and prior computer science teaching experience to better understand these dynamics.

Taking these differences and cautions together, our main takeaway from these comparisons is that both sets of workshop attendees showed substantial and positive pre-to-post changes in beliefs about computer science education. We also find that in both 2025 and 2024, the positive change in self-reported confidence is larger for educators with less prior computer science teaching experience. Although subgroup coefficients in 2025 are smaller and less significant than they were in 2024, we do not have sufficient evidence to draw conclusions about why that may be the case, given design and sample differences.

Findings About Applying Knowledge and Skills in Schools and Classrooms

The ultimate goal of a capacity-building investment like EWIG: CS is to change the practices of educators in ways that better serve students. Our best measures of quality for Summer of CS, then, are not the impressions of participants during their attendance but their behaviors when they return to schools and classrooms. Focus group participants shared their opinions about their level of preparation to teach and support computer science education, as well as the anticipated obstacles that might stand in the way.

Preparation to Teach Computer Science

When asked how prepared they felt to apply their learning when they returned to their organizations in the fall, focus group respondents identified several examples of ways in which they felt equipped for success. Most frequently, these workshop attendees described specific strategies they planned to employ in a classroom setting. One person explained, "I already feel like I have a bunch of new things that I'm like, 'I want to try that. I want to try that. I never thought of that.'" Another educator shared, "I can see myself using this literally the first week of school—not necessarily the micro:bit in hand, but at least the Make Code website, and [students] see their version of the micro:bit when they're actually creating."

Key Finding #7

Focus group participants felt well-prepared to apply their learning in classrooms and schools but also identified key obstacles such as inadequate administrator leadership, insufficient funding, and lack of state support for computer science.

Respondents in half of the focus groups also expressed excitement for integrating computer science content into other subject areas. "I don't have enough time in the day to teach it as a separate thing," one attendee reflected, "so I think they did a really good job … showing us how we can integrate it into other subjects." Another participant added, "If you look at the topics of all the trainings this week … they're all tied to other subjects, so … we're taking it back and we're using it in computer science classes too, but in regular classes instead of just computer science."

Obstacles That Stand in the Way of Computer Science Teaching and Learning

Despite the positive feelings about teaching computer science when school resumes, members of the focus groups also highlighted obstacles that they believed would stand in the way of applying lessons from the Summer of CS workshops.

Leadership From District and School Administrators

First among the challenges identified by focus group participants was a misunderstanding among district and school leaders about what computer science entails or why it is valuable. One person shared the following frustration:

> I think administrators either think of computer science as straight coding or they want drones because drones are cool and they can take pictures and put them on their Instagram, but micro:bits or physical computing or things that, to me, actually make it accessible to kids … they're just not interested at all.

Tied to this challenge for some respondents was the concern that administrators and teachers see computer science exclusively as a stand-alone subject and therefore are not poised to support the integration of computer science material into other classes. One educator noted the following:

> I anticipate the roadblock being that computer science is largely seen by teachers as a standalone subject rather than an amazing vehicle to facilitate all subjects. … If we could shift that, we would have more people integrating it into their classrooms, and that's when our students would have access.

Support from administrators was a broader challenge that focus group participants noted, with its absence, made computer science difficult to launch and sustain at a school site. "When we have conversations with our teachers," one educator explained, "they're constantly saying, 'Yeah, I'm not getting support from my admin.'" Another attendee echoed this sentiment by reflecting, "I can go to a training, but if your counselors and admin aren't in on it, then this [workshop] is just for the teacher and whatever impact they can make."

Funding for Computer Science

Focus group participants also drew attention to insufficient funding to support computer science education. One teacher shared, "There's not funding for up-to-date robotics or to replace ones that break because things wear and tear. There's not funding for new computers or even a new keyboard for a computer to be repaired. I have this equipment that's 10 years old; it's been out of date for eight years." Another teacher worried about having the tools to bring what they learned in their workshop into the classroom: "It was nice getting the micro:bit training, but it's something that can be kind of pricey. If the whole school is not on board, you might not have the micro:bits to actually implement the lessons with your students."

Statewide Support for Computer Science

Beyond the district or school level, participants in six focus groups lamented the lack of a priority for computer science education at the state level. Without a state law that requires schools to offer computer science, for example, these people noted that there are limited incentives for district and school administrators to launch classes and programs. Similarly, educators in these focus groups noted that districts and schools often prioritize subjects that are tested and reported annually by the state. Describing this mindset, one person noted, “If it’s not tested, then you might as well not teach it.”

Next Steps for the EWIG: CS Evaluation

The ultimate goal of a capacity-building investment like EWIG: CS is to change the practices of educators in ways that better serve students. Our best measures of quality for Summer of CS, then, are not the impressions of participants during their attendance but their behaviors when they return to schools and classrooms. Although focus group data help us to understand participants' expectations for how they will apply their newly acquired knowledge when they return to school, the data we discuss in this report cannot tell us whether these changes will take place. However, the AIR evaluation team plans to explore this issue through a follow-up survey to be administered to summer 2023 and summer 2024 participants during the 2025–26 school year. This follow-up survey will ask respondents about the concrete steps they have taken in the months and years after their workshop participation. The data from this survey will have limitations as they will rely on self-reported accounts of classroom behavior. Nevertheless, additional respondent perspectives captured a year after their Summer of CS experience should provide valuable information to supplement the intermediate outcomes reported here.

In the meantime, the research team has continued to explore the remaining research questions outlined in Exhibit 1. Survey and focus group data from Computer Science Champions based in California's county offices of education provide insights into Research Questions 4 and 5; please see AIR's March 2025 report, *CS Champions Survey and Focus Group Findings*. In addition, forthcoming case studies of districts across the state will enable an examination of computer science course availability and participation to address Research Questions 6 and 7.

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