Expanding Pathways in Computing (EPIC)
2022-23 Annual Report

Prepared by EPIC STEM Evaluation Services
at The University of Texas at Austin
Texas Advanced Computing Center

Table of Contents

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Introduction

EPIC Mission and Goals

The Expanding Pathways in Computing (EPIC) unit within The University of Texas at Austin (UT) Texas Advanced Computing Center (TACC) is dedicated to promoting equitable computer science (CS) and STEM (Science, Technology, Engineering, and Mathematics) education. EPIC's mission is to broaden participation[1] in CS and STEM K-20 pathways through research, outreach, and policy advocacy.

To achieve this mission, EPIC partners with school districts; institutions of higher education; industry leaders; and federal, state, and local government entities who are dedicated to expanding access and opportunity for students traditionally underrepresented in STEM. This includes for example, women; Black, Hispanic and Indigenous students; rural students; students from low-income households; and students with disabilities. EPIC also provides evaluation services to external entities to help advance their STEM education research and outreach.

EPIC aims to expand and improve CS and STEM K-20 pathways to provide high-quality, inclusive education for all students. Specifically, EPIC's goals are to:

- Increase the participation and success of diverse students in CS and STEM education;
- Build a sustainable CS and STEM education community of practice; and
- Improve the quality of research and evaluation on broadening participation in CS and STEM.

Overview of EPIC Programs and Services

EPIC has three main areas of programs and services: 1) Research and Policy, 2) WeTeach_CS (WTCS) Teacher Professional Development (PD) and Outreach, and 3) STEM Evaluation Services. Each area has a unique function, and they work collectively to achieve EPIC's goal and objectives. This report highlights EPIC's activities and accomplishments in the 2022-2023 academic year for each of these programs

Research and Policy

EPIC's research and policy activities are designed to expand the availability and use of research-based knowledge about CS education. EPIC is engaged in both developing and disseminating research and in helping policymakers, teachers, administrators, and other advocates for equitable CS education apply this knowledge to address CS education challenges.

WeTeach_CS Teacher Professional Development and Outreach

WTCS is a CS teacher PD and outreach program that builds the capacity of K-12 educators and institutions to improve access to, participation in, and experiences of high-quality CS education for a diverse range of students. While WTCS focuses on K-12 CS educators, its work also aims to improve the capacity of schools and school districts to build K-20 CS education pathways for students.

STEM Evaluation Services

The STEM Evaluation Services team works with internal EPIC and TACC groups and external clients to evaluate their programs and to use data to improve and broaden participation in STEM and CS education.

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[1] The National Science Foundation (NSF) refers to *broadening participation* as "broadening of opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines." https://www.nsf.gov/od/broadeningparticipation/bp.jsp

EPIC Accomplishments

WeTeach_CS Professional Development Reach

Participants Served

WTCS offered a total of 86 events and other PD resources from September 2022 to August 2023, serving a total of 951 educators (see **Table 1**). The events focused on introductory and advanced CS topics, using both in-person and virtual or online formats. In total, WTCS offered 22,585 hours of continuing professional education (CPE).

Table 1. WTCS Professional Development and Participants

Type	PD Topic	# Events/ Resources	# Registrants*
Workshops	• Certification Prep Support • Cybersecurity • Computer Programming • Curricula Support • Foundations Course Support	28	386
Webinars	• Certification Prep Support • Cybersecurity • Curricula Support	13	15
Courses	• Foundations of CS for Teachers • Foundations of Cybersecurity for Teachers • Strategies for Effective and Inclusive CS Teaching	32	363
Partner Events	• Code.org Counselor and Administrator Training • Code.org CS Discoveries • Code.org CS Fundamentals • Code.org CS Principles	6	79
Curriculum	• WeTeach_AP® CSA (22-23) • WeTeach_CS For HS (22-23)	2	70
Summit	• WeTeach_CS Summit 2023	1	225
Resources	• WeTeach_CS Cert Prep Practice Packet - Computer Science • WeTeach TExES Tech Apps EC - 12 (242) Practice Packet • WeTeach Cert Prep Practice Packet - Computer Science (CEDI) • RCC Introduction to Programming with Python: FINAL EXAM	4	28
Total		**86**	**951**

*The registrant number in each row represents the number of unique registrants for each type of WTCS event/resource. The total number of registrants is the number of unique registrants across all types of WTCS events/resources; thus, it is less than the sum of registrants as some registrants participated in multiple events.

WTCS has developed and supported two CS curricula for teachers to implement in their courses, WeTeach_CS for HS and WeTeach_AP CSA. A total of 70 teachers registered for the curricula for the 2022-2023 academic year. **Table 2** shows the number of participants in each curriculum during this time period. Teachers across the country have free access to the online curriculum in Canvas. If they choose, they can also purchase individual student accounts through a partnership between WeTeach_CS and Codio. The Student column in **Table 2** is based on the number of student accounts associated with each curriculum, or if no student accounts were created, is based on data from the teacher curriculum survey. However, these numbers only include students who had direct access to Canvas through a student account or whose teacher completed the curriculum survey.

Table 2. Curriculum Involvement*

	# Teachers	# Students
WeTeach_CS for HS	63	1,433
WeTeach_AP CSA	37	981

*Some teachers and students used both curricula.

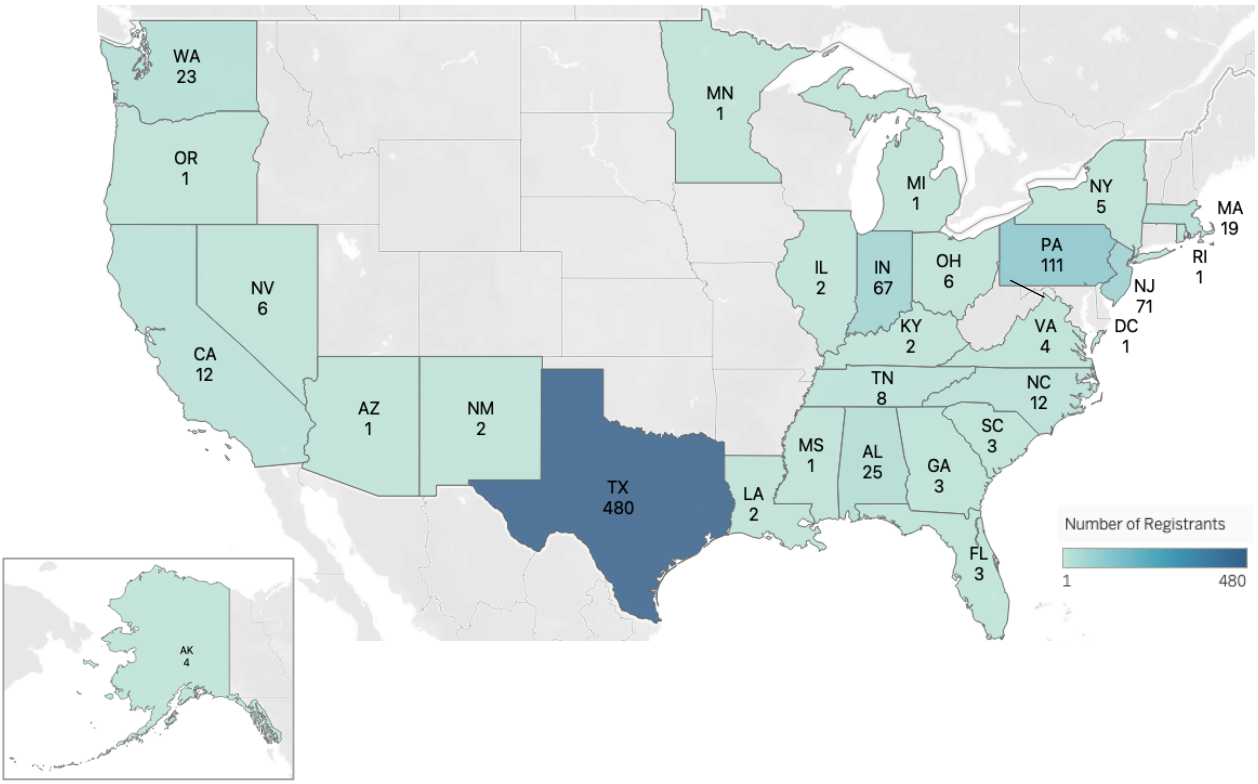
Characteristics of WTCS Registrants

This section summarizes data on individuals who registered for WTCS PD in the 2022-2023 school year. Individuals who registered for a WTCS event through its registration system (UTakeIt) were asked to complete a UTakeIt Profile that collected data on their professional and demographic characteristics. This section only includes the 880 registrants who completed a UTakeIt Profile.

States Served

The 880 WTCS registrants included 877 who were based in 30 states across the United States (see **Figure 1**) and three based outside of the US. Within Texas, 480 WTCS registrants represented **193 school districts** and **346 schools**.

Figure 1. States of WTCS Registrants (N=877)



Demographic Characteristics

WTCS served a diverse group of educators. As shown in **Table 3**, WTCS registrants identified as White (61%), Hispanic or Latino/a (11%), Black or African American (11%), Asian (6%), or as multiple races/ethnicities (6%). Among the 53 registrants identifying as multiple races/ethnicities, 20 (38%) identified as Hispanic or Latino/a and White, six (11%) identified as American Indian/Alaska Native and White, and six (11%) identified as Asian and White. Compared to Texas teachers overall, WTCS registrants

were demographically similar with a lower representation of Hispanic or Latino/a and female participants among WTCS.

Table 3. Race/Ethnicity and Gender – Registrant Comparisons with Texas Teachers

	% WTCS Registrants (N=842)	% Texas Teachers* (N= 381,202)
Race/Ethnicity		
White	61%	55%
Hispanic or Latino/a	11%	30%
Black or African American	11%	12%
Asian	6%	2%
American Indian or Alaska Native	<1%	<1%
Native Hawaiian or Pacific Islander	<1%	<1%
Middle Eastern or North African	<1%	-
Multiple Races/Ethnicities**	6%	1%
Other	<1%	-
Prefer not to answer	4%	-
Gender		
Female	63%	76%
Male	36%	24%
Non-binary	<1%	-
Prefer not to answer	1%	-

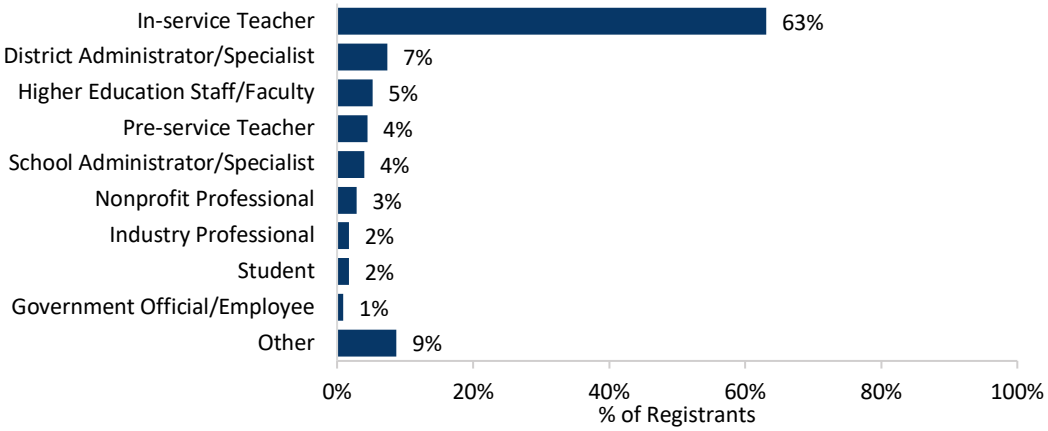
*Texas teacher data was obtained from TEA's PEIMS data for teachers employed in the 2022-2023 school year (https://tea.texas.gov/reports-and-data/educator-data/educator-reports-and-data). These data did not include some of the categories asked on the UTakeIt Profile including *Middle Eastern or North African*, *non-binary, other/prefer to self-describe*, and *prefer not to answer*.

**UTakeIt registrants could select all race/ethnicities that applied. UTakeIt data for individuals who reported more than one race/ethnicity were recoded to the "multiple races/ethnicities" category in order to align categories with the PEIMS data for comparison purposes.

Professional Characteristics

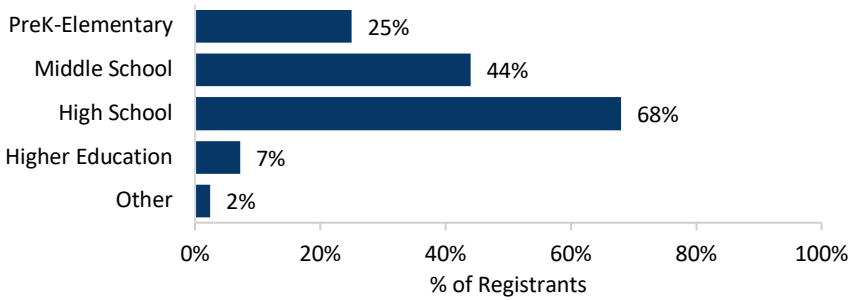
More than half of WTCS registrants were in-service teachers (63%) (see **Figure 2**). A smaller proportion of registrants were district administrators and specialists (7%), higher education staff and faculty (5%), pre-service teachers (4%), school administrators and specialists (4%), nonprofit professionals (3%), industry professionals (2%), students (2%) or government officials and employees (1%). A few registrants were in other roles (9%), such as PD providers, workshop presenters, or instructional coaches.

Figure 2. Professional Role (N=880)



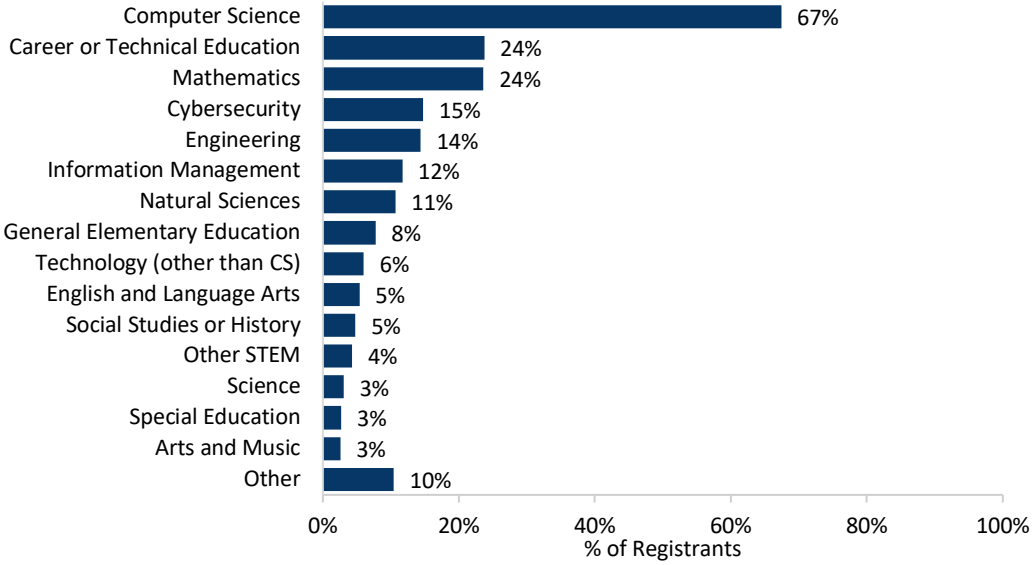
As shown in **Figure 3**, two thirds of WTCS registrants taught or worked at the high school level (68%), while less than half of registrants taught or worked in Pre-K to elementary school (25%), middle school (44%), and/or higher education (7%). "Other" respondents included educators who taught adult learning or in-service teachers. The majority of WTCS registrants taught or worked in the CS subject area (67%) and others taught or worked in a variety of other subject areas, such as career or technical education (24%) and mathematics (24%) (see **Figure 4**). Registrants who selected "other" taught or worked in areas such as instructional coaching, audio/video production, gifted and talented, health science, or psychology.

Figure 3. Grade Levels (N=836)*



*Percentages total more than 100%, since registrants could select all options that applied. Excludes respondents who selected "Not applicable".

Figure 4. Subjects (N=813)*

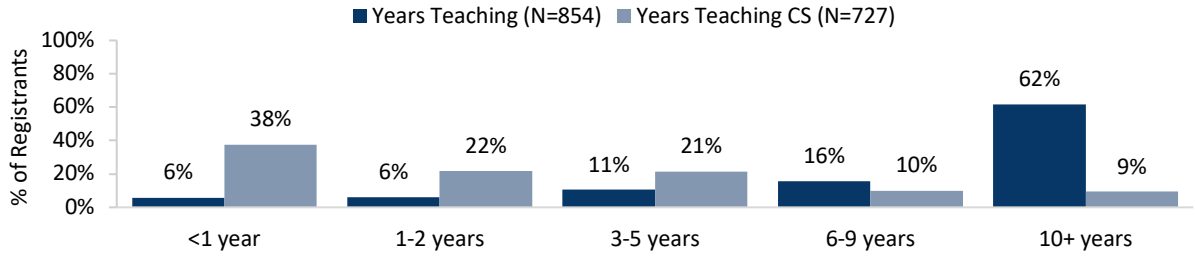


*Percentages total more than 100%, since registrants could select all options that applied. Excludes respondents who selected "Not applicable" and did not select a subject. Figure only shows subjects selected by 3% or more respondents.

Figure 5 shows WTCS registrants' teaching experience in general and experience teaching CS, specifically. Most (89%) WTCS registrants taught for at least three years with over half (62%) teaching for 10 years or more. In contrast, over half (60%) had two years or less of experience teaching CS, specifically, with about a fifth teaching CS for three to five years (21%) and six or more years (19%). Almost all educators had a bachelor's degree (88%), and more than half had a graduate degree (61%). Some registrants were not

asked about their experience teaching CS because they filled out an earlier version of the UTakeIt Profile that did not ask those questions.

Figure 5. Years of Experience



Broader Impacts

EPIC collected statewide data from the Texas Education Research Center (ERC)[2] to assess progress in achieving the WTCS program's goals within Texas. This section reports data across time up to the most recent years for which data were available.

WTCS was founded to address the lack of teacher professional development dedicated to K-12 CS in Texas. Since WTCS launched in 2014-15, there has been an overall increase in the number of teachers employed by Texas schools that were certified in CS (**Figure 6**) and the percent of high schools that offered one or more CS courses (**Figure 7**). There has also been an increase in the number and diversity of students enrolled in one or more CS course, even adjusting for the growth in the number of since 2014-15. (**Figure 8**). Notably, since the COVID-19 pandemic started in 2019-20, the percentage of schools offering CS has decreased slightly (**Figure 7**). Anecdotal data from the field indicates that some CS teachers who were certified in other subjects were pulled out of CS classes to teach other classes due to teacher attrition.

The increase in the number of in-service CS-certified teachers noticeably accelerated after WTCS's launch in 2014-2015 through 2017-2018, followed by a slower increase through 2020-2021. Between 2015 and 2018, WTCS supported a statewide CS teacher professional development network, funded by the federal Math and Science Partnership (MSP) formula funding for the state of Texas. The decreases in the percent of schools offering CS in the 2020-2021 school year may be partly due to the COVID-19 pandemic, as well as the elimination of the MSP program at the federal level. While WTCS was able to continue to support CS teacher certification efforts after 2018 by leveraging corporate, philanthropic, and other grant funding, the number of teachers obtaining a CS certification annually decreased notably when passthrough funding from the state was eliminated. Over time, rural and charter schools continued to have significant challenges in their ability to offer CS and were less likely to have a CS certified teacher (see **Figure 7**). In 2023, EPIC launched a WTCS Rural CS Certification Collaborative as part of the U.S. Department of Education funded Lone Star STEM project to

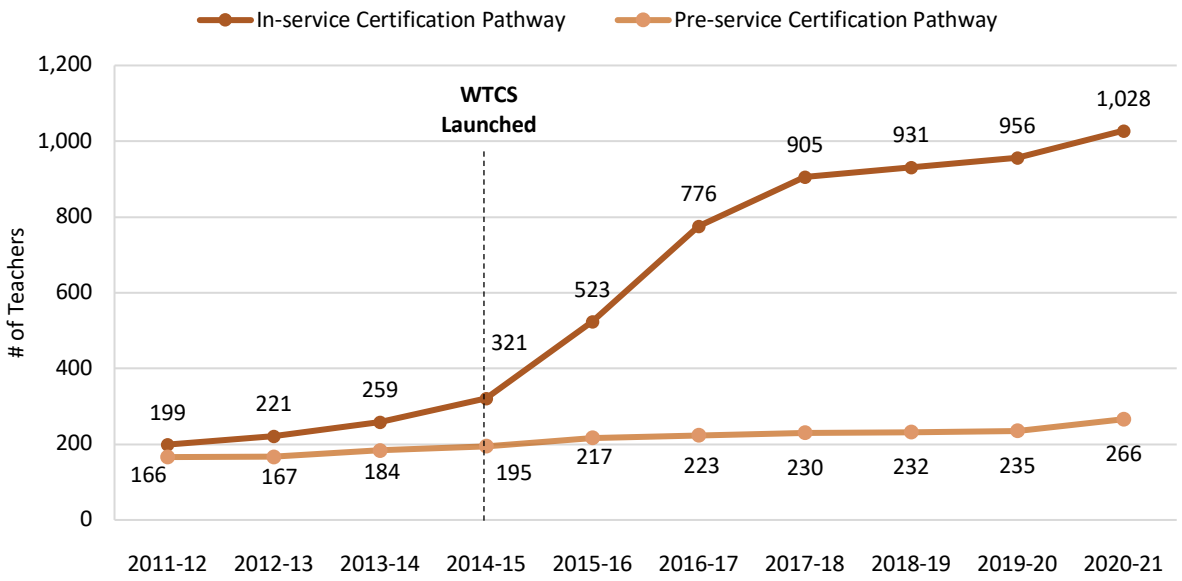
> "Because of the [WeTeach_CS] opportunities provided to me to be able to offer and expose our students to this fascinating world of computer science in my rural [district] schools, we have a couple of students who are now pursuing degrees in this field, and I know their contributions to this community will be valuable for everyone."
>
> –Inservice Teacher

[2]Texas Education Research Center (TRC): https://texaserc.utexas.edu/

address this gap. As noted in **Figure 8**, the state has begun to see a leveling off or decrease in number and diversity of students enrolling in high school CS courses since 2019-20.

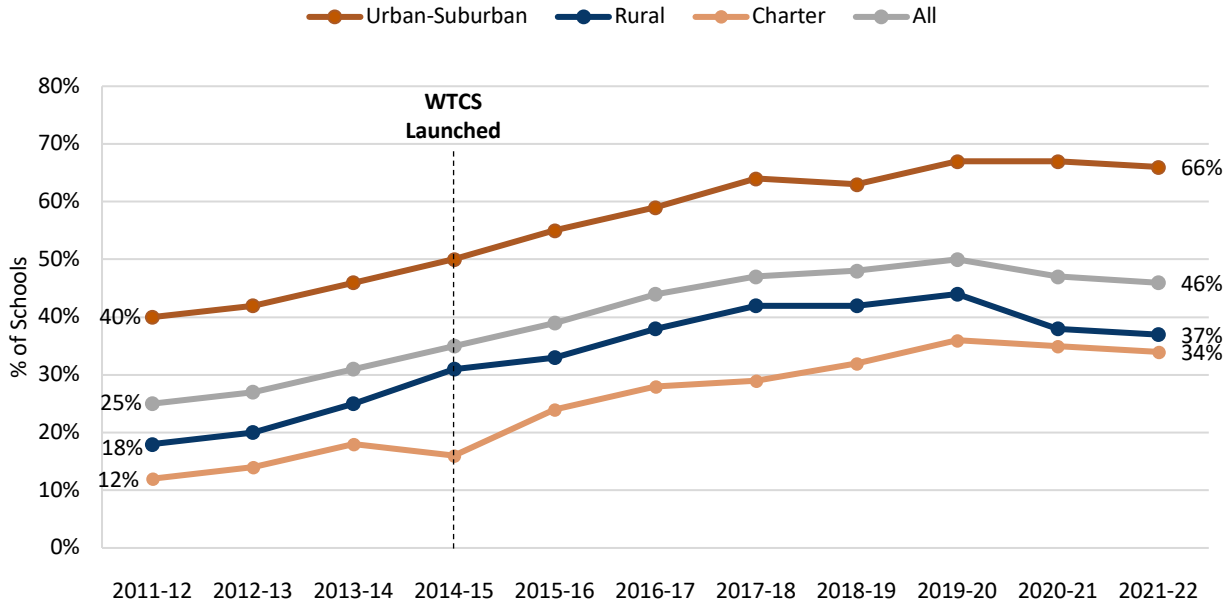
Goal 1: Increase the Number of Certified CS Teachers in Texas

Figure 6. Number of Texas Teachers Certified to Teach CS



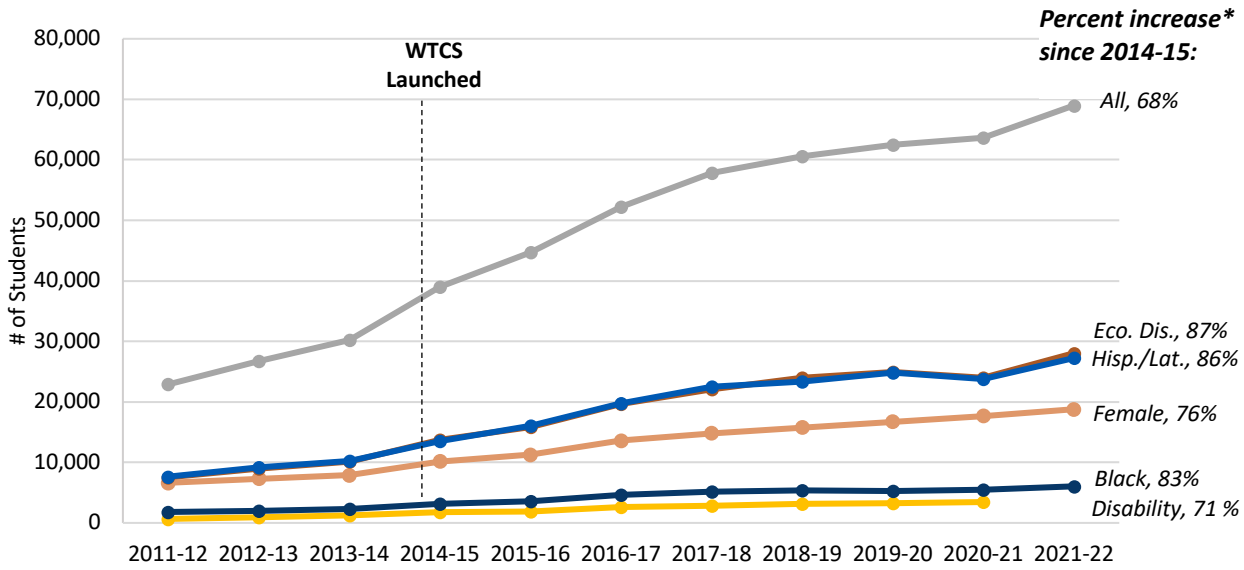
Goal 2: Increase the Number of High Schools that Offer CS

Figure 7. Percentage of Texas High Schools Offering Computer Science Courses



Goal 3: Increase the Number of Students that Enroll in High School CS Courses and Goal 4: Broaden and Diversify Student Enrollment in CS Courses

Figure 8. Number of Texas High School Students Enrolled in One or More Computer Science Courses



*Adjusted for population growth. Eco.Dis.=Economically Disadvantaged. Hisp./Lat.=Hispanic/Latino.

While the overall number of economically disadvantaged students, female students, students with disabilities, and Hispanic/Latino and Black students enrolled in high school CS courses has continued to increase since WTCS launched, there remain significant inequities in student enrollment as compared to the representation of these students in the overall Texas student population. EPIC is focused on addressing these disparities through several strategies:

- The **Computing Educator Diversity Initiative (CEDI)** recruits Black and Hispanic/Latino teachers to become CS educators and serve as role models for Texas students of color in particular.
- The **AWSM (Accelerating Women's Success and Mastery) in CS** project is a research practice partnership supporting approximately 20 secondary educators all focused on increasing recruitment and success of young women in CS. The project also includes the AWSM in CS Honor Roll, in which schools and educators across Texas with at least 50% female enrollment in high school CS courses are recognized.
- The **Strategies for Effective and Inclusive CS Teaching** online course is focused on helping teachers to identify and address both institutional and instructional barriers to success for students who have been historically marginalized in CS.
- The **CS4TX** coalition leverages EPIC's research to advocate for state policies that will broaden participation in CS. EPIC research contributed to advocacy that successfully modified the state prerequisite of Algebra 1 for the CS 1 course by changing it to a co-requisite. This change will ensure that students who were not placed early on in their school career on advanced mathematics pathways that would lead to Algebra prior to high school (often students of color and low-income students) will

> "[In WeTeach_CS] I have been able to expand my thinking on how to broaden participation and opportunities for students and directly use the resources provided to do so."
>
> – District Administrator/ Instructional Specialist

still be able to begin their 9th grade year enrolling in CS 1 as an introductory course. This change was approved by the Texas State Board of Education in 2022.

Outreach and Research Projects

EPIC provides outreach and research aimed at improving equity in CS education in Texas and across the United States. This section highlights EPIC projects in these areas in 2022-2023.

Outreach

Professional Development

- **WTCS Professional Development Events** included a variety of workshops, webinars, and online courses for educators. The events primarily focused on CS education, such as CS 8-12 certification preparation, CS teacher strategies, cybersecurity, elementary CS integration, and advanced CS course pathways. While WTCS offers in-person and online events, it offers most PD experiences through online coursework with both synchronous and asynchronous learning experiences.
- **Certification Incentive Program (CIP)** provided current and pre-service teachers in Texas with a $1,000 stipend for getting certified in CS 8-12.

> "WTCS PD is what helped me get certified to teach CS. I passed on my first attempt. I think what was really great about the PD was that it was a good mix of coding, relating to real-life and other types of situations. It just helped everything to 'click.' I do think it has translated to my teaching and how I support my students."
>
> –Inservice Teacher

- **WTCS Curricula** for CS high school courses included WeTeach_CS for HS and WeTeach_AP CSA curriculum. WTCS developed the curricula, offered scholarships to cover curriculum cost, and provided teachers with workshops to support their implementation.
- **Network/Community Building** consisted of community events and outreach within the CS education community, including the WeTeach_CS Summit and presentations at regional and national venues.

Externally Funded Service Projects

- **Code.org's Professional Learning Program** supported Code.org curriculum training that WTCS provided to elementary, middle school, and high school teachers, as well as to counselors and administrators in Texas. WTCS is the Code.org Professional Learning Program's regional partner for the state of Texas.
- **Elementary CT4NYC**, funded by the Robin Hood Learning and Technology Fund, provided integrated computational thinking PD, mentoring, co-teaching, and curriculum to high-need elementary schools in New York City in partnership with BootUp PD.

> "WTCS PD has helped me in the WeTeach Cyber Collaborative to improve my teaching credentials and therefore my teaching abilities. Because of that confidence, I improved our CyberStart rating at the school and worked to get students certified this year."
>
> –Inservice Teacher

- **Lone Star STEM (LSS)**, funded by the U.S. Department of Education through a subaward from Jobs for the Future, supported multiple Texas schools and districts that are building CS and cybersecurity programs of study in high schools. Key projects in 2022-23 included the following:
  - **WeTeach_Cyber Collaborative**, provided PD to Texas certified high school teachers working within a community of practice to develop cybersecurity knowledge, tools, and strategies for their Career and Technical Education (CTE) cybersecurity programs of study.

- **WeTeach_CS Rural Certification Collaborative**, launched in March 2023, provided PD and brought together Texas high school teachers from rural communities to deepen their CS content knowledge and teaching skills, aiming to increase access to CS courses for rural students.

- **UT Austin's Institute for Foundations of Machine Learning (IFML)** partnered with WTCS to implement Artificial Intelligence (AI) modules in high school classrooms as part of National Science Foundation (NSF)-funded IFML Broader Impacts programs that are designed to expand the diversity of those in AI education and careers (NSF #2019844).
- **Texas CS Leadership Network,** funded by Google, created a community of practice for CS administrators and teacher leaders to collaborate and share resources through in-person and virtual meetings.

Research Projects

- **Accelerating Women's Success and Mastery in Computer Science (AWSM in CS)**, funded by NSF (# 1837602), supported a network of secondary computing educators focused on increasing access and participation of young women, especially young women of color, in computing courses.
- **Computing Educator Diversity Initiative (CEDI),** piloted initially through an NSF supplement for AWSM in CS with a second cohort of teachers funded by Microsoft, included a research project that studied the experiences and impacts of CEDI for teachers of color participating in training collaboratives.
- **CS Equity Deep Dive,** funded by a Google CS Education Research award, examined the factors associated with access to and participation in CS in middle and high school, as well as the relationship between secondary enrollment in CS and postsecondary outcomes.
- **Expanding Computing Education Pathways (ECEP),** an NSF (#2137834) and Google funded Broadening Participation in Computing (BPC) Alliance involved 29 states and Puerto Rico, supported broadening participation in CS by increasing the number and diversity of students in the CS pipeline through systemic change, policy research and data-driven advocacy.
- **Motivation to Teach Computer Science (MTCS) Scale** designed to understand why teachers chose to teach CS. Grounded in self-determination theory, the scale characterized teachers' motivation to teach CS on a continuum from external to increasingly internal motivation.
- **Quantifying Disparities in CS Education** identified effective methods for measuring and reporting inequities in CS education.
- **Absenteeism and CS**, which investigated whether and to what extent participation in CS courses improved students' attendance rates.
- The **Capacity, Access, Participation, and Experience (CAPE)** project examined the ways that the CAPE framework could be applied to support researchers and practitioners in broadening participation in computing.
- **Researching Early Access to Computing and Higher Education (REACH): Understanding CS Pathways with a Focus on Black Women** (NSF #2201700) investigated the relationship between students' computing experiences in K-12 and higher education within a framework to assess equity across multiple sectors of education.
- **Strategies for Effective and Inclusive CS Teaching (ScIP)** provided K-12 teachers a hybrid professional learning course, so they were equipped to embrace diversity and focus on equitable access to, participation in, and experiences of CS in their schools and classrooms. The online course, facilitator training, and national dissemination have been supported by NSF through the ECEP Alliance (NSF #32137834), the Siegel Family Endowment, and Google.
- **Texas CS Data Dashboard** provided an in-depth look at the state of K-12 CS education data in Texas through an interactive data platform. Users could examine trends in CS education over time at the

state, regional, district, or school level. The CS Data Dashboard is supported in part by the ECEP Alliance's Common Metric Project and the Siegel Family Endowment.

Service Projects

EPIC provides services to internal and external partners through the STEM Evaluation Services team. This section describes projects in these areas.

STEM Evaluation Services

Internal Evaluation

STEM Evaluation Services conducted internal evaluations of EPIC's outreach and research projects along with projects in other TACC units. Example internal evaluation projects in 2022-2023 included:

- **WTCS Evaluation** involved collecting comprehensive data on WTCS (such as student and school characteristics, levels of participation, satisfaction, and outcomes) to provide real-time feedback to the WTCS PD team to improve their work.
- **DesignSafe Evaluation,** funded by NSF (NSF #1520817 and #2022469), evaluated TACC's DesignSafe-CyberInfrastructure that supported research workflows, data curation and publication, and data analysis and visualization for the natural hazards community.
- **Tapis Advanced Collaborative Open Source (TACOS) Evaluation** assessed TACC's NSF-funded project (NSF #2229614) to design an open source ecosystem by assessing user and partner needs, interests, and engagement.
- **Research Experience for Undergraduates (REU) Evaluation** supported TACC's NSF-funded CyberInfrastructure 4 Social Change (CI4SC) REU Site (NSF #2150390). that broadened participation in computing and research for students traditionally underrepresented in computing.

External Evaluation

STEM Evaluation Services also worked with organizations outside of TACC to provide external evaluation within 21 projects. Example external evaluation projects in 2022-2023 included:

- **Launch Years Initiative (LYI): Moving Modern Mathematics to Scale Evaluation,** funded by the Gates Foundation, assessed and supported the UT Austin Charles A. Dana Center's initiative that sought to modernize K-20 mathematics pathways to achieve equitable student outcomes.
- **Louis Stokes Alliance for Minority Participation (LSAMP) Evaluation,** funded by NSF, evaluated the Southwestern Georgia LSAMP that established an alliance of higher education institutions to increase STEM baccalaureate degrees among historically underrepresented students in southwestern Georgia.
- **Center for Inclusive Computing (CIC) Transfer Fastlane Program Evaluation** assessed a program that aimed to improve the representation of women in UT's Department of Computer Science, funded by the Northeastern University (NU) CIC.
- **Google CS First Research** examined the extent to which and how computing is taught and integrated into elementary general education classrooms in Grades 3-6 nationally.
- **Increasing Access to Chemistry for High Schoolers with Blindness Evaluation,** funded by the National Institutes of Health (NIH), evaluated Baylor University's Special Research Experiences that provided accessible and experiential chemistry learning opportunities for blind and visually impaired students.
- **The Institute for Learning-enabled Optimization at Scale (TILOS) Evaluation,** funded by NSF, evaluated the Broader Impact initiatives of an AI Institute involving a partnership with University of California San Diego (UCSD), Massachusetts Institute of Technology (MIT), National University, University of Pennsylvania, UT, and Yale University.

- **OpenSciEd project** which supported UT Austin Charles A. Dana Center's national field test of open science high school curriculum in biology, chemistry, and physics courses in ten states.
- **Texas Education Agency (TEA) Dual Credit MOU Review and Resources** to curate and review Dual Credit Memorandum of Understanding (MOU) agreements that Texas public schools have with Texas public Institutions of higher education to identify best practices.

Collaborations

EPIC's mission of increasing participation in K-20 STEM and CS education relies on relationships with multiple collaborators who support EPIC and its goals. Collaborators can include organizations that EPIC works with on a project, that EPIC provides services to, or that provide funding to EPIC. **Table 4** provides a list of the collaborating entities and **Figure 9** shows the states represented by these collaborations along with ECEP States.

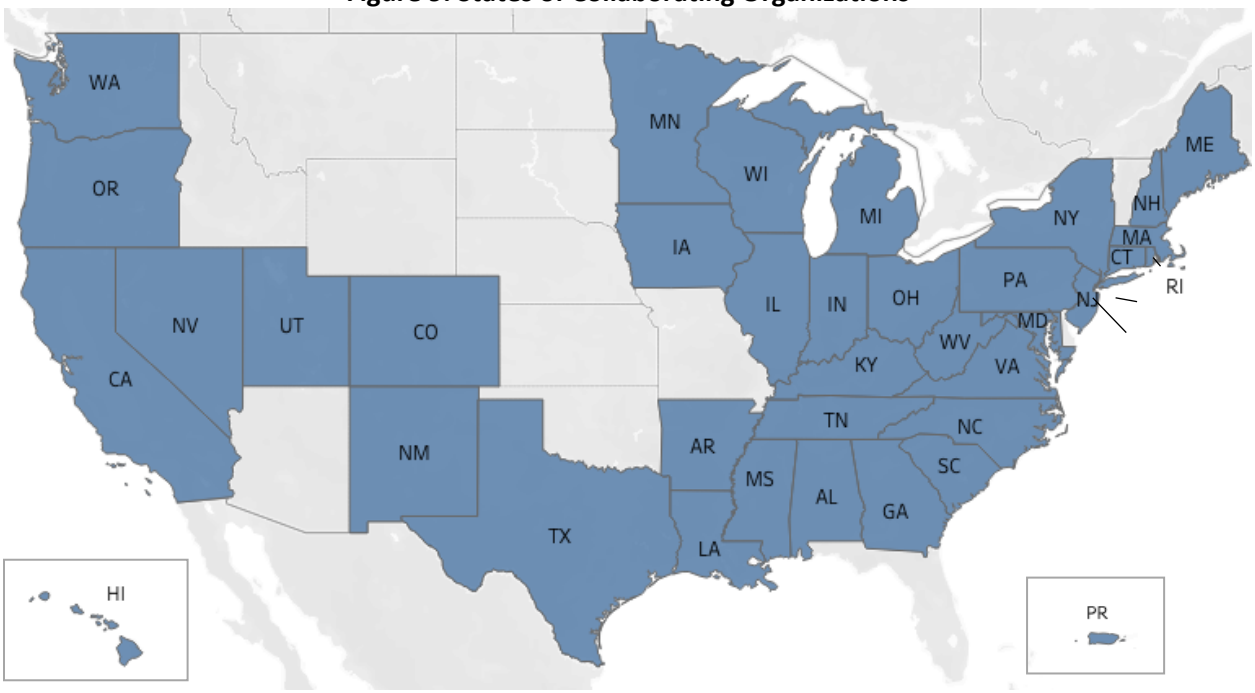
Table 4. Collaborating Organizations by Institution Type*

Higher Education	Nonprofits	Government	Industry	Professional Organization

• Austin Community College
• Angelo State University
• Baylor University
• Cleveland State University
• Columbus State University
• El Paso Community College
• Indiana University
• Kean University
• Massachusetts Green High Performance Computing Center
• Massachusetts Institute of Technology (MIT) Teaching Systems Lab
• Montclair State University
• Northeastern University
• Stockton University
• Texas A&M International University
• Texas State University
• The Citadel
• The University of Alabama
• The University of Alabama in Huntsville
• The University of Texas at Austin
  ○ UT Charles A. Dana Center
  ○ UT Cockrell School of Engineering
  ○ UT Computer Science Department
  ○ UT Extended Campus
  ○ UT UTeach Institute
  ○ UT VPR Office
• The University of Texas at Dallas
• The University of Texas at San Antonio
• University of California, Irvine
• University of California, San Diego
• University of Colorado Boulder
• University System of Maryland
• West Virginia University
	• AimHire
	• Beyond 100K
	• BootUp PD
	• Code Crew
	• Code.org
	• CompTIA
	• CS4TX
	• CSEdResearch.org
	• CSforALL
	• Cyber.org
	• CyberTexas Foundation
	• Gates Foundation
	• Jobs for the Future
	• Kapor Center
	• Mott Foundation
	• NextTech
	• Robin Hood Foundation
	• SageFox Consulting
	• Siegel Family Endowment (SFE)
	• VentureLab
		• Education Service Center (ESC), Region 1
		• ESC, Region 4
		• ESC, Region 5
		• ESC, Region 10
		• ESC, Region 13
		• ESC, Region 19
		• ESC, Region 20
		• NASA
		• NIH
		• NSF
		• Pennsylvania Training and Technical Assistance Network (PaTTAN)
		• South Carolina Department of Education
		• Texas Department of Information Resources
		• Texas Education Agency (TEA)
		• US Department of Education
			• Amazon
			• Codio
			• Dell
			• Google
			• Hackersjack
			• HKS
			• Microsoft
			• Texas Instruments
				• Computer Science Teacher Association (CSTA)
				• CSTA Puget Sound
				• Greater Austin STEM Ecosystem
				• TechNet
				• Texas Association of Secondary School Principals (TASSP)
				• Texas Computer Education Association (TCEA)
				• Texas CSTA Chapters
				• Texas IT Caucus

*This list does not include all ECEP Alliance partners or internal collaborators within TACC.

Figure 9. States of Collaborating Organizations

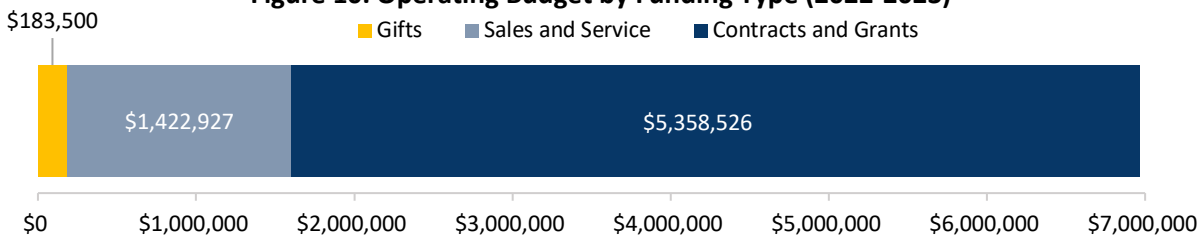


Funding

Funding Awards

EPIC is funded through multiple sources, including grants, service income, and gifts. In 2022-2023, EPIC received a total of $6,964,953. As shown in **Figure 10**, most of the funding was received from contracts and grants income, followed by sales and service, and gifts.

Figure 10. Operating Budget by Funding Type (2022-2023)



Communication and Dissemination

Publications and Conference Presentations

EPIC expanded its influence and reach in the CS and STEM education fields through multiple dissemination efforts. In 2022-2023, EPIC presented its research at conferences both within Texas and nationally. The EPIC team published journal articles, white papers, and conference papers aimed at improving the discourse and furthering knowledge surrounding K-12 CS and STEM education. EPIC also facilitated numerous outreach presentations to statewide and national audiences. **Appendix B** includes a list of EPIC's publications and conference presentations.

Texas Computer Science Education Data Dashboard

The EPIC team developed data dashboards for its research and evaluation projects using Excel and Tableau software. For example, in 2022-2023, EPIC created a new version of its data dashboard that exhibits data visuals of CS education in Texas[3]. The visuals on the dashboard are based on the CAPE framework, highlighting the capacity for, access to, participation in, and experience of CS. Other visuals on the dashboard demonstrate disparities in CS access and participation across several populations, such as gender, race/ethnicity, economic status, section 504 status, disability, and English proficiency.

Conferences Where EPIC Presented (2022-2023)

- American Education Research Association
- American Society for Engineering Education
- American Evaluation Association
- CSEd Botswana Summit
- Computer Science Teachers Association
- Greater Austin STEM Ecosystem Corporate Convening
- Infosys Crossroads
- National Center for Women & Information Technology Summit
- Region 5 Education Service Center webinar
- Region 13 STEM Ecosystem Convening
- Richard Tapia Celebration of Diversity in Computing Conference
- Special Interest Group Computer Science Education (SIGCSE) Technical Symposium
- Technology and Innovation in Education
- Texas Computer Education Association (TCEA)

Social Media

EPIC used social media to reach the public, as well as CS teachers, researchers, and organizations. Example metrics on EPIC's social media reach are as follows:

- EPIC published a newsletter through WTCS, with **8,627 subscribers**.
- EPIC published a new cybersecurity newsletter through WTCS, with **500 subscribers**.
- The WTCS Twitter account had **3,832 followers** and had a total of over **193,800 impressions** within the reporting period. The account was especially active over the summer months, having 128 tweets and over 70,600 impressions from May to July.
- The WTCS LinkedIn had **555 followers**; Instagram had **86 followers**.
- New EPIC social media accounts launched in September 2023 include Threads, with **25 followers**.
- EPIC's Facebook account has **813 followers**. A top performing post on EPIC's Facebook page had 1,148 impressions.

[3]Warner, J. R., Bibriescas, N., Jacobson, M., McCann, C. (2022). Texas CS Education Data Dashboard. https://tacc.utexas.edu/epic/research/dashboard

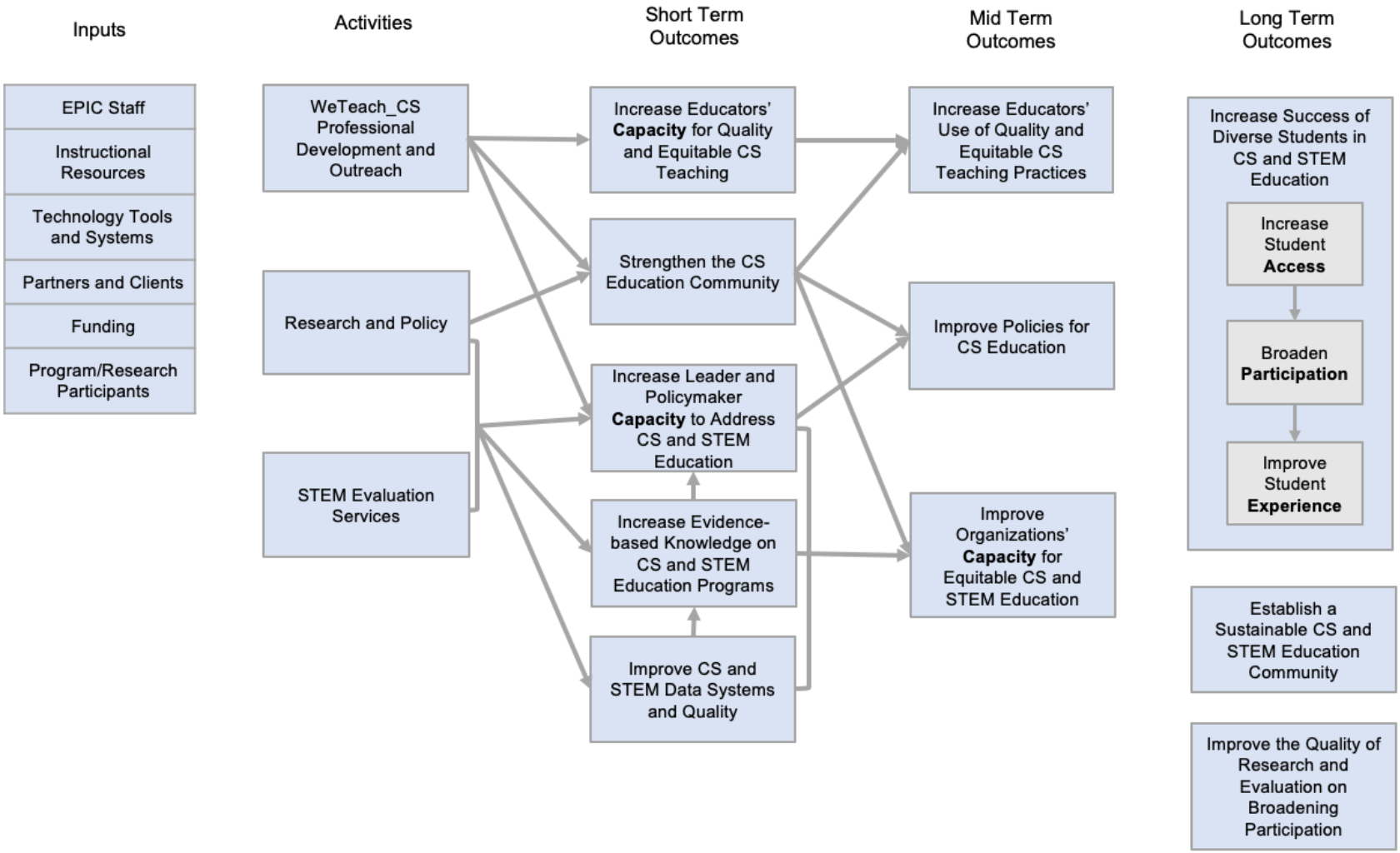
Summary and Future Directions

This year EPIC continued to expand its programs and services. New projects included establishing the Rural Certification Collaborative to train Texas teachers to become certified in CS and teach CS in their rural communities. EPIC also established and began implementing the Texas CS Leadership Network, which is a community of practice of CS administrators and leaders. In addition, EPIC expanded its state partnerships supporting teacher certification by adding projects in New Jersey and Washington State. EPIC's STEM Evaluation Services also expanded the internal and external projects it evaluates, including new services with TACC's TACOS project and Google CS First. EPIC's research has also had international impact, with countries like Thailand and Botswana adopting the CAPE framework to guide their strategic planning for CS education.

Moving forward, EPIC will build on past success and work to further increase its impact. This coming year, EPIC aims to increase the number of teachers trained across Texas by building a statewide network of WeTeach_CS partners. EPIC will also continue to pursue opportunities to scale up our programs and partnerships with new states and update our professional development to more explicitly address inclusive teaching practices in CS. With the approval of new K-8 standards in Texas for Technology Applications that substantially include computational thinking, coding, cybersecurity, and social implications of computing for the first time, EPIC will invest in developing more resources for K-8 educators to help them implement these standards. In addition, the internal research and evaluation team will continue to expand its data collection across different aspects of EPIC to better understand our effectiveness and changes in trends over time and continue to learn how EPIC can better meet the needs of our partners and the broader CS and STEM fields.

Appendix A. EPIC Logic Model

Figure A1. EPIC Logic Model



Appendix B. Publications and Presentations

EPIC Publications and Presentations
September 2022-August 2023

Publications

Childs, J., Fletcher, C., Baker, S., Ogden, K. (2023). An exploration of a professional development initiative for teachers of color. [poster] SIGCSE '23. In *Proceedings of the 54th ACM Technical Symposium on Computer Science Education*, 1292. https://doi.org/10.1145/3545947.3576238

Fletcher, C. L. & Warner, J. R. (2022). Leveraging collective impact to scale computer science teacher professional development and certification. In Mouza, C., Yadav, A., & Leftwich, A. (Eds.), *Preparing Teachers to Teach Computer Science: Models, Practices and Policies*. Information Age Publishing.

Martin, N. D., Baker, S. N., Haynes, M., & Warner, J. R. (2023). The Motivation to Teach Computer Science (MTCS) scale: development, validation, and implications for use. *Computer Science Education*, 1-18. https://doi.org/10.1080/08993408.2023.2182561

Tillman, DA, Yan W, Song A, Liew J, Lim K, Garbrecht L. (June 25, 2023). Work in Progress: Toward an Augmented Reality (AR) Learning Environment for Hispanic High School Students to Visualize and Embody STEM Spatial Transformations. *In Proceedings of the American Society for Engineering Education Annual Conference & Exposition*, Baltimore, MD. 2023 June.

Torbey R, McGill M, Gabrecht L. (March 6, 2023). Creating and Modifying Existing Surveys to fit Your CS Education Research Needs. In *Proceedings of the 54th ACM Technical Symposium on Computer Science Education*, V. 2, 1177. 2023 March. https://doi.org/10.1145/3545947.3569622

Thompson, A., Antoine, A., Debarlaben, A., Saint-Germain, D., Tynes, L., & Jones, V. (2022). Building Capacity Among Black Computer Science Educators. In *Proceedings of the 54th ACM Technical Symposium on Computer Science Education V. 2* (pp. 1192-1193). doi: 10.1145/3545947.3569605

Presentations

Antoine, A., Bailey, S., Sanders, D., Wilson, D. (2023). Sports & Hip-Hop: Recruiting and Retaining Young Black Men in CS. Computer Science Teachers Association 2023 Equity in Action Summit.

Antoine, A., Box, C., Cox, B., Dunton, S., & Rosato, J. (2023). How Do We Redefine and Rebuild Capacity in Computing Education in the Post-COVID Educational Environment (Panel). SIGCSE Technical Symposium on Computer Science Education, Toronto, CA.

Antoine, A., Chatman, K., & Monroe, C. (2023). CompSci for the Culture IV: Making Students Future Proof. WeTeach_CS Summit, Houston, TX.

Antoine, A., Debarlaben, A., Jones, V., Saint-Germain, D., Thompson, A., & Tynes, L. (2023). Building Capacity Among Black Computer Science Educators (Panel). SIGCSE Technical Symposium on Computer Science Education, Toronto, CA.

Antoine, A., Johnson, M., Nicholson, J., Tynes, L., Wilson, D. (2023). Surviving Or Thriving: Supporting Black Male Involvement in Computer Science. Computer Science Teachers Association 2023 Equity in Action Summit.

Antoine, A., Vasquez-Wilson, A. (2023). ScIP: An Introduction to Scaling Effective and Inclusive CS Teaching. Expanding Computing Education Pathways (ECEP) Summit 2023, Oakland, CA.

Carrell, A. (2023). WeTeach_CS and You Can Too! Austin CSTA Chapter Meeting, Virtual.

Carrell, A. (2023). WeTeach_CS and You Can Too! Region 5 ESC webinar, Virtual.

Carrell, A. (2023). WeTeach_CS and You Can Too! Technology and Innovation in Education Conference, Rapid City, SD.

Fletcher, C., & Hall, A. (2023). STEM & CS Policy in the 88th Texas Legislature. Greater Austin STEM Ecosystem Corporate Convening, Austin, TX.

Fletcher, C. (2022). Growing A Robust and Diverse Computer Science Program. Invited Webinar, Texas Association of Secondary School Principals, Virtual.

Fletcher, C. (2023). Addressing Inequities in K-12 Computing Education at the Roots. NCWIT K-12 Alliance Huddle, Virtual.

Fletcher, C. (2023). CAPE: A Framework for Assessing Equity in Educational Ecosystems. Invited talk, Center for Education Innovation Research, North Carolina State University, Virtual.

Fletcher, C., & Sander, D. (2023). From Compact to Classroom: New States Rallying for CS K12 Education. Infosys Crossroads, Phoenix, AZ.

Fletcher, C. (2023). Panel of Botswana Teachers - Summit Reflections. CsEdBotswana Summit, Gaborone, Botswana.

Fletcher, C. (2023). CAPE Framework: Designing a National Ecosystem to Support Computer Science Education in Botswana. CSEdBotswana University and Ministry Planning Meeting, Gaborone, Botswana.

Garbrecht, L. (2023). STEM Evaluation Services and K20 Teacher Professional Development for Broader Impacts. UT OVPR Annual Research Proposal Resource Fair, Virtual.

Garbrecht, L., Martin, N., Haynes, M., Baniahmadi, M. (2023). Using Data to Inform Strategies and Assess Outcomes and Equitable Impact. Launch Years Initiative Cross State Learning Session, Virtual.

Garbrecht, L., McGill, M., & Garbrecht, L. (2023). Creating and Modifying Existing Surveys to fit Your CS Education Research Needs. 54th ACM Technical Symposium on Computer Science Education, Toronto, Canada.

Glass, S., Blier, D., Carrell, A., Ramirez, H., Bowen, L., & Wadlington, T. (2023). I Teach Computer Science: Ideas, Strategies, Best Practices, and Community. Texas Computer Education Association Conference, San Antonio, TX.

Haynes M., Garbrecht L, Childs J, Baker S. (2022). Effective Evaluation Methods to Promote and Assess Equitable Roles in Researcher-Practitioner Partnerships. American Evaluation Association Conference, New Orleans, LA.

Jacobson, M., Baker, S., & Yang, Y. (2022). Evaluating the use of online data sharing platforms. American Evaluation Association Conference, New Orleans, LA.

Lau, J. (2023). DEEP DIVE: 10,000 (Tech Apps) TEKS Under the Sea. Region 13 STEM Ecosystem Convening, Austin, TX.

Lau, J. (2023). K-5 Resources Share-a-Thon. WTCS Summit 2023, Houston, TX.

McGill, M., Reinking, A., Fletcher, C., Weintrop, D. (2022). Evidence-Based CS Education Trends that will Influence Your K-12 Initiatives. CSEdCon 2022, TBD.

C., Seipp, K. (2023). Evidence-Based CS Education Trends That Will Influence Your K-12 Initiatives. Computer Science Teachers Association Annual Conference.

Taylor, V., Da Silva, D., Dubow, W., Fletcher, C., Gates, A., Gosha, K., Ladner, R., & Payton, J. (2022). Effective programs for increasing diversity in computing. 2022 CMD-IT/ACM Richard Tapia Celebration of Diversity in Computing Conference, Washington, D.C.