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Response to Priorities

Expanded Computer Science Professional Development Week (E_CSPD_Wk)

leverages the content expertise of the CSTA national organization with the local context, relationships, and implementation expertise of CSTA chapter leadership to **organize a teacher-directed professional development (PD) sequence that satisfies 100% of continuing education required by the State Education Agency** (AP 3: Teacher-Directed Professional Learning & CPP 2: State Educational Agency Partnership). The professional learning options presented to CS teachers during E_CSPD_Wk are rooted in evidence-based, proven instructional methods, as well as research in adult learning principles (AP 1: Demonstrates Rationale). Building off the success of a teacher-led, -designed, and -directed pilot of CSPDWeek offered by CSTA South Carolina (CSTA SC) in summer 2020, this grant enables CSTA SC to: (1) expand programming to reach experienced CS teachers (in addition to new CS teachers); (2) explore micro-credentials in partnership with SC State Department of Education (SCDOE); and (3) offer an improved version of the expanded offering in year 2 and 3. Additionally, CSTA National will assist the replication of CSPDWeek in Indiana, which will launch in year two; the CSTA IN chapter will then offer their version of E_CSPD_Wk 4 times. Across the 2 states, this grant will enable a total of 7 E_CSPD_Wk events. **Each CSPDWeek will reach ~ 300 teachers/year, reaching 2,100 teachers during the grant. These 2,100 teachers will reach ~ 52,500 students (2,100 teachers X 25 students/teacher).** As summarized in the table, the 2 implementation states have many high-need students.¹

	# of Students	SES	Race/Ethnicity				Rural
State		FRL	White	Black	Latinx	Asian	
South Carolina ²	778,047	61.5%	49.5%	32.6%	10.9%	1.7%	52%

¹ CSTA's definition of high-need students is young women, rural, Title 1, and Black, Indigenous, and students of color.

² <https://ed.sc.gov/data/other/student-counts/active-student-headcounts/>

Indiana ³	1,135,194	47%	66.8%	12.3%	12.8%	2.7%	49%
TOTAL	1,913,241	53%	60%	21%	12%	2%	50%

A large percentage of districts in both states are located in rural areas⁴ (see Appendix F for details), thus E_CSPD_Wk will be designed with rural accessibility at the center (Rural Eligibility). Expected outcomes include: (1) Improve CS teachers’ personal and teaching attributes; (2) Increase the number of certified/endorsed CS teachers; (3) Increase the number of high-need students showing proficiency in CS; (4) Increase high-need students personal attributes in regards to CS; and (5) Increase access to CS-related teacher directed professional learning options.

Introduction

Developing, supporting, and sustaining K-12 computer science (CS) teachers is the key to more students learning CS. CS is the fastest growing subject in the US, based on College Board Advanced Placement (AP) data (Jones, 2018), with thousands of new teachers transitioning mid-career to teach CS annually. These teachers open doors for students to access these fast-growing fields. While the number of K-12 CS teachers in the US has exploded, most schools still do not offer CS⁵; and when they do, teacher preparation is significantly less than other subject areas. About 75% do not have a degree in CS or CS education,⁶ as compared to 30% and 18% of novice and veteran high school math teachers, respectively (Banilower et al., 2018). Marginalized communities are disproportionately impacted; they are less likely to have access to CS classes; and when they do, they are more likely to have new CS teachers without supports for professional learning.

Most CS teachers’ primary CS training is a one-time orientation PD workshop facilitated by a curriculum provider (Menekse, 2015), focusing on implementing a

³ <https://inview.doe.in.gov/state/1088000000/population>

⁴ NCES local codes 32, 33, 41, 42, and 43

⁵ <https://csteachers.org/Stories/announcing-the-2019-state-of-computer-science-education-report>

⁶ CSTA survey data shows similar trends; 73% of CS teachers do not have a CS degree.

specific curriculum (Jones, 2018). Few CS teachers report developing instructional skills during PD, collaborating with teachers in their school, and having a mentor/coach support their growth (Banilower et al., 2018). It is common for high schools to have one CS teacher, thereby leaving the teachers without departmental supports (Ni, 2011). Unfortunately, there are few opportunities to continue learning beyond joining another orientation PD or postsecondary course.

To address the aforementioned trends, CSTA proposes E_CSPD_Wk to provide statewide, teacher-directed, professional learning and community building that satisfies 100% of continuing education required by the State Education Agency across South Carolina and Indiana. CSTA is a dynamic and vibrant professional association with a general membership of 18,000+ educators organized as a network of 90+ local chapters in 48 states and Puerto Rico. Each CSTA chapter operates as a teacher directed Professional Learning Community (PLC), influencing large numbers of CS teachers' mindsets and practices.

(A) Quality of the Project Design

South Carolina's inaugural CSPDWeek was held⁷ July 20-24, 2020. Hosted by CSTA SC, The Citadel, and SCDOE, CSPDWeek offered multiple weeklong workshops for 200 K-12 SC educators⁸ to receive a 30-hour, state-recognized CS PD experience⁹ Even in the virtual setting, CSPDWeek provided extensive opportunities for active, hands-on learning, plus the time and space to informally learn from and share promising practices with other teachers (see Appendix I for a few examples).

While the Inaugural CSPDWeek in SC¹⁰ was a huge success, improvements can always be made based on teacher feedback. Therefore, E_CSPD_Wk will include

⁷ Originally the event was to be held at The Citadel. Due to COVID-19, it was moved to a virtual format.

⁸ Of the 200 attendees, only 5 taught elementary, 62 taught middle, and 132 taught high school students.

⁹ SC requires 30-hours of PD in order to teach introductory CS courses, allow it does not specify what PD must be taken, as long as it is SC-approved or -recognized. CSTA SC obtained approval from SC for the PD offered during the inaugural CSPDWeek in July 2020.

¹⁰ The inaugural CSPDWeek in each location is referred to as version 0.

multiple strands to meet CS teachers' diverse needs¹¹ Strands will align to the 4 most common entry points to CS PD, as presented in the CSTA Guide for Reflective Teachers, including: (1) New teacher + new to CS; (2) Experienced teacher + new to CS; (3) New teacher + experience in CS industry; and (4) Experienced teacher + experienced in teaching CS + desires to go deeper into CS content and/or CS pedagogy. Further detail on the strands can be found in Appendix I.

After learning from CSTA SC's first full implementation of CSPDWeek with strands (V1), the expansion to Indiana will begin, as summarized below; please note the cells in bold (V2.X) indicate the implementation year of the study.

	2020 (pre-grant)	2021	2022	2023	2024	2025
South Carolina	V0	V1 (pilot)	V2.1	V2.2		
Indiana			V1	V2.1	V2.2	V2.3

(1) Professional learning replaces existing mandatory professional development

Both SC and IN are leaders in the statewide CS education movement. SC approved K-8 CS standards in 2017 and high school CS standards in 2018. Beginning in 2019-20, the state's graduation requirement includes a CS course, and K-8 CS and Digital Literacy is mandated to be taught to all elementary and middle school students. Similarly, IN adopted K-12 CS learning standards in 2016 and will require (beginning July 1, 2021) each public school to offer a CS course to high school students. In spring 2019, Indiana was the first state to implement a statewide assessment to measure student achievement in CS in grade 6. **These two states' policy frameworks, combined with current limited PD, shows strong demand for E_CSPD_Wk teacher-directed PD to replace state required PD.** See CS-specific context data summaries for each state in Appendix I.

(d 1) Stipend system policies and replacement of mandatory PD

¹¹ This expanded offering, including multiple strands, is what we refer to as version 1.1 & 1.2.

¹² .

In Fall 2018, South Carolina state leadership convened a committee¹³ to draft CS PD recommendations resulting in a process to review CS PD providers' curriculum to determine if it is sufficient and aligned to the state standards. CSTA SC received approval for 100% of the 30-hour mandatory hours for the inaugural CSPDWeek. SCDOE views **E_CSPD_Wk** as a key part to their CS PD vision, including micro-credentialing. CSTA SC and SCDOE's relationship is described in Appendix C.

(d 2) Stipend system will ensure that teacher-directed PD meets goals /activities

E_CSPD_Wk is designed so that all teacher selected pathways will be aligned to the CSTA Teacher Standards and meet the goals of the project. This structure also ensures that participants who complete the full program will receive 100% of state required continuing education credits. To promote completion, teachers will receive stipends in two payments: (1) [REDACTED] upon successful completion of the summer CSPDWeek, and (2) [REDACTED] the following June after completion of 8 PLC meetings throughout the school year.

(2) Use of stipends for high-quality professional learning

All professional learning options offered through E_CSPD_Wk will be aligned to the CSTA Standards for CS Teachers and vetted by the CSTA PD Committee or the elected CSTA chapter leadership in each state. The *CSTA Standards for CS Teachers* are designed to provide clear guidance around effective and equitable CS instruction in support of rigorous CS education for all K-12 students, in order to: (1) Explain what CS teachers should know and be able to do; (2) Provide aspirational goals to guide teachers' professional learning and to continuously develop their teaching practice from novice to master CS teachers; and (3) Establish benchmarks for CS professional learning. A complete description of each of the 5 indicators (CS Knowledge & Skills, Equity & Inclusion, Professional Growth & Identity, Instructional Design, and

¹³ The 6-person committee included the two Key Personnel from CSTA SC chapters.

Classroom Practice) is in Appendix I.

In addition to aligning PD to the CSTA Standards, E_CSPD_Wk acknowledges that teachers enter CS with diverse backgrounds and different strengths and need different PD experiences. Participants will use the CSTA Guide for Reflective Teachers, developed by a working group comprised entirely of current or former teachers, to identify areas for professional learning within the *CSTA Standards for CS*. **This is the crux of the E_CSPD_Wk; it has a variety of options for both beginners and experienced teachers and empowers teachers to choose their own pathways.**

The CS education field is held back by limited standardized measures of student CS achievement and no standardized measures of teacher growth. Professional learning programs for CS teachers currently must rely on self-reported confidence and efficacy data from participants to evaluate and improve teacher growth. Given the teacher-directed focus of E_CSPD_Wk, CSTA proposes to work with expert researchers in CS education to develop a standardized measure of growth across the *CSTA Standards for CS Teachers* to enable teachers to track their progress across PD opportunities. Beyond this project, a widely accepted measure of teacher growth would enable teachers to identify their areas of need and programs to support their growth, allow schools of education to assess future CS teachers' preparedness, and support policy makers as they develop new endorsement and certification requirements for CS teachers. The distributed, self-directed structure of E_CSPD_Wk is perfectly suited to develop this measure.

(c 3) Proposed stipend structure, including protection against fraud, waste, and abuse

Stipends to teachers for their time will be paid in two ways: (1) at E_CSPD_Wk conclusion, based on the hours of PD completed; and (2) upon completion of ongoing PLC meetings and teacher-led PD throughout the school year following E_CSPD_Wk. Attendance will be taken at all E_CSPD_Wk and follow up PLC sessions and determine eligibility for the stipends. Complete attendance at E_CSPD_Wk (36 hrs, [REDACTED]) and participation in at least 75% of PLC meetings (12-16 hrs, [REDACTED]) will be required.

Attendance will be monitored through CSTA’s chapter web platform, which includes an event management system, widely used by CSTA chapters across the U.S.

CSTA will implement a multi-step payment review process. All payments will be issued electronically and require a 4-person review process. The site specific program manager will approve all attendance records and send to CSTA and the stipend manager will review, approve, and email payment information to bill.com. The accounting team will then review the payment and documentation, and create a pending transaction in bill.com. The director of operations will review and approve the pending transaction. Last, the accounting team then pays the bill after approval.

(f 2) Stipend system management process, including determination of new PD meeting the definition of “professional learning” and processes for timely reimbursement

CSTA has an existing, active process to curate quality PD opportunities for K-12 CS teachers to make it easy for CS teachers who have diverse needs and goals to find relevant PD opportunities through an interactive web display. CSTA publishes an updated list of quality programs each quarter. Teachers can filter opportunities based on grade level, experience, course alignment, cost, and delivery mode (online or in-person), and more specific criteria. They can click a card to view more detailed information about the PD and the associated curriculum and visit the program website.¹⁴

An independent committee of experts evaluates submissions from teachers and PD providers using a rubric aligned to indicators of quality CS PD (Vallaincourt & Schanzer, 2018) and elements of effective teacher PD (Darling-Hammond, Hyler, & Gardner, 2017) including:

Active Learning	Efficacy	Models & Modeling	Sustained Duration
Differentiation	Content Focus	Feedback & Reflection	Ongoing Support
Collaboration	Inclusivity	Scale & Sustainability	Accessibility

To increase teacher choice, teachers can also submit PD opportunities to their local elected chapter leadership. **Using similar criteria to that used by the committee of**

¹⁴ <https://csteachers.org/page/quality-pd-review-process/>

content experts, the local elected chapter leadership will approve programs for their state E_CSPD_Wk, including funding for teachers to develop and deliver content that meets their local needs for CSPDWeek. As budgeted, CSTA plans for teachers to be eligible for up to [REDACTED] to develop a complete PD strand. Once approved, the local project manager will maintain an electronic record of attendance to provide the stipend manager at the end of the week. This will allow the stipend manager to quickly issue stipends based on teacher attendance. Payments to PD providers will be made through an electronic payment system, managed by the CSTA stipend manager who can release payments in a timely manner.

(3) Flexibility and autonomy for teachers in selecting their professional learning

As is true with all CSTA operating procedures, teachers will have control to develop the menu of options offered at their local CSPDWeek by leveraging the following: (1) CSTA Chapter Leadership will review the prior year's offerings, feedback forms, and related surveys, with an eye toward the following questions: what was missing, was that PD quality, did the PD address specific teacher needs?, etc.; (2) CSTA Chapter Leadership, in partnership with the state department of education, will solicit requests from local teachers with the quality PD listing as a starting point, and use this to make the initial K-12 options available during the CSPDWeek; (3) CSTA Chapter Leadership will identify gaps based on requests for the region and develop additional offerings; (4) Teachers will select into the content that is most relevant to them during the registration process. Teachers will be provided a Catalog with descriptions of each offering, including a comparison table clearly identifying the target audience, state standards alignment, and key concepts/skills covered in each workshop; and (5) CSTA Chapter Leadership and SEA staff will be available to talk teachers through selecting a workshop.

(d 3) Communicating professional learning options not previously available to teachers

Many educators from a variety of subject areas are tasked with teaching CS content and courses, yet there are very few PD opportunities available to them despite mandatory

standards at the state level. As an example, the SCDOE issued waivers to 77 schools/districts to provide an additional year to obtain training in CS for teachers. These new-to-CS teachers will be targeted for E_CSPD_Wk.

Additionally, CSTA SC and SCDOE in partnership have determined that there are also schools/teachers in SC who seek training that “goes beyond the basics.” Recent CS PD has heavily focused on introductory CS curricula, and little training has occurred for curriculum agnostic content and pedagogy (e.g., cybersecurity, supporting English learners, improving feedback on student projects). CSPDWeek will provide an opportunity to reach teachers who desire this next level of training.

In partnership with the SEA, E_CSPD_Wk will be marketed by the CSTA chapter, leveraging the vast networks that make teacher-led organizations special. As an early way to pique interest, CSTA chapter leadership will promote the expected CS teacher benefits of attending this teacher-directed PD experience, including: (1) Providing a no-cost opportunity for all SC educators to learn CS regardless of prior experience, subject area, or geographical location; (2) Bringing high-quality, standards-based, engaging PD workshops that are fundamentally based in sound CS pedagogical practices; (3) Creating a safe environment and multiple avenues for professional collaboration among educators; (4) Celebrating and showcasing CS successes in education and industry from across implementation states; (5) Motivating educators to return to their classrooms encouraged, excited, and well-prepared to provide quality CS instruction; and (6) Exposing educators to a variety of CS curricula, instructional materials, and hardware / software tools.

(d 4) Mechanisms for teachers to select different high-quality, instructionally relevant professional learning activities connected to high-need students’ achievement

Effective CS teachers continuously develop their knowledge, practice, and profession to keep pace with the rapidly evolving discipline. They are reflective practitioners who examine their pedagogy, teaching strategies, strengths, and improvement. This self-reflection helps teachers change attitudes and awareness, which lead to their professional

growth and ability to support their students. To support CS teachers' self-reflection and development process, CSTA has developed and distributed two tools (found in Appendix I): (1) The **Self-Reflection Checklist** to analyze individual strengths and improvement areas aligned to the *CSTA Standards for CS Teachers*; and (2) Teachers then use the **Roadmap for Professional Learning** to identify areas of focus and begin planning activities to support development of these target knowledge and skills, regardless of the CS teacher's entry point to the profession. Through the development of a standardized assessment of teacher growth to be developed in this project, teachers will be able to chart their progress and select instructionally relevant content at E_CSPD_Wks over multiple years.

(4) Simple process for teachers to select professional learning based on needs

CSTA has an established process for teachers to identify and select their own professional learning needs, as described previously. The new E_CSPD_Wk links these processes to state guidance on micro-credential requirements, selection through an online registration system. CSTA has deep experience leveraging registration systems for large conferences and will utilize these systems and design flows to ensure teachers have a simple process to select their preferred learning options.

(5) Goals, objectives, and outcomes are clearly defined and measurable

E_CSPD_Wk's measurable goals, objectives, and outcomes are summarized below.

Objective	Measurement
Goal 1: Improve CS teachers' personal and teaching attributes through E_CSPD_Wk and ongoing supports.	
1.1 Improve CS teachers' personal attributes (CS knowledge, skills, interest/engagement in CS, and CS identity).	Standards for CS and Reflective Teaching Checklist, surveys, classroom observation in Y3
1.2 Improve CS teachers' teaching attributes (CS pedagogy, CS teaching community, confidence in teaching CS).	Standards for CS and Reflective Teaching Checklist, surveys, classroom observation in Y3
Goal 2: Increase the statewide number of certified / endorsed CS teachers through E_CSPD_Wk and ongoing supports.	
2.1 Increase the statewide number of newly certified / endorsed CS teachers.	State certification / endorsement data

Goal 3: Increase the number of high-need students showing proficiency in CS.	
3.1 Increase the number of high-need students that pass a CS-related course.	Official transcripts
3.2 Increase the number of IN students at the proficiency level in CS on the ILEARN or ISTEP.	IN standardized test data
3.3 Increase number of high-need students enrolled in AP CSP or AP CSA.	Official transcripts
3.4 Increase number of high-need students who take the AP CSP or AP CSA exam.	AP CSP or AP CSA Exam enrollment, as compared to baseline year for each participating school
3.5 Increase number of high-need students who earn a qualifying score on the AP CSP or AP CSA exam.	AP CSP or AP CSA Exam
Goal 4: Increase high-need students personal attributes in regards to CS.	
4.1 Improve students' personal attributes ¹⁵ (CS interest/engagement in CS, CS identity, and engagement in CS course).	Student survey and classroom observation in year 3
Goal 5: Increase access to CS-related teacher directed professional learning options.	
5.1 Increase the number of CS teachers attending E_CSPD_Wk and related activities.	Attendance logs
5.2 Offer E_CSPD_Wk in a second state (Indiana).	Attendance logs
5.3 Integrate participants into local CSTA chapters for ongoing teacher directed professional learning	Attendance logs
5.4 Disseminate findings so that more states consider offering teacher directed professional learning options.	Dissemination logs

(B) Adequacy of Resources and Quality of the Management Plan

CSTA currently manages a portfolio of over [REDACTED] in multi-year grants from a variety of sources and raised [REDACTED] in FY2020 from all sources. Four grantors have funded CSTA annually for programmatic and operating support and recently signed long-term commitments; these and several others also regularly sponsor CSTA's conference. CSTA has an annual audit and all have been clean, showing strong fiscal controls and systems. CSTA contracts with an accounting service vendor for its monthly accounting and augments and supervises this vendor's activities with internal operations staff including an Office Manager, a Director of Operations and the Project Director. This vendor tracks and manages accounting compliance requirements of federal grant programs and currently manages requirements for a number of active federal grants. UC

¹⁵ Tool to measure student attitudes: <https://csedresearch.org/tool/?id=196>

San Diego (the independent evaluator) also has extensive fiscal control protocols with oversight from the local office, as well as the campus budget office and contracts and grants office with capacity to serve high volumes of external and internal budgeting.¹⁶

(1) Sufficient stipend to replace mandatory professional development

All strands of E_CSPD_Wk will satisfy 100% of the mandatory PD requirements in SC and IN. Research shows that PD must be of a sustained duration to change practice, and E_CSPD_Wk is designed to sustain throughout a full academic year, with four, two-hour, content specific workshops and four, two-hour, facilitated PLC meetups throughout the year, for a total of 52 hours of professional learning.¹⁷ Yoon et al. (2007) identified nine studies of PD using experimental or quasi-experimental designs and found that the effective PD models examined in these studies offered an average of 49 hours of development per year, with an associated average boost in student achievement of 21 percentile points.¹⁸

(c 1) Stipend structure, including estimated amounts and associated expenses

The hourly rate used to calculate the E_CSPD_Wk stipend is [REDACTED] hour, as described in detail on p.6 (d2). Additional stipends to cover the costs of travel and housing to attend E_CSPD_Wk will be offered to geographically disparate, rural teachers.¹⁹ [REDACTED] per strand (30 participants) is estimated to be paid directly to PD providers.

(c 2) Stipend is sufficient to ensure access to professional learning activities that are comparable in quality, frequency, and duration to nonparticipating teachers

Because the two participating states mandate the number of hours²⁰ required to teach an introductory CS course, but do not have specific requirements for the quality or frequency of the professional learning, E_CSPD_Wk's design far exceeds the quality,

¹⁶ UC San Diego received approximately \$1B in outside grant funds in 2018-19

¹⁷ Excerpted from Darling-Hammond et al., 2017

¹⁸ https://learningpolicyinstitute.org/sites/default/files/product-files/Effective_Teacher_Professional_Development_REPORT.pdf

¹⁹ For budgeting purposes, CSTA assumes 60% of participating teachers will require a travel stipend.

²⁰ Mandated duration = 30 hours.

frequency, and duration²¹ that nonparticipating teachers can access. Teachers will be compelled to attend E_CSPD_Wk because it is grounded in the aforementioned evidence-base, aligned to standards, and has a sustained frequency; the stipend merely helps compensate them for their valuable time.

(2) Costs are reasonable given objectives, design, and potential significance

CSTA requests [REDACTED] in EIR federal funding to build off the success of a teacher-led, -designed, and -directed pilot of CSPDWeek held in July 2020 in order to offer a variety of options for both beginner and experienced CS teachers to choose their own pathways to meet their diverse needs that satisfies 100% of continuing education required by the SEAs in SC and IN. Across the two states, this grant will enable a total of seven E_CSPD_Wk events, each 52-hours in length over the course of an academic year.

This represents an investment of approximately [REDACTED] per teacher (2,100 teachers trained over the grant period). Each of these teachers will reach at least 25 students, thus impacting a total of 52,500 students; the investment per student is only [REDACTED]

The main cost drivers for E_CSPD_Wk are stipends for participating teachers (totaling [REDACTED]), teacher-led, -designed, -delivered PD via CSTA SC and IN ([REDACTED] and [REDACTED] respectively), and the third-party evaluation.

(3) Easy payment structure enables teachers to apply for and use the stipend

CSTA will use an online registration system to manage teacher applications for each CSPDWeek. This system will be built off of CSTA's registration system used by ~3000 teachers to attend its annual conference, and will ensure that participation is easily accessible to all teachers. During the registration process we will collect information about each applicant's school and CS class demographics in order to prioritize teachers who reach high-need students within the state if demand surpasses the stipends available.

(f 1) Selection of professional learning options selection and vendor payment

²¹ E_CSPD_Wk duration = 52 hours.

Teachers will be able to submit their selections from the list of opportunities as part of the online registration system for CSPDWeek. During this process teachers will be able to review all options and select the one(s) that meets their needs. CSPDWeek will contract directly with the PD providers, ensuring that payment is made to them without requiring the teacher to request pre-payment of a stipend or reimbursement.

(f 2) Selection of additional professional learning options, determination of meeting definition of “professional learning” and timely reimbursement to teachers

Professional learning options not currently listed as meeting the requirements of the CSTA PD Committee will be regularly reviewed by the committee. Additionally, programs that are not listed or interested in completing the full review process could request a local exception. This process is described in detail on p.8-9

(4) Qualifications of key personnel

The table below summarizes the key personnel roles for E_CSPD_Wk; their qualifications follow. Detailed resumes/curriculum vitae are found in Attachment B.

Name	Activities
Jake Baskin, CSTA (Project Director)	Overall leadership of CSPDWeek including convening the project team and ensuring strong grant management
CSTA Chapters	Recruit teacher planning committees, market local CSPDWeek, recruit participating teachers, organize and host local CSPDWeek, liaise with SEA
SEA	Assist in marketing, align CSPDWeek curricular options to micro-credentials and/or certification that it replaces mandatory PD, provide necessary documentation of fulfillment of PD

Jake Baskin (Project Director) is the Executive Director of CSTA, the world’s leading association for K-12 CS teachers. He is a former high school CS teacher, department chair, and PD provider with the Chicago Public Schools. Prior to joining CSTA, Jake was Director of State Government Affairs for Code.org, where he worked with educators and policymakers to advocate for policies that expand access to high-quality CS education. At Code.org, he helped build a nationwide network of regional partners that worked with over 100 districts to implement comprehensive CS programs.

Rosemary Bianchi has over a decade of experience in CS education serving as a teacher and school administrator. Her love of technology and computers at a young age has fueled her passion and excitement for all things computing, including leading as the Secretary of CSTA SC, and serving on state policy and planning committees.

Jennifer Albert, Director of the STEM Center of Excellence and Assistant Professor at The Citadel, has been actively involved in CS since 2013. She has been involved in writing both the SC K-8 and High School Digital Literacy and CS Standards. She has been a CSTA member since 2013 and started chapters in both NC and SC. **Angel H. Malone, Director of the Office of Career and Technical Education with the SCDOE,** ensures that all students in SC are #FutureReadyCTE. In her nearly twenty years in education, she has served as a science teacher, science instructional coach, assistant principal, and founding principal of a health professions high school.

(5) Management plan will achieve the objectives on time and within budget

Given the scope and breadth of E_CSPD_Wk's plan to drastically transform the way CS teachers access professional learning across two states, in partnership with SEAs, the table below is a brief summary of the detailed plan that each partner will develop.

(6) Procedures to inform continuous improvement and systematic changes

In Year 1, E_CSPD_Wk personnel will build a formative feedback loop with CSTA SC leaders to collect and analyze data about marketing, recruitment, course offerings, and accessibility of the pilot program, as well as teacher feedback on how they experienced and used each program element. This data will be used to identify challenges and opportunities in the pilot, which will inform future PD design and implementation. After the initial formative feedback loop, evaluation team members will inform continuous improvement processes via monthly informal and quarterly/annual formal updates.

Milestones	Responsibility	Y1 '21	Y2 '22	Y3 '23	Y4 '24	Y5 '25
Solidify communication mechanisms between partners, participating districts, and interested schools	PD, E, CLS					
Hire positions	PD					
Design and manage a nomination process for CSPDWeek menu of options	PD, PM, CLS					
Develop instruments to evaluate teacher growth	E, PM					
Setup automated systems for stipend tracking, oversight, and payment	SC					
Hire local site manager (contract position)	PD, PM					
Work with state CSTA Chapter and SEA to develop PD need areas aligned to state strategy and certification requirements	PM, CLS, SM					
Solicit nominations from the local teacher community via local CSTA chapter to develop menu of PD for CSPDWeek	PM, SM					
Confirm data-sharing agreements and execute contracts with participating schools	PM, SM					
Launch application for teacher participants and hold outreach events with local chapter and market event through SEA to all districts	SC, CLS					
Hold CSPDWeek	PM, SM, CLS					
Launch virtual PLCs to support teachers throughout the year	PM					
Hold regular PLC meetings with local CSTA chapter, led by local teachers.	PM, SM					
Collect evaluation data from end of year – AP test, student grades,	PM, E					
Collect annual feedback from students, teachers, administrators, and staff to inform continuous improvement	E, PM					
Make semi-annual updates to program to reflect feedback from key stakeholders, partners, and participants	E, PM					
Develop complete evaluation and management plans to submit to DOE	PD, PM, E					
Finalize data analyses; Disseminate learnings to amplify impact	PD, DE					

A key component of the evaluation feedback loop will be the incorporation of student data to focus chapter leaders on actionable items to increase recruitment, engagement and success of CS teachers by diversifying module choices. For instance, an improvement loop might include an analysis of teacher grade spans, potentially identifying recruitment or programming gaps. This could then inform the next year’s marketing and recruitment strategy. Whatever the interventions, evaluation data will inform the program design.

(g 1) Strategy to expand use of stipends, including continuously improving the system

CSTA has a network of chapters across 48 states and Puerto Rico, and plans to replicate CSPDWeek in new states based on learnings from SC and IN. Through each chapter’s close relationship with their respective SEAs,²² we plan to design future E_CSPD_Wk offerings that meet each state’s PD requirements. Because the CS certification/endorsement landscape is still developing, we will continuously improve the process to align PD offerings to the state’s certification requirements, thus giving each state the autonomy and flexibility to structure CSPDWeek to maximize opportunities for teachers to work toward endorsements/certifications.

(C) Quality of the Project Evaluation

UC San Diego’s Center for Research on Educational Equity, Assessment, and Teaching Excellence (CREATE) is an interdisciplinary research center that increases understanding and development of education-related services, in particular for TK-20 low-income and under-represented students, including many federal grant evaluations (e.g., Department of Education, National Science Foundation, Office of Naval Research, Department of Defense). **Dr. Monica Sweet, CREATE’s Co-Director of Research and Evaluation, will lead all aspects of the evaluation.** Dr. Sweet is a quantitative and developmental psychologist with expertise in education-related research and evaluation

²² Often CSTA leadership are selected to fill newly formed CS positions within SEAs.

as well as longitudinal, multivariate, and multilevel designs. She has taught 40+ courses, published in top tier journals, and conducted 50+ evaluations, including evaluations of two related NSF-funded projects focused on CS education. **Dr. Susan Yonezawa, CREATE Associate Director, brings qualitative expertise to the fidelity of implementation evaluation.** Dr. Yonezawa has a Ph.D. in Educational Policy and expertise in student voice, personalization, and equity-minded school reform research. She has published 25+ articles and chapters and led projects funded by entities such as ONR, NSF, and Spencer Foundation. She is also currently evaluating a 2019 EIR grant.

The proposed evaluation will study all aspects of E_CSPD_Wk, from fidelity of implementation to student outcomes, using a mixed-methods approach, including both mediating and moderating factors, and employing a multivariate and multilevel design when testing student outcomes (with students nested within teachers/classes and teachers nested within grant year). The evaluation draws from intertwined Logic Models, depicted as *Figures 1* and *2* in Appendix I. *Figure 1* defines the key project components (PD), mediators (teacher outcomes), and student outcomes, as well as their theoretically linkage. *Figure 2* delves into the programmatic aspects of E_CSPD_Wk, including how teacher-directed PD is selected and experienced, how teachers engage with content and apply it in their classrooms, and how these work in conjunction with teachers' pre-project CS- and CS-teaching-related attitudes, beliefs, and knowledge to impact the attributes thought to foster improvements in the student outcome variables listed in *Figure 1*.

The evaluation plan will consist of three sub-studies: SS1=fidelity of implementation (each year); SS2=project impact on teachers (each year), and SS3=project impact on students in CSP and CSA classes (Years 3 and 4).

SS1 will include measures of fidelity of implementation, including attendance and hours of participation overall and per module. This data will be collected by CSTA and shared with evaluators for analysis. Additional fidelity-related data elements will be identified during Year 1 in parallel with implementation. In Year 3, SS1 will include PD

observation, as E_CSPD_Wk implementation will be especially important in the Year 1 of the student impact study. SS1 data will be analyzed and reported using primarily descriptive and qualitative means, although when possible, findings will be disaggregated by prior CS teaching (no, yes) and CS PD history (years of prior CS PD).

SS2 is the study of teacher impact, corresponding to Figure 2. It will include repeated measures of teachers' personal and teaching attributes relating to CS-and perception measures of PD-related engagement, learning, and classroom application to allow for change analysis over time, as well as the mediating effects of E_CSPD_Wk on teacher attributes. Teachers will complete surveys pre-post summer PD and at the end of each following school year until grant end. Surveys will measure all variables defined in *Figure 2*; questions and prompts tapping into these constructs will be drawn from surveys used successfully in CREATE's prior evaluations of CS teacher training. Teachers will complete an objective assessment of CS teaching standards use/ knowledge on the survey timeline. Resulting data will be analyzed using longitudinal multi-level models reflecting the structure of *Figure 2* and include potential moderators of those relationships (e.g. years teaching CS, credential, CS class type, school SES/ URM, urban/rural).

SS3 is the study of student impact, corresponding to Figure 1. Data for SS3 will be collected during Years 3-4 and analyzed during Years 3-5, given timing of student-level data availability. Given the lack of standardized CS student outcome measures for most CS classes, SS3 will focus on CSP and CSA classes, which are more standardized due to their AP exams. They also allow for analysis of AP results. Student data will be provided by schools/districts and include AP scores (score, pass/no pass)-and course grades (letter grades, pass/no pass, and Z scores relating to points earned in class). SS3 teacher data will be the same data collected in SS2; teacher outcomes from same year as student outcomes will be analyzed. To more accurately consider project impact on students, SS3 will include a comparison group of teachers (and their students) who did not experience E_CSPD_Wk. Comparison group data will be analogous to project group data and be

collected during the same school year, resulting in two streams of SS3 data in Years 3-4: one for the E_CSPD_Wk group (or ‘treatment’ group) and one for the comparison group. Resulting data will be analyzed using multi-level models (students nested within year and years nested within teachers) reflecting the structure of *Figure 1* and including potential moderators of those relationships (e.g. years teaching CS, credential, CS class type, school SES/ URM, urban/rural,) as well as variables of ‘treatment’ (project/control) and CS class type (CSP/CSA).

(1) Methods produce evidence that meet the WWC standards with reservations

The evaluation will employ a quasi-experimental design, with teachers as the unit of selection, to meet WWC standards with reservations. Comparison group teachers will be selected to match CSP and CSA project teachers in the student impact study (Years 3-4); matches will be made using propensity scores (Austin, 2011; Rosenbaum & Rubin, 1983, 1984) derived from teacher-level variables such as credential, years teaching (all and CS), CS background, and gender, and school-level variables such as school SES and URM %, and urban/rural. This set of WWC-approved analyses will be used to determine magnitude and significance of E_CSPD_Wk versus comparison teacher-based differences in student outcomes. CSP and CSA outcome analysis will be conducted separately. In addition to these main analyses of student impact, a series of comparative interrupted time series analyses (CITS, or difference-in-differences) analyses will be conducted for teachers with prior CSP/CSA experience, using student outcome data from past years as a baseline to assess magnitude and significance of change, and more specifically, differential change across project versus comparison groups.

Power analysis estimates for the proposed CITS analyses were calculated using PowerUp! (Dong & Maynard, 2013). Given an estimated power ($1-\beta$) of 0.80, a one-tailed alpha level (α) of 0.05, a conservative estimate of student cohort sizes within teacher ($n= 35$), and an estimated MDES (minimum detectable effect size) of 0.5 (a half standard deviation difference in average outcomes), E_CSPD_Wk needs ~50 teachers per

analysis, or 25 project teachers + 25 comparison teachers. Given the projected number of AP CSP/CSA teachers in the pool of available teachers and projected number of teachers participating in the project per year, these teacher sample sizes should be achievable.

(2) Components, mediators, outcomes, and acceptable implementation thresholds

The designs of SS1-SS3 define all variables of interest, including how and when data will be collected. The designs also detail the specific analysis plans for each sub-study, which include qualitative and quantitative means of assessing the project's nature and magnitude as well as mediating and moderating factors on both teacher and student outcomes of interest (i.e. Pearl, 2010). SS2 (*Figure 2*) depicts the hypothesized paths of E_CSPD_Wk influence, how the project elements act as mediators of change in teacher outcomes, and SS3 (*Figure 1*) considers the influence of E_CSPD_Wk on student outcomes as a function of the mediating effects of teacher outcomes, and the impact of both teacher/school level and student-level moderating factors on these relationships. SS3 also contains methods to allow for WWC-approved standards of producing evidence of impact on students. SS1 details a more qualitative and descriptive study of fidelity of implementation, with determinations of minimum acceptable thresholds to be set in Years 1–2. To start, 'acceptable implementation' will include 80% of participating teachers attending all 48 PD hours and teachers demonstrating statistically significant increases in performance on the to-be-developed assessment of CS teaching standards.

(3) Methods provide performance feedback and periodic assessment of progress

The evaluation team will conduct all analyses in a timely manner, reporting informally back to project leads for formative purposes during monthly meetings. Drs. Sweet and Yonezawa will prioritize the SS1 analysis and reporting after the summer intensive PD and at the end of the school year (when teachers have completed follow-up PD), to allow for: a) data-driven decisions based on actionable recommendations from Drs. Sweet and Yonezawa, and b) project iterations for the next implementation year. SS2 results will be used for formative and summative purposes; if teachers are not

experiencing positive changes in CS-related personal and teaching attributes, for instance, project leads and evaluation team will pinpoint modifications. The longest lag will occur for the summative SS3 analyses, as they require student outcome data, which will not be available until the summer after the study year. Drs. Sweet and Yonezawa will provide formal summaries of findings for grant reporting purposes and work with CSTA to disseminate findings and to the CS education community and to the research and applied education communities, via presentations/publications.

Additional Application Requirements

(a) Pool of teachers eligible to request a stipend, including eligibility prioritization

E_CSPD_Wk will be open to all public/charter school teachers in SC and IN who will teach CS in the next school year, as a standalone class or integrated in other coursework, ensuring that learnings can be applied in the following academic year. If interest exceeds availability, teachers will be prioritized based on their number of high-need students.

(b 1) Describe the anticipated level of teacher participation, including information on teacher satisfaction with existing professional learning

Teachers are core to CSTA's work and are often engaged, formally and informally.

Noting the importance of PD and perceived support levels, CSTA members²³ shared:

Statement	% Strongly Disagree/ Disagree	% Strongly Agree/ Agree
Lack of teacher subject knowledge is a challenge to teaching CS.	38%	62%
I have the professional support to be a successful CS teacher. ²⁴	14%	66%

(b 3) Future teacher participation levels and teacher involvement in proposal design

Volunteer teacher leaders wholly owned the original SC CSPDWeek. Current CSTA SC leadership, including current and former CS teachers, conceived of, planned, hosted, facilitated, fundraised, liaised with SCDOE, and problem-solved through a transition from in-person to virtual due to Covid-19 proving that volunteer teacher leaders are more

²³ 3,668 CSTA members completed the recent survey.

²⁴ 20% of respondents were neutral.

than capable of implementing high-quality, meaningful, teacher-directed and teacher-led professional learning. E_CSPD_Wk will utilize the same process, leveraging existing CSTA volunteer chapter leaders to identify teachers excited to lead and design CS PD. Ni's (2011) study confirms that using collaboratively reflective inquiry within CS teachers can facilitate community learning and professional identity development.

(b 4) Anticipated level of teacher participation and inclusion in decision-making

Teachers are central to CSTA and will be deeply involved in CSPDWeek throughout the development process: (1) The menu of PD options will be reviewed by CSTA's PD Committee, including many teacher representatives across grade bands; (2) The local CSPDWeek, plus ongoing PLCs/PD, will be led by local CSTA chapters, whose leaders are elected by local members; (3) The local CS teacher population will be surveyed to determine needs and inform the development team in selecting the menu for CSPDWeek.

(c 4) Participant selection if interest exceeds stipend availability

Given the current size of the CS teaching force in SC and IN, we anticipate that the stipends will be sufficient to meet the number of expected applicants. However, if the interest surpasses the available stipends, we will prioritize based on (1) the amount of high-need students taught and (2) the amount of CS in their overall workload.

(e) Supporting teachers' implementation of changes in instructional practice

E_CSPD_Wk will incentivize (via stipend) participating teachers to attend ongoing meet-ups to reflect, share learnings/challenges, and learn from and alongside peers about changes in instructional practice as a result of professional learning. This ongoing learning is important for sustained change and creates a CS teacher professional network.

(g 2) Use of stipends to incorporate new effective practices discovered through teacher-directed professional learning into the PD curriculum for all teachers

CSTA will work to secure funding to replicate the E_CSPD_Wk model across states within its chapter network. CSTA would promote the program's success through its annual conference and informal network of SEAs with established CS Education

positions. Additionally we will promote the CSTA Quality PD List that is independently vetted by experts, highlighting areas that may be offered during CSPDWeek.

(g 4) Strategy to expand the use of professional learning stipends including participant selection if interest exceeds stipend availability

Given that E_CSPD_Wk is a single-subject PD offering, combined with the relatively new-to-CS teaching force and the diversity of evolving topics, we anticipate that the stipends or PD options will be sufficient to meet the expected participant numbers. If interest exceeds resources, we will prioritize as described in (c4) on p.24.

(h 1) SEA will maintain its current fiscal and administrative levels of effort in teacher PD and allow the professional learning activities funded to supplement the level of effort that is typically supported

SCDOE's letter of commitment to and support of E_CSPD_Wk can be found in Appendix C. This letter details the cost share, the ability to replace mandatory PD with this project, and the ongoing commitment to developing, supporting, and sustaining K-12 CS teachers to expand access to CS for rural, low-income, and students of color to ensure all students can acquire skills to prepare them for high-demand CS and STEM careers.

(h 2) Funds will only be used for instructionally relevant activities

There are two review aspects that will ensure that all funds are used for professional learning activities: (1) The initial menu of potential professional learning opportunities will be based off of the program list vetted by the CSTA PD Committee as high quality. (2) The local CSTA chapter will vet additional options to meet the self-identified needs of local teachers. CSTA will require that stipends are not used for advanced degrees, taking/preparing for licensure exams, or pursuing enrichment activities.

(h 3) A variety of professional learning options for teachers are allowed; use of the stipend is not overly restrictive; thus providing teachers selection autonomy

CSTA is an independent organization with elected teacher leadership at the local level; each chapter is committed to providing teacher autonomy, including maintaining an independent review process established by the CSTA PD Committee described on p.8-9.