

Expanding Pathways in Computing (EPIC) 2023-24 Annual Report

*Prepared by the Evaluation Services
at The University of Texas at Austin
Texas Advanced Computing Center*



TEXAS
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TEXAS ADVANCED COMPUTING CENTER



EPIC
EXPANDING PATHWAYS
IN COMPUTING

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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 expanding computer science (CS) and STEM (Science, Technology, Engineering, and Mathematics) education. EPIC's mission is to broaden participation¹ 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 all students.

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

- Increase the participation and success of 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

In 2023-24, EPIC had 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 2023-2024 academic year (i.e., September 1, 2023 - August 31, 2024) 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 wide 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.

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 and EPIC research projects offered a total of 171 events and other PD resources from September 2023 to August 2024, serving a total of 2,564 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 31,806 hours of continuing professional education (CPE). EPIC served additional educators through Expanding Computing Education Pathways (ECEP), an NSF-funded Broadening Participation in Computing (BPC) Alliance. Across three ECEP events in 2023-24, EPIC served 214 educators and education leaders across 48 US states (all except New Jersey and Vermont), Puerto Rico and Nigeria.

Table 1. WTCS Professional Development and Participants

Type	PD Topics	# Events/ Resources*	# Registrants**
Workshops	<ul style="list-style-type: none"> • Certification Prep Support • Cybersecurity • Computer Programming • Foundations Course Support • Launch_K5 CS*** 	96	781
Webinars	<ul style="list-style-type: none"> • Certification Prep Support • Cybersecurity • Curricula Support 	5	71
Courses	<ul style="list-style-type: none"> • Foundations of CS for Teachers • Foundations of Cybersecurity for Teachers • Scaling Innovative Pedagogy (SciP) • Launch_K5 CS*** 	88	1,064
Convening	<ul style="list-style-type: none"> • Texas CS Leadership Network (TXCSLN) 	1*	123
Curriculum	<ul style="list-style-type: none"> • WeTeach_AP® CSA (22-24) • WeTeach_CS For HS (22-24) 	2	5****
Summit	<ul style="list-style-type: none"> • WeTeach_CS Summit 2024 	1	368
Resources	<ul style="list-style-type: none"> • WeTeach_CS Cert Prep Practice Packet • WeTeach TExES Tech Apps EC - 12 (242) Practice Packet 	16	204
Total		171	2,564

*Some events involved multiple sessions. For example, the TXCSLN included eight virtual meetings in 2023-24. **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. ***Launch_K5 teacher PD events were classified as both workshops and courses since they contained both types of activities. ****Additional educators that used curricula in 2023-24 were not included since they registered prior to the 2023-24 school year.

WTCS has developed and supported two CS curricula for teachers to implement in their courses, WeTeach_CS for HS and WeTeach_AP CSA. **Table 2** shows the number of participants in each curriculum in the 2023-24 academic year. Teachers across the country have free access to the online curricula 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 teacher and student accounts associated with each curriculum.

Table 2. Curriculum Involvement*

	# Teachers	# Students
WeTeach_CS for HS	24	615
WeTeach_AP CSA	16	308

*Some teachers and students used both curricula.

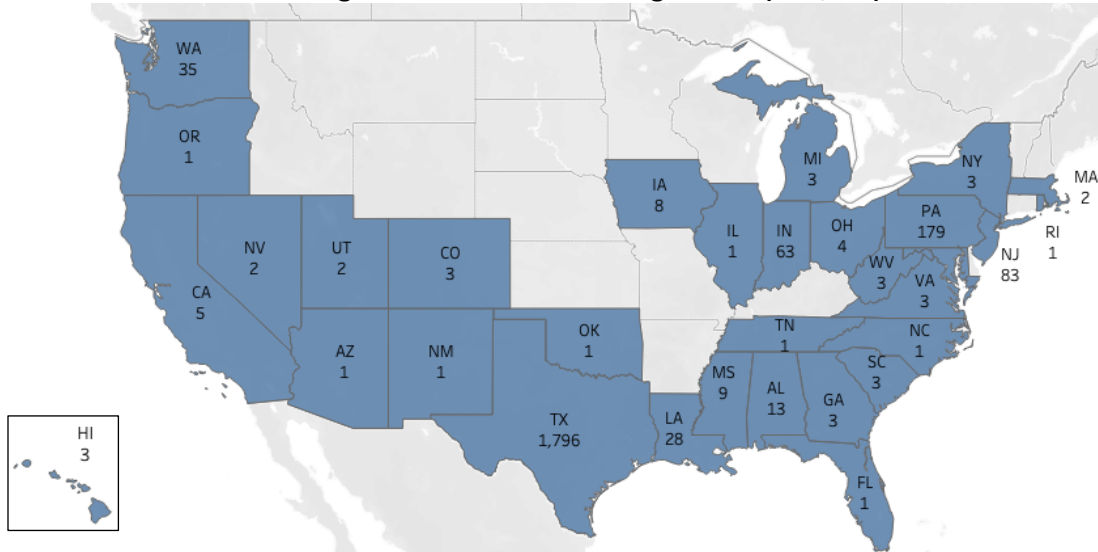
Characteristics of WTCS Registrants

Individuals who registered for PD were asked to complete a Participant Profile that collected data on their professional and demographic characteristics. This section summarizes data on the 2,266 individuals who registered for WTCS PD in the 2023-2024 academic year and completed a Participant Profile.

States Served

The 2,266 WTCS registrants were based in 33 states across the United States (see **Figure 1**). Within Texas, WTCS registrants represented **311 school districts** and **729 schools**. Almost two thirds (65%) of educators in Texas public schools were in Title 1 schools. In addition, for educators in Texas public schools, their schools had an average of 60% of students eligible for free and reduced lunch.

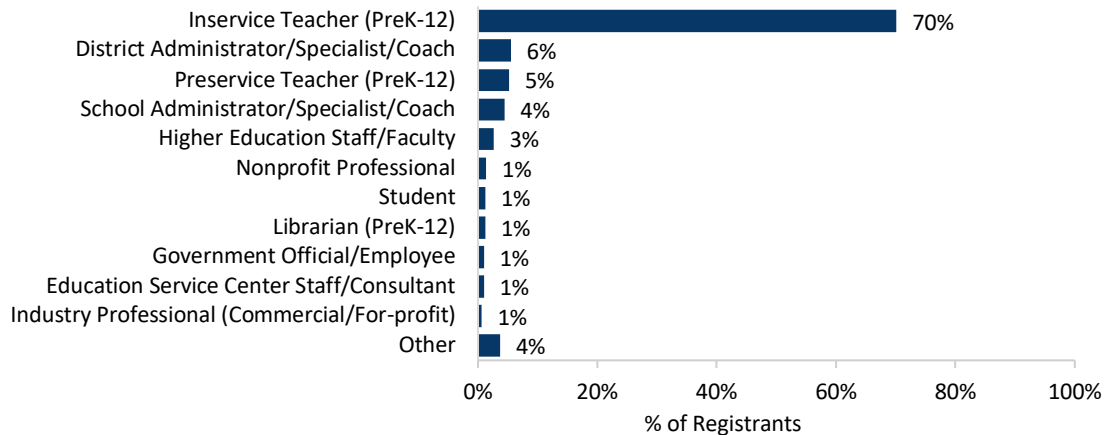
Figure 1. States of WTCS Registrants (N=2,266)



Professional Characteristics

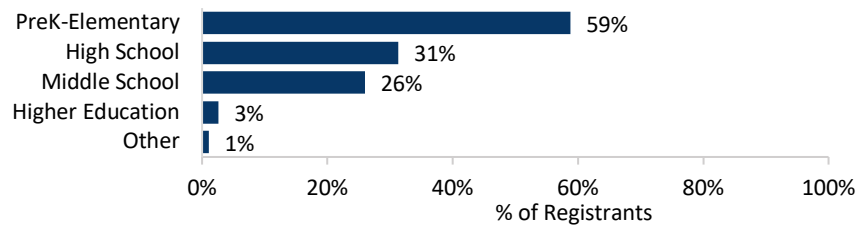
More than two-thirds (70%) of WTCS registrants were in-service teachers (see **Figure 2**). A smaller proportion of registrants were district administrators and staff (6%), pre-service teachers (5%), school administrators and staff (4%), higher education staff and faculty (3%), and 1% were in the remaining roles. A few registrants indicated they were in “other” roles (4%), such as gifted and talented specialists, technology director, or special education teacher.

Figure 2. Professional Role (N=2,264)



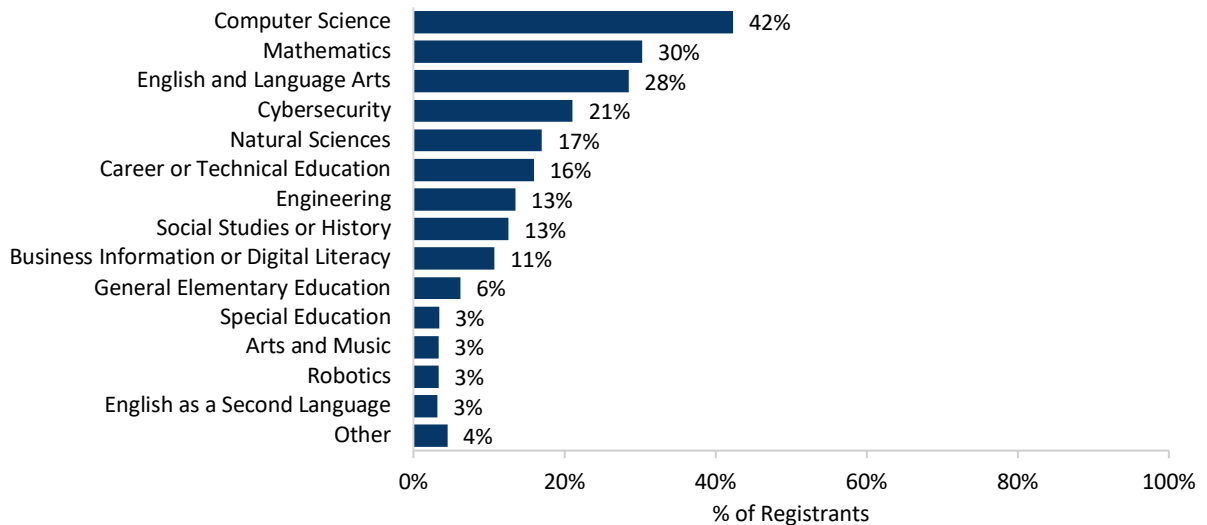
As shown in **Figure 3**, more than half (59%) of WTCS registrants taught or worked at the PreK-Elementary level, while less than half of registrants taught or worked in high school (31%), middle school (26%), and/or higher education (3%). “Other” respondents included educators who taught adult learning or in-service teachers. The most common subject or area the educators taught or worked in was CS (42%), followed by Mathematics (30%) and English and Language Arts (28%) (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=2,111)*



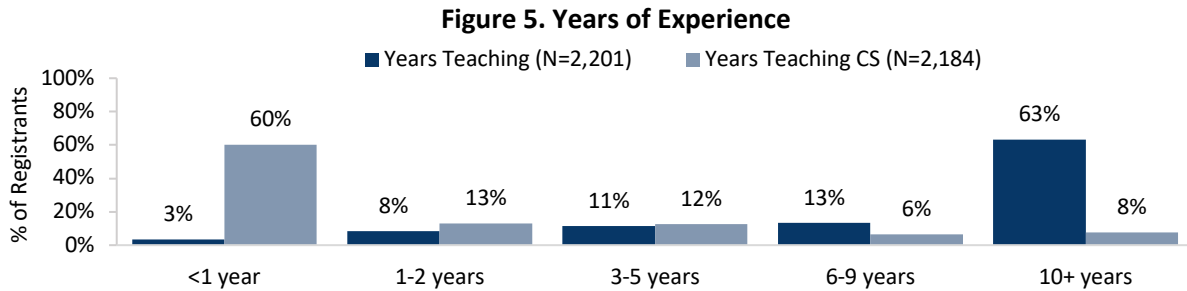
*Percentages total more than 100%, since registrants could select all options that applied.

Figure 4. Subjects (N=1,380)*



*Percentages total more than 100% as registrants could select all options that applied. The figure excludes respondents who selected “Not applicable” and did not select a subject and only shows subjects selected by 3% or more respondents. Question was not asked of K-5 teachers completing a Profile when registering for Launch_K5 unless they were a subject specific teacher.

Figure 5 shows WTCS registrants’ teaching experience in general and their experience teaching CS, specifically. Most (87%) WTCS registrants taught for at least three years with over half (63%) teaching for 10 years or more. In contrast, almost three-quarters (73%) had two years or less of experience teaching CS, with 12% teaching CS for three to five years and 14% teaching CS six or more years. Nearly all (98%) educators had a bachelor’s degree and almost half (49%) had a graduate degree.



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 2022-23 school year, since it is the most recent years for which data were available.

WTCS was founded to address the lack of CS-certified teachers in Texas. The increase in the number of in-service teachers certified in CS 8-12 noticeably accelerated after WTCS’s launch in 2014-2015 through 2017-2018, followed by a slower increase through 2021-22 and a slight decrease in 2022-23 (**Figure 6**). Between 2015 and 2018, WTCS supported a statewide CS teacher PD network, funded by the federal Math and Science Partnership (MSP) formula funding for the state of Texas. 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 March 2024, EPIC launched the Texas CS Pipeline Initiative, which includes support for scaling CS teacher certification PD across Texas.

“I am the only [CS 8-12] certified CS teacher in my district. If it had not been for this course preparing me for the test, we would not even have a CS program”
 –Inservice Teacher

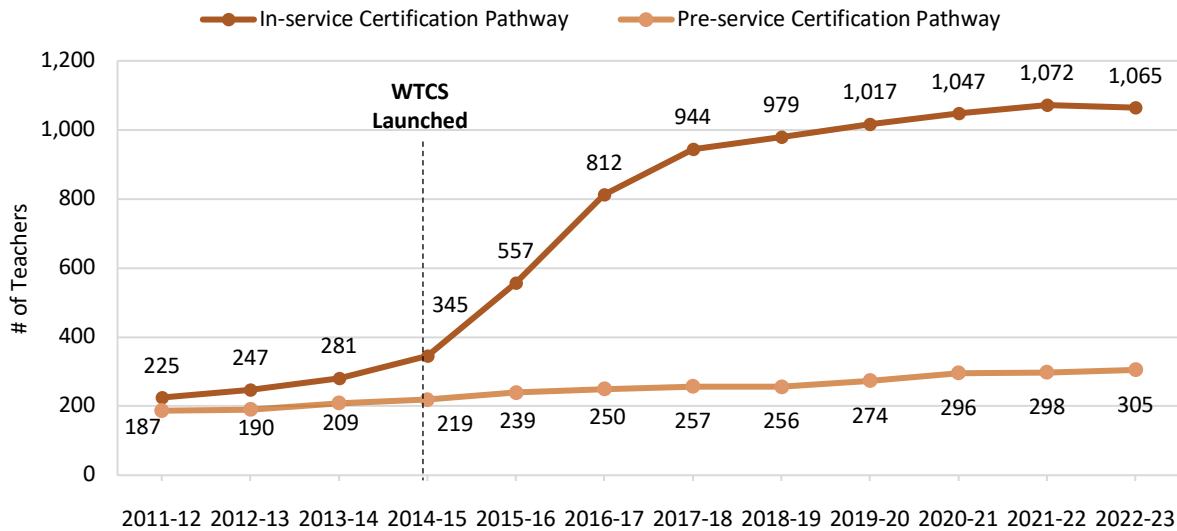
Since the launch of WeTeach_CS, there has been an increase in the percent of high schools that offered one or more CS courses through 2019-20. However, since the COVID-19 pandemic started in 2019-20, the percentage of schools offering CS has decreased slightly (**Figure 7**). The decreases in the percent of schools offering CS in the 2020-2021 school year may be partly due to the elimination of the MSP program at the federal level. 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. Meanwhile, there has also been an increase in the number of students enrolled in one or more CS course. There has also

²Texas Education Research Center (TRC): <https://texaserc.utexas.edu/>

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 students since 2014-15 (Figure 8). 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 remains lower student enrollment for those groups as compared to the representation of these students in the overall Texas student population.

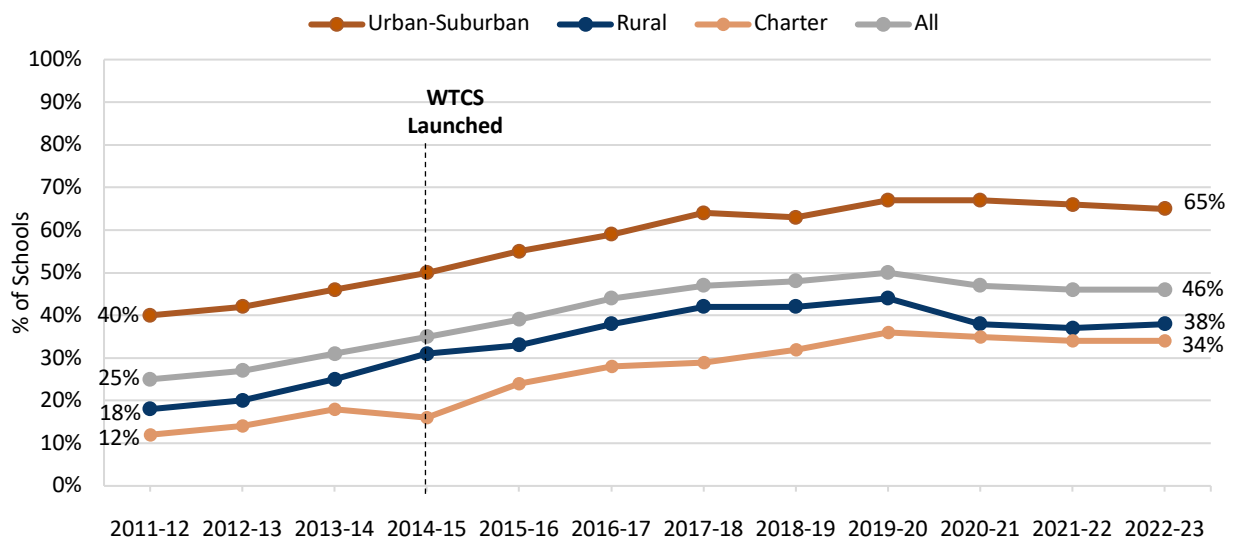
Goal 1: Increase the Number of Certified CS Teachers in Texas

Figure 6. Number of Texas Teachers CS 8-12 Certified



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

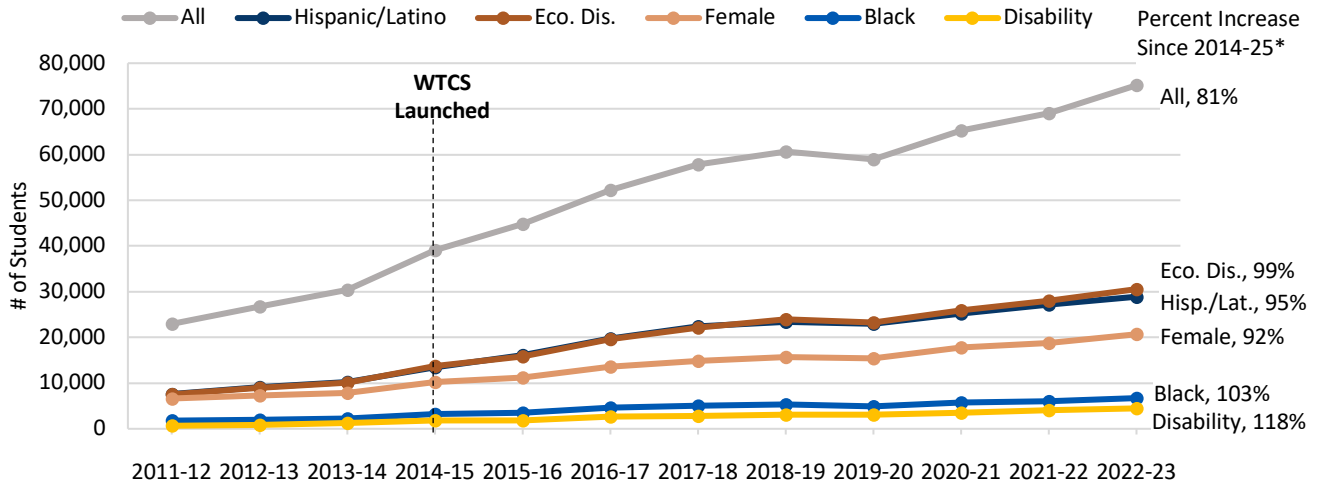
Figure 7. Percentage of Texas High Schools Offering Computer Science Courses



Goal 3: Increase the Number of Students that Enroll in High School CS Courses

Goal 4: Broaden 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.

Since 2019, WTCS has encouraged school district leaders to offer CS courses in middle school for high school credit and has provided Code.org PD for teachers who teach the introductory Fundamentals of CS course since 2018. In 2023-24, EPIC expanded PD for K-5 and middle school teachers through the Texas CS Pipeline Initiative and other projects. **Figure 9** shows that the percent of middle schools in Texas that offer CS courses has increased in recent years since 2016-17, with the greatest increase for urban and suburban schools. In addition, the number of students enrolled in middle school CS courses has greatly increased over the same period, including increases of about 300% or more across multiple groups underrepresented in CS (**Figure 10**). Through building the capacity of K-5 and middle school teachers to provide high-quality computing instruction, students will be more prepared to take CS in high school and in post-secondary education.

Goal 5: Expand CS Opportunities for K-8 students to build a pipeline for CS-related programs of study

Figure 9. Percentage of Texas Middle Schools Offering Computer Science Courses

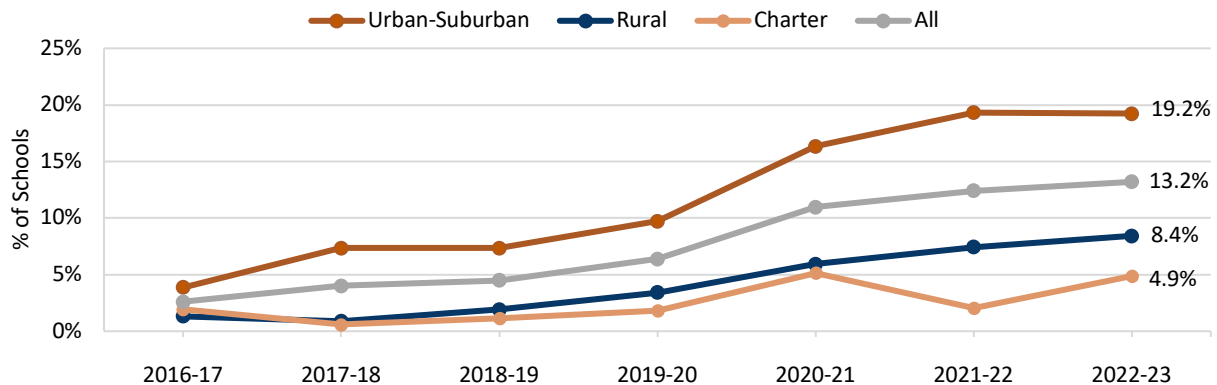
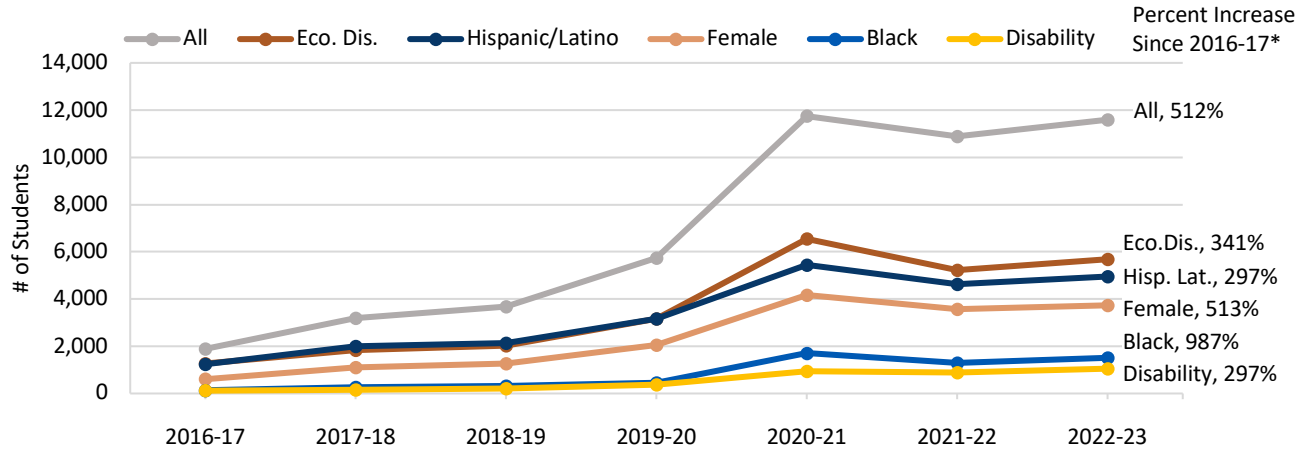


Figure 10. Number of Texas Middle School Students Enrolled in One or More Computer Science Courses



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

Outreach and Research Projects

EPIC provides outreach and research aimed at improving CS education in Texas and across the United States. This section highlights EPIC projects in these areas in 2023-2024.

Outreach

Professional Development

- **WTCS Professional Development** included a variety of workshops, webinars, and online courses for educators. The PD 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 offered in-person and online events, it offered 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 Curricula** for CS high school courses included WeTeach_CS for HS and WeTeach_AP CSA curricula. WTCS developed the curricula, offered scholarships to cover curricula 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.

“It [WeTeach_CS] opened my eyes to where this generation is heading to and my role as a teacher to prepare them for this world of computer science. It [WeTeach_CS] really demonstrated the critical thinking that is gained by students with these kinds of programs.”
 –Inservice Teacher

Externally Funded Service Projects

- **Texas CS Pipeline (TXCSP)** provided PD and resources to Texas K-12 educators to build their capacity to teach CS, artificial intelligence (AI), and Cybersecurity. It was supported by the Texas State Legislature through the Texas Higher Education Coordinating Board and funded expansion of WTCS PD starting in April 2024 within the following program areas:

- **Launch_K5 CS** trained K-5 teachers to apply new standards for integrating technology instruction into their classroom, called the Texas Essential Knowledge and Skills for Technology Applications (Tech Apps TEKS). PD was implemented through a train-the-trainer model in which educators across Texas participated in a three-day workshop and then trained teachers through a two-day workshop and asynchronous online course adapted from Code.org. Trainers and educators were given lesson plans and materials for integrating the Tech Apps TEKS into different subject areas.
- **Secondary Certification Hubs** prepared middle and high school teachers to become certified to teach CS with the Tech Apps or CS 8-12 certification. Participating teachers underwent a series of PD events and courses within a community of practice called a "hub" that was led by a project director and instructional team member. Six external partners led a regional WTCS Certification Hub (Rice University, UT Dallas, UT El Paso, Region 1 ESC, Region 5 ESC, Region 12 ESC) with one statewide hub managed by UT Austin at TACC.
- **The WeTeach_Cyber Hub** built the capacity of high school teachers to teach cybersecurity and prepares them to get CompTIA Security+ industry-based certification through PD events and courses. Teachers participated within a hub and had meetings during the school year as they participated in PD and prepared for the certification exam.
- **Middle School and High School AI Hubs** instructed teachers to teach or integrate AI into their classrooms through providing PD events and curriculum materials. Teachers participated within a hub and had meetings during the school year as they implemented AI lessons with their students. These hubs leveraged partnerships with AI4K12 at the University of Florida and the Institute for Foundations of Machine Learning at UT Austin as part of their PD.
- **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 served as the Code.org Professional Learning Program's regional partner for the state of Texas.
- **Cyber.org** partnered with WTCS to promote and provide demonstrations on its cybersecurity resources to K-12 teachers, who could receive free access to the Cyber.org curriculum modules, cyber range, lesson plans, and supplementary resources.
- **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.
- **Lone Star STEM (LSS)**, funded by the US 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:
 - **The 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.
 - **The WeTeach_CS Rural Certification Collaborative** 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 AI modules in high school classrooms as part of National Science Foundation (NSF)-funded IFML Broader Impacts programs that are designed to broaden participation for 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, was funded as a stand-alone NSF Research Practice Partnership (#21308887) in fall of 2023 to upskill and certify teachers who could serve as role models for diverse students in secondary CS courses.
- **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 students in the CS pipeline through systemic change, policy research, and data-driven advocacy.
- **Scaling Innovative Pedagogy (ScIP)** provided K-12 teachers a hybrid professional learning course, equipping them to promote 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 (#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 Metrics 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 2023-2024 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 (#1520817 and #2022469), assessed TACC’s DesignSafe-CyberInfrastructure that supported research workflows, data curation and publication, and data analysis and visualization for the natural hazards community.
- **Research Experience for Undergraduates (REU) Evaluation** supported TACC’s NSF-funded CyberInfrastructure 4 Social Change (CI4SC) REU Site (#2150390) that broadened participation in computing and research for students traditionally underrepresented in computing.
- **TACC Chishiki-AI SCIFE Evaluation** supported TACC’s NSF-funded Chishiki-AI SCIFE project (#2321040) that focused on building an ecosystem for integrating AI into Civil and Environmental Engineering by supporting a community of cyberinfrastructure professionals and domain experts via collaborative research, training, a learning platform, and an AI-enabled cyberinfrastructure.

External Evaluation

STEM Evaluation Services also worked with organizations outside of TACC to provide external evaluation within 21 projects. Example external evaluation projects in 2023-24 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 improve student outcomes.
- **Louis Stokes Alliance for Minority Participation (LSAMP) Evaluation**, funded by NSF (#1817519), 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.
- **Increasing Access to Chemistry for High Schoolers with Blindness Evaluation**, funded by the National Institutes of Health (NIH) (#5R25GM146265-03), 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 (#2112665), evaluated the Broader Impact initiatives of an AI Institute involving a partnership with University of California San Diego, Massachusetts Institute of Technology, 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.
- **epiENGAGE project**, funded by the Centers for Disease Control and Prevention (CDC) (#NU38FT000008), which assessed priorities and needs to develop analytic capacity and institutional partnerships that increase state, tribal, local, and territorial readiness for future infectious disease outbreaks with research leadership at UT Austin and the University of Massachusetts, Amherst.

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. **Tables 3 and 4** provides a list of the collaborating entities and **Figure 11** shows the states represented by these collaborations.

Figure 11. States of Collaborating Organizations

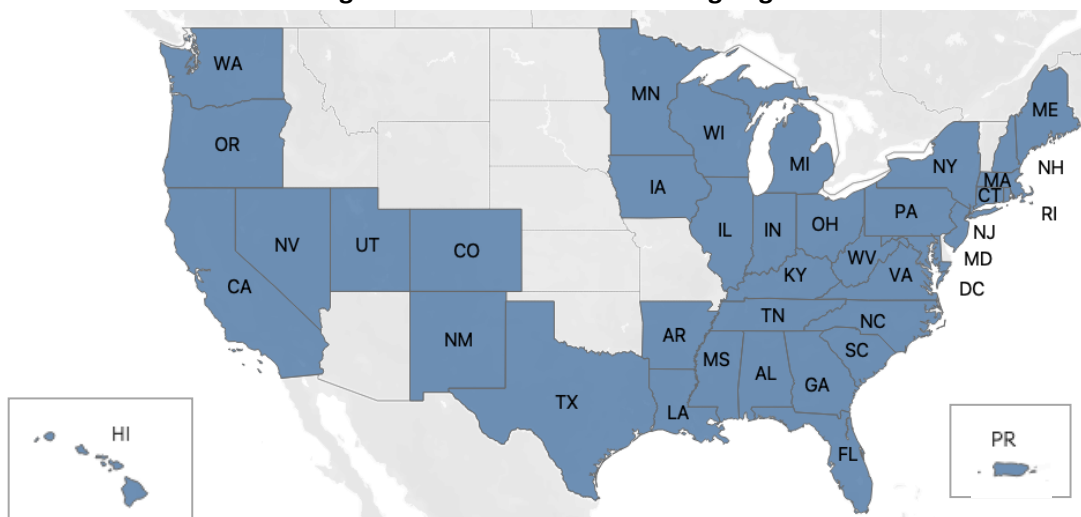


Table 3. Collaborating Organizations: Higher Education*

Higher Education			
<ul style="list-style-type: none"> • Angelo State University • Austin Community College • Baylor University • Brigham Young University • Capital Community College • Carnegie Mellon University • The Citadel • Cleveland State University • The College of State Scholastica, National Center for CS Education • Columbus State University • El Paso Community College • Georgia Institute of Technology • Indiana University • Kean University • Marquette University • Massachusetts Green High Performance Computing Center • Massachusetts Institute of Technology (MIT) Teaching Systems Lab • Mississippi State University • Montclair State University • North Carolina State University 	<ul style="list-style-type: none"> • Old Dominion University • Portland State University • Rhode Island College • Rice University • Ripon College • Southern Connecticut State University • Stockton University • Temple University • Texas A&M International University • Texas State University • The University of Alabama • University of California, Irvine • University of California, Los Angeles • University of California, San Diego • University of Colorado Boulder • University of Florida • University of Hawaii, Maui College • University of Hawaii at Manoa • University of Illinois 	<ul style="list-style-type: none"> • University of Maryland, College Park University of Minnesota, Twin Cities • University of Maryland System, Maryland Center for Computing Education • University of Massachusetts, Amherst • University of New Hampshire • University of New Hampshire at Manchester • University of North Carolina, Charlotte • University of Oregon • University of Puerto Rico, Rio Piedras • University of Rhode Island • The University of Texas at Austin <ul style="list-style-type: none"> ○ UT Charles A. Dana Center ○ UT Cockrell School of Engineering ○ UT Computer Science Department ○ UT UTeach Institute ○ UT OVPR 	<ul style="list-style-type: none"> • The University of Texas at Dallas • The University of Texas at El Paso • The University of Texas at San Antonio • University of Washington, Seattle • University of Wisconsin, Madison • Virginia Community College System • Western Washington University • Westminster College • West Virginia University
Non-Profit			
<ul style="list-style-type: none"> • ACCESSComputing • Alamo Armed Forces Communications and Electronics Association International (AFCEA) Education Foundation • AimHire • Alliance for Interdisciplinary Innovation in Computing Education (AiiCE) • Beyond 100K • BootUp PD • Code Crew • Code.org • CodeSavvy • CodeVA • College Board 	<ul style="list-style-type: none"> • Community Foundation of Utah • CompTIA • CRA-W • CSEdResearch.org • CSforAll • CSforCLE • CSforMA • C Spire • Cyber.org • Educate Maine • Gates Foundation • IAAMCS @ Morehouse • Jobs for the Future • Kapor Center • Kentucky Science and Technology Center 	<ul style="list-style-type: none"> • LatinX Digital Leaders Now • LEAP Alliance • Learning Technology Center • Maine Mathematics and Science Alliance • Micro:bit Foundation • Microsoft TEALS • Mott Foundation • National Center for Women & Information Technology (NCWIT) • NCWIT - Wisconsin • NewBoCo • Nextech • Northeast LASER Alliance • Robin Hood Foundation 	<ul style="list-style-type: none"> • SageFox Consulting • Siegel Family Endowment (SFE) • Smithsonian Science Education Center • STARS Computing Corps • STEM Advisory Council • STEMM Opportunity Alliance • TechCorps • Utah STEM Action Center • VentureLab • Virginia College Access Network • Virginia Economic Development Partnership

*This list does not include internal collaborators within TACC.

Table 4. Collaborating Organizations: Government, Industry, Nonprofit, Professional Organization*

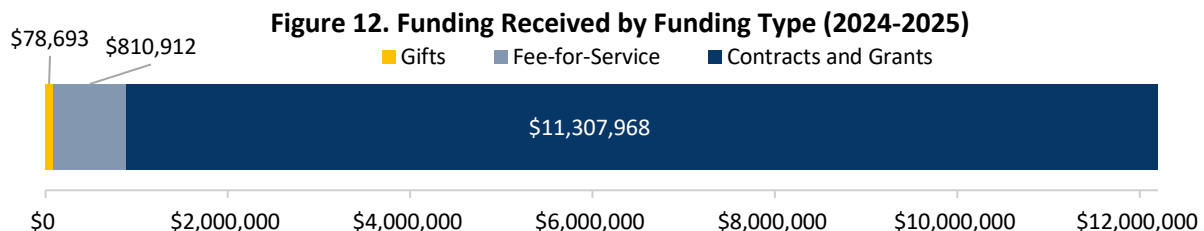
Government			
<ul style="list-style-type: none"> Academy of Aerospace and Engineering Alabama Dept of Early Childhood Education Alabama State Dept of Education Arkansas School for Mathematics, Sciences, and the Arts Arlington Public Schools California Dept of Education Centers for Disease Control (CDC) Central Rivers AEA Chesapeake County Clark County Schools Clayton County Public Schools Connecticut State Dept of Education Dodgeville School District Enterprise School District Education Service Center (ESC), Region 1 ESC, Region 5 ESC, Region 12 ESC, Region 20 	<ul style="list-style-type: none"> Georgia Dept of Education Grant Wood AEA Greenville Public Schools Hawaii Dept of Education Illinois (IL) Dept of Innovation and Technology IL State Board of Education Indiana Dept of Education Iowa Dept of Education Kentucky Dept of Education Loudoun County Maine Dept of Education Maryland State Dept of Education Massachusetts Dept of Elementary and Secondary Education Minnesota Dept of Education Mississippi Dept of Education National Aeronautics and Space Administration (NASA) Nevada Dept of Education New Hampshire Dept of Education 	<ul style="list-style-type: none"> National Institutes of Health (NIH) National Science Foundation (NSF) New Mexico Public Education Dept Office of the Superintendent of Public Instruction Ohio Dept of Education Oregon Dept of Education Pacific Northwest National Laboratory Pascagoula-Gautier School District Penn Manor School District Pennsylvania (PA) Dept of Education PA Training & Technical Assistance Network (PaTTAN) Plano Independent School District Rhode Island Dept of Education South Carolina Dept of Education 	<ul style="list-style-type: none"> Southeast Arkansas Education Service Cooperative Texas Department of Information Resources Texas Education Agency (TEA) Texas Higher Education Coordinating Board Tuscarora Intermediate Unit 11 The Hawaii Association of Independent Schools Utah State Board of Education US Department of Education Virginia Department of Education Virginia Superintendent of Schools - Roanoke City Warwick School District Wauwatosa School District Whitefish Bay High School Wisconsin Dept of Public Instruction
Industry			
<ul style="list-style-type: none"> Akkodis Amazon Google 	<ul style="list-style-type: none"> HKS, Inc. Microsoft Corporate 	<ul style="list-style-type: none"> Newark SECURA insurance 	<ul style="list-style-type: none"> Texas Instruments VEX Robotics
Professional Organization			
<ul style="list-style-type: none"> Computer Science Teacher Association (CSTA) CS4TX 	<ul style="list-style-type: none"> Greater Austin STEM Ecosystem Oregon CSTA TechNet 	<ul style="list-style-type: none"> Texas Computer Education Association (TCEA) Texas CSTA Chapters 	<ul style="list-style-type: none"> Texas IT Caucus Virginia Chamber of Commerce

*This list does not include internal collaborators within TACC.

Funding

Funding Awards

EPIC is funded through multiple sources, including grants, fee-for-service income, and gifts. In 2023-2024, EPIC received a total of \$12,197,572. As shown in **Figure 12**, almost all of the funding was received from contracts and grants income, primarily for the Texas CS Pipeline (\$10 million). A smaller proportion of funding was from fee-for-service and gifts.



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 2023-2024, 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 2023-2024, 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 framework⁴, highlighting the capacity for, access to, participation in, and experience of CS education in Texas K-12 schools.

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 bi-weekly newsletter through WTCS, with **9,019 subscribers**.
- EPIC published a new cybersecurity newsletter through WTCS, with **736 subscribers**.
- The WTCS Twitter account had **4,143 followers**.
- The WTCS LinkedIn had **1,100 followers**; Instagram had **160 followers**.
- New EPIC social media accounts launched in September 2023 include Threads, with **67 followers**.
- New EPIC Bluesky account had **8 followers**.
- EPIC's two Facebook accounts had **1,047 followers**.

Selected Conferences Where EPIC Presented (2023-2024)

- American Educational Research Association (AERA)
- Alamo STEM Conference
- Alberta School Board Association
- American Association of Physics Teachers Summer Meeting
- Computer Science Teachers Association 2024 Annual Conference
- Cyber.org EdCon
- CyberStart America
- International Computing Education Research Conference
- National Association of School Boards Annual Conference
- Region 5 Superintendents Technology Conference
- San Angelo Cybersecurity Expo
- Southwest Educational Research Association (SERA)
- South by Southwest (SXSW) Education 2024
- Texas Computer Education Association (TCEA)
- Texas CSTA Chapters Conference 2024

³Texas Advanced Computing Center. (2024). Texas CS Education Data Dashboard. <https://tacc.utexas.edu/epic/research/dashboard>

⁴Fletcher, C. L. & Warner, J. R. (2021). CAPE: A framework for assessing equity throughout the computer science education ecosystem. *Communications of the ACM*, 64(2), 23-25. <https://doi.org/10.1145/3442373>

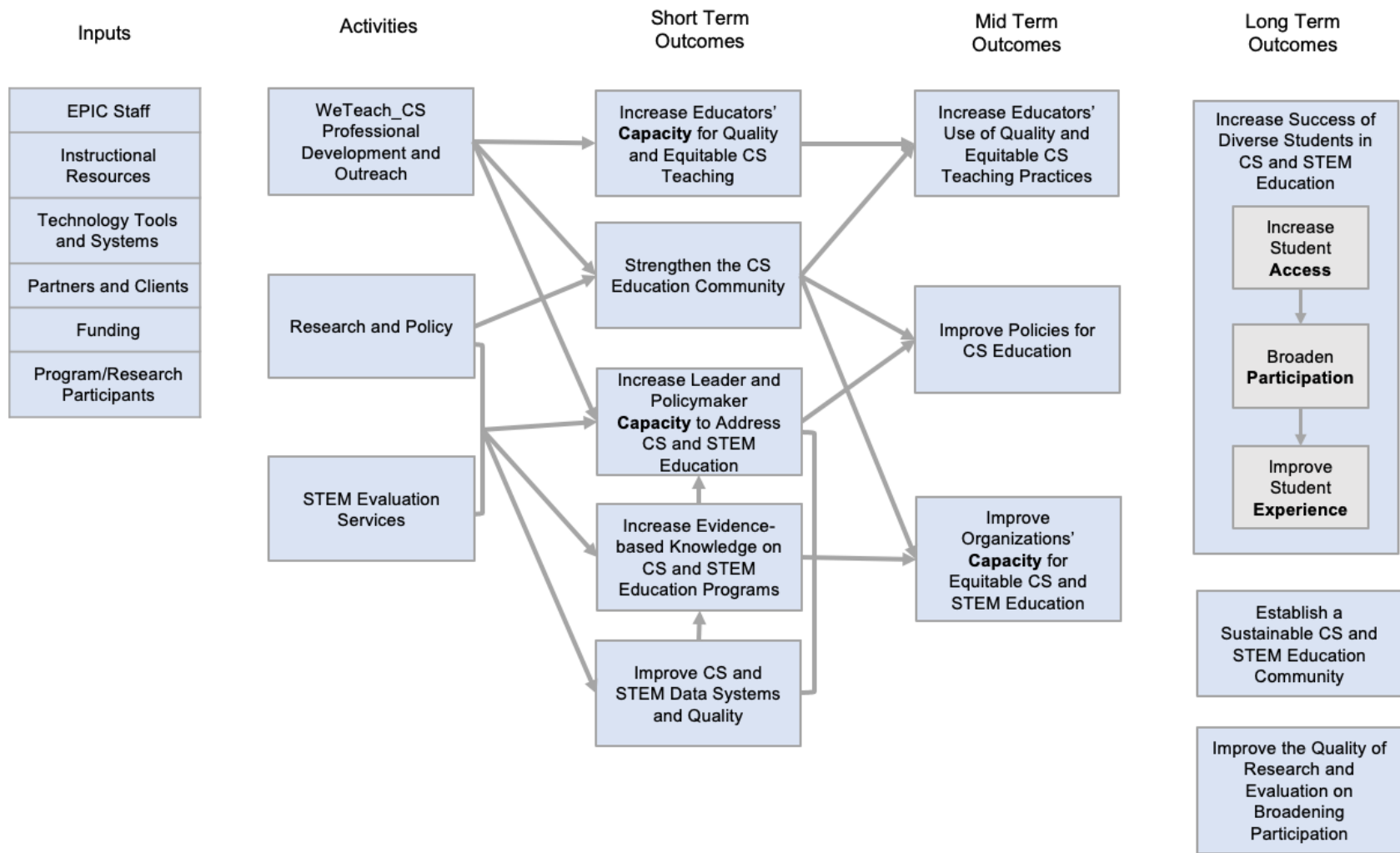
Summary and Future Directions

In 2023-24, EPIC continued to expand its programs and services. Through the Texas CS Pipeline, EPIC scaled existing teacher training programs related to CS teacher certification, cybersecurity, and AI. In addition, through the Texas CS Pipeline, EPIC added a Technology Applications teacher certification component and trained teachers to implement new K-8 standards in Texas for Technology Applications focused on computational thinking, coding, cybersecurity, and social implications of computing. Each of these initiatives is growing in 2024-25, with additional WTCS Certification Hubs across the state and new cohorts of teachers participating in AI, Cyber, and Launch K-5 PD. In addition, the TXCSP is adding a CS Pre-service Provider Community of Practice in collaboration with UTeach_CS to explore barriers to pre-service teacher preparation programs and recommend policy solutions. In 2025, the TXCSP initiative will also launch a Preferred Curriculum Provider program to engage additional high quality professional development providers in serving more K12 CS teachers across the state. EPIC's STEM Evaluation Services also expanded the internal and external projects it evaluates, including new services with TACC's Chishiki-AI SCIPE project and the UT Center for Pandemic Decision Science's epiENGAGE project.

Moving forward, EPIC will build on past success and work to further increase its impact. In 2024-25, EPIC aims to increase the number of teachers trained across Texas by continuing to build a statewide network of WeTeach_CS partners and add new hubs through the Texas CS Pipeline Initiative. EPIC will also continue to pursue opportunities to scale up its programs and partnerships with new states. In addition, STEM Evaluation Services will be expanding to evaluate several more internal programs at TACC with new funding through the NSF Leadership-Class Computing Facility (LCCF) project. Accordingly, STEM Evaluation Services will become its own unit at TACC, while still continuing to serve as EPIC's internal evaluators. As internal evaluators, they will expand data collection across different aspects of EPIC to better understand EPIC programs' effectiveness and changes in trends over time and continue to learn how EPIC can better meet the needs of its 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 2023-August 2024

Publications

Alonzo, E. A., Lato, T. J., Gonzalez, M., Olson, T. L., Savage, Q. R., Garza, L. N., Green, M. T., Koone, J. C., Cook, N. E., Dashnaw, C. M., Armstrong, D. B., Wood, J. L., Garbrecht, L. S., Haynes, M. L., Jacobson, M. R., Guberman-Pfeffer, M. J., Minkara, M. S., Wedler, H. B., Zechmann, B., & Shaw, B. F. (2024). Universal pictures: A lithophane codex helps teenagers with blindness visualize nanoscopic systems. *Science Advances*, *10*(2), eadj8099. <https://doi.org/10.1126/sciadv.adj8099>

Childs, J., Zarch, R., Dunton, S., Madkins, T. C., Trautmann, K., Taylor, Z. W., Jacobson, M., Ozturk, S., & Ottenbreit-Leftwich, A. (2024). Advancing equity and access: Addressing the side effects of broadening participation in computer science K–12 education. *Review of Research in Education*, *48*(1), 121–153. <https://doi.org/10.3102/0091732X241286475>

ECEP Alliance (2023). Profiling Computer Science (CS) Preservice Teacher Education Programs Policy Brief. <https://ecepalliance.org/>

Garbrecht, L., Baker, S., & Wang, Z. (2024, March). Integrating computer science in elementary education. In *Proceedings of the ACM Technical Symposium on Computer Science Education (SIGCSE '24)* (p. 1910). <https://doi.org/10.1145/3626253.3635379>

Garvin, M., Dunton, S. T., Trautmann, K., Childs, J., & Fletcher, C. (2024, May). Situating equity in education policy to advance broadening participation in computing (BPC). In *Proceedings of the 2024 on RESPECT Annual Conference* (pp. 107–115).

Jeon, M., Koressel, J., Ottenbreit-Leftwich, A., Childs, J., & Jantaraweragul, K. (2024). Indiana high school's computer science enrollment and disparity indices: On gender, ethnicity, locale, and economic status. *Computers in the Schools*, 1–20.

Marshall, S. L., Grooms, A. A., & Childs, J. (2024). Do we have the capacity? The policy imperative for equity-focused K-12 computer science education. *Journal of Research in Science Teaching*.

Martin, N. D., Antoine, A., Wilson Vazquez, A., & Black, C. (2024). Training effective facilitators to scale equity-focused computer science professional learning. In *Proceedings of the 2024 Research on Equity and Sustained Participation in Engineering, Computing, and Technology (RESPECT) Annual Conference* (pp. 270–277). Atlanta, GA, USA. ACM. <https://doi.org/10.1145/3653666.3656108>

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>

Tang, S., Wang, Z., Sutton-Jones, K., Tong, F., Lu, X., & Zhang, L. (2024). Exploring the impact of an English talent program on college students' language proficiency: A mixed-methods study. *International Journal of Educational Research*, *125*. <https://doi.org/10.1016/j.ijer.2024.102362>

Tang, S., Wang, Z., Zhang, L., & Jimenez, D. (2024). Understanding the complexities of student learning progress in Texas: A study of COVID-19 and rural vs. non-rural districts. *Behavioral Sciences, 14*(5). <https://doi.org/10.3390/bs14050408>

Wang, Z., Martin, N. D., Baker, S. N., & Haynes, M. (2024). A measurement invariance analysis of the motivation to teach computer science (MTCS) scale among female and male educators. In *Proceedings of the 55th ACM Technical Symposium on Computer Science Education V. 1* (pp. 1409–1413). <https://doi.org/10.1145/3626252.3630766>

White, S. V., Childs, J., Koshy, S., & Scott, A. (2024, May). Policy implementation in the era of responsible artificial intelligence (AI) use in K–12 education. In *Proceedings of the 2024 on RESPECT Annual Conference* (pp. 81–85).

Yan, Y., Muenks, K., Mata, R. A., & Yang, Y. (2024). How do undergraduate students' perceptions of professor cultural competence and growth mindset relate to motivation to engage in intercultural interactions? *Social Psychology of Education, 27*(2), 299–334.

Zarch, R., Dunton, S. T., & Childs, J. (2024, May). From data bonk to data wonk: The value of collaborative exploration of state-based data systems in support of equitable computer science education policy, programs and practices. In *Proceedings of the 2024 on RESPECT Annual Conference* (pp. 231–235).

Presentations

Antoine, A. (2024). A Class of Our Own. April 2024. 9th Annual Black Youth Guidance Forum (CSUN). Northridge, CA.

Antoine, A. (2023). Code for Change: Equitable Teaching in Computer Science Education. November 2023. ISTE Expert Webinar Series. Virtual.

Antoine, A. (2024). Including All Voice in the Digital World. April 2024. Region 13 STEM Ecosystem Convening. Austin, TX.

Antoine, A., & Armant, J. (2024). Return of the MACC - Music, AI, Culture and Coding to Empower the Next Generation of Global Learners. August 2024. ISTE Expert Webinar Series. Virtual.

Antoine, A., Bashir, D., Hicks, V., Murphy, E., Sanders, D., Wadlington, T., & Wilson, D. (2024). The Missing Piece: Black Men. July 2024. Computer Science Teachers Association 2024 Annual Conference. Las Vegas, NV.

Antoine, A., Cannady, J., Childs, J., Crawford, C., De Jesus, S., & Dunton, S. (2024). The Power of Words in CS Education. July 2024. Computer Science Teachers Association 2024 Annual Conference. Las Vegas, NV.

Antoine, A., Chatman, K., & Monroe, C. (2024). Step Up to the Challenge: Using AI to Future-Proof Students. March 2024. SXSW Edu 2024. Austin, TX.

Antoine, A., Chatman, K., Patel, J., & Vazquez, A. W. (2024). Inclusivity in Computing Education: A Workshop on Scaling Inclusive Pedagogy. July 2024. Computer Science Teachers Association 2024 Annual Conference. Las Vegas, NV.

Antoine, A., Hicks, V., & Lockett, D. (2024). Fostering Collaboration: Industry-Academia Partnerships in HBCU CS Programs. July 2024. Computer Science Teachers Association 2024 Annual Conference. Las Vegas, NV.

Baniahmadi, M., Nechanicky, M., Parker, K., Rogoff, D., & Baker, S. (2024). Computer Science Integration in Elementary School. July 2024. Computer Science Teachers Association 2024 Annual Conference. Las Vegas, NV.

Bibriescas, N., Jacobson, M., Warner, J., Wang, Z., & Childs, J. (2023). Data Dashboards as a Storytelling Tool: Advantages and Considerations. October 2023. American Evaluation Association. Indianapolis, IN.

Carrell, A. (2024). Texas Computer Science Pipeline, January 2024. Texas EcosySTEM. Virtual.

Carrell, A. (2024). Texas Computer Science Pipeline, March 2024. ESC STEM Leads. Virtual.

Carrell, A. (2024). WeTeach_CS and You Can Too, February 2024. Alamo STEM Ecosystem Education Conference. San Antonio, TX.

Carrell, A., & Roehl, S. (2024). WeTeach_CS and Code.org, March 2024. Code.org Regional Partner Summit. Evanston, IL.

Falbo, T., & Yang, Y. (2024). High school context: College student standing, self-esteem, and academic self-concept. August 2024. APA Annual Conference. Seattle, WA.

Fletcher, C. (2024). AI in Schools: Policy Considerations for K12 School Leaders. April 2024. Alberta School Board Association. Virtual.

Fletcher, C. (2024). AI in Schools: Policy Considerations for K12 School Leaders. April 2024. National Association of School Boards Annual Conference. New Orleans, LA.

Fletcher, C. (2023). Cultivating a Culture of Belonging. October 2023. WeTeach_Cyber Collaborative. Virtual.

Fletcher, C. (2024). STEM Talent is Evenly Distributed, Opportunity is Not. April 2024. Region 13 STEM Conference. Austin, TX.

Fletcher, C., & Carrell, A. (2024). Strategies for Scaling a CEd Ecosystem. August 2024. International Computing Education Research Conference. Melbourne, Australia.

Fletcher, C., & McCune, J. (2024). Advocating for CS Equity with the ECEP Alliance. July 2024. Computer Science Teachers Association 2024 Annual Conference. Las Vegas, NV.

Garbrecht, L. (2024). STEM Evaluation Services and K-20 Teacher Professional Development for Broader Impacts. February 2024. NSF CAREER "Ask Us Anything" Panel Discussion. Virtual.

Haynes, M., & Baker, S. (2024). Integrating Computer Science in Elementary Classrooms: Sharing Ideas, Challenges, and Lessons Learned. June 2024. WTCS_CS Summit. Fort Worth, TX.

Haynes, M., Baniahmadi, M., Wang, Z., Parker, K., & Rogoff, D. (2023). A Path to Equity: Integrating Computer Science in Elementary Education. October 2023. CSforALL Summit 2023. Oakland, CA.

Hendricks, N. (2024). Advanced Cyber Range Training. June 2024. Cyber.org EdCon. Orlando, FL.

Hendricks, N. (2024). Dictionary Attack Lab. April 2024. San Angelo Cybersecurity Expo. San Angelo, TX.

Hendricks, N. (2024). Intro to Cybersecurity. February 2024. Alamo STEM Conference. San Antonio, TX.

Hendricks, N. (2024). Intro to the Cyber.org Range. February 2024. Alamo STEM Conference. San Antonio, TX.

Hendricks, N. (2024). Introduction to Cyber.org's HS Cybersecurity Curriculum. February 2024. Texas CSTA Chapters Conference 2024. Arlington, TX.

Hendricks, N. (2024). K12 Cybersecurity Professional Development Opportunities. April 2024. San Angelo Cybersecurity Expo. San Angelo, TX.

Hendricks, N. (2024). Malpasset Dam Incident. February 2024. Alamo STEM Conference. San Antonio, TX.

Hendricks, N. (2024). Shielding Rural Futures: The Imperative of Cybersecurity Education in Rural High Schools. June 2024. WeTeach_CS Summit. Fort Worth, TX.

Hendricks, N., & CompTIA Representatives. (2023). CompTIA Tech Workforce Educational Meetings with Congressional Staffers. November 2023. CompTIA Workforce Educational Fly-in. Washington, D.C.

Hendricks, N., Jefferson, S., Prather, S., Webb, J., Toepfer, A., & Hall, F. (2023). CyberStart America: Texas Kickoff. October 2023. CyberStart America. Virtual.

Jimenez, D., Tang, S., & Wang, Z. (2024). Evaluating the Impact of Language of Instruction and Language Content in a Second-Grade Bilingual Classroom. February 2024. Southwest Educational Research Association (SERA). Arlington, TX.

Lau, J. (2024). K-5 Tech Apps TEKS Activity Extravaganza. February 2024. TCEA. Austin, TX.

Lau, J. (2024). SCRATCHing The Surface of Elementary Coding. June 2024. WeTeach_CS Summit. Houston, TX.

Newland, J. (2024). Comparing Different Types of Computational Thinking to Teach Kepler's Third Law. July, 2024. American Association of Physics Teachers Summer Meeting. Boston, MA.

Newland, J. (2024). Using Data Science and Computer Science Techniques to Teach High School Science. June 2024. WeTeach_CS Summit. Fort Worth, TX.

Newland, J. (2024). Using Data Science in High School Astronomy. August 2024. Astronomy Society of the Pacific Conference. Virtual.

Newland, J., Wang, J., & Yeh, M. (2024). Fostering Mentorship Through Authentic High School Quantum Computing and Engineering Research. July 2024. American Association of Physics Teachers Summer Meeting. Boston, MA.

Roehl, S. (2024). Coding Fundamentals--Introduction to Coding Using the Micro:bit. January 2024. STEM 4 Innovation Virtual Conference for K-12 Education. Virtual.

Roehl, S. (2024). Coding Fundamentals--Introduction to Coding Using the Micro:bit. February 2024. Texas CSTA Chapters Conference 2024. Arlington, TX.

Roehl, S. (2024). Computational Thinking: Helping Texas Educators Implement the New K-8 Tech Apps. April 2024. Region 5 Superintendents Technology Conference. Seadrift, TX.

Roehl, S. (2024). Computational Thinking and Coding with Cyber.org. June 2024. Cyber.org EdCon. Orlando, FL.

Roehl, S. (2024). Cybersecurity Basics K-5. February 2024. TCEA. Austin, TX.

Roehl, S. (2024). Cybersecurity Basics K-8. February 2024. RGV STEM Conference. Mission, TX.

Roehl, S. (2024). Data Insights and AI. WeTeach_CS Summit. Jun 2024. Fort Worth, TX.

Roehl, S. (2024). Empowering Minds: Bridging the Digital Divide with Micro:bit Magic! July 2024. CSTA National Conference. Las Vegas, NV.

Roehl, S. (2024). K-5 Tech Apps Activity Extravaganza. February 2024. Region 1 STEM Summit. South Padre Island, TX.

Roehl, S. (2024). K-5 Tech Apps TEKS Activity Extravaganza. February 2024. TCEA. Austin, TX.

Roehl, S. (2024). Unlocking Resources: Helping Texas Educators Implement the New 6-8 Tech Apps. April 2024. Region 13 STEM Ecosystem. Austin, TX.

Wang, J., Newland, J., & Yeh, M. (2024). Fostering Mentorship Through Authentic High School Quantum Computing and Engineering Research. July, 2024. American Association of Physics Teachers Summer Meeting. Boston, MA.

Wang, Z., Correlcelli, J., Jacobson, M., & Fletcher, C. (2024). From School to State: Interrogating Inequities in the Computing Education Ecosystem. April 2024. AERA. Philadelphia, PA.

Wang, Z., Tang, S., & Jimenez, D. (2024). Exploring the Effectiveness of Milestone Tests in Enhancing ELA Learning for 3rd Grade Students in Georgia's Rural School Districts. April 2024. AERA. Philadelphia, PA.