

Strengthening Computer Science Teacher Preparation Pathways in Texas

Recommendations for Recruitment,
Preparation, and Certification

Report from the Texas Computer Science Pipeline Working Groups



Authors

Uchenna Emenaha Miles, University of Texas at San Antonio
Mary Urquhart, University of Texas at Dallas
Michael Odell, University of Texas at Tyler
Greg Speegle, Baylor University
Kimberly Hughes, National Center for STEM Education
Yvonne Loya, National Center for STEM Education
Leslie Brommer, National Center for STEM Education

Citation

Miles, U. E., Urquhart, M., Odell, M., Speegle, G., Hughes, K., Loya, Y., & Brommer, L. (2026). *Strengthening computer science teacher preparation pathways in Texas: Recommendations for recruitment, preparation, and certification*. National Center for STEM Education.

Acknowledgments

We thank all the Texas Computer Science Pipeline working group participants, whose insights and contributions formed the basis for this report. This effort was made possible through a partnership among the WeTeach_CS program at the Texas Advanced Computing Center, the Texas Higher Education Coordinating Board, and the National Center for STEM Education.

Working groups:

CS Certification Pathways and Requirements

Leslie Brommer, National Center for STEM Education
Jane Long, Stephen F. Austin State University
Carol Fletcher, WeTeach_CS, University of Texas at Austin
James Newland, WeTeach_CS, University of Texas at Austin
Tim Sears, University of Texas Rio Grande Valley
Elaine Soares, WeTeach_CS, University of Texas at Austin
Greg Speegle, Baylor University

Educator Recruitment

Michaine Ashley, Texas Woman's University
Maaz Amjad, Texas Tech University
Camille Burnett, Prairie View A&M University
Amy Carrell, WeTeach_CS, University of Texas at Austin
Karen Graham, University of Houston
Greg Hale, University of Texas at Arlington
Li-Jen Lester, Sam Houston State University
Yvonne Loya, National Center for STEM Education
Erika Mein, University of Texas at El Paso
Mary Urquhart, University of Texas at Dallas

Educator Preparation Coursework

Daniel Burt, Texas A&M University Kingsville
Kristian Fischer, University of Texas at Tyler
Alihan Hadimlioglu, Texas A&M University–Corpus Christi
Jiangjiang (Jane) Liu, Lamar University
Denise Gregory, University of Texas at Dallas
Kimberly Hughes, National Center for STEM Education
Uchenna Emenaha Miles, University of Texas at San Antonio
Michael Odell, University of Texas at Tyler
Sujing Wang, Lamar University
Jill Westerlund, University of Texas at Austin

National Center for STEM Education
The University of Texas at Austin
3925 W Braker Lane Suite 4.11120
Austin TX 78759

nationalstemed.org

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Executive Summary

Texas faces an urgent, well-documented shortage of certified computer science (CS) teachers that threatens students' access to the computing skills increasingly central to postsecondary and workforce opportunities. Addressing this shortage requires coordinated statewide action across recruitment, preparation, certification, and policy.

While all Texas high schools are required to offer computer science coursework, only 46% did so in 2022–2023, and just 5% of high school students statewide were enrolled in a CS course. In the most recent year for which data are available, Texas educator preparation programs (EPPs) produced only a small number of newly certified CS teachers, and the overwhelming majority of those came through for-profit, alternative certification routes rather than university-based programs, even though university-prepared teachers are associated with stronger student outcomes and higher retention (Hughes et al., 2025).

The Texas Computer Science Pipeline (TX CSP) initiative brings together EPP partners and other stakeholders from across the state to respond to these challenges through coordinated, research-aligned action. The first phase of work involved clarifying challenges and broadly outlining priority areas of focus for the state (Hughes et al., 2025).

Recent research indicates that developing sustainable CS educator preparation pathways is not primarily a matter of adding isolated CS content to existing pathways. Programs must build faculty capacity, provide candidates with repeated opportunities to develop CS content knowledge and pedagogical confidence, and create practice-based learning experiences that prepare candidates to teach CS in authentic classroom contexts (Karlin et al., 2024; Margulieux et al., 2022; Villavicencio et al., 2025). Research on CS teacher preparation program development also points to the importance of committed institutional champions, stakeholder buy-in, sustainable funding, and state policy alignment; without these conditions, promising pathways often struggle to move beyond small-scale or short-term implementation (Hardin et al., 2026; Liao et al., 2025). Emerging research also suggests that add-on or dual-certification models can be promising when they are intentionally sequenced, supported by policy and institutional infrastructure, and designed to strengthen candidates' CS knowledge, pedagogy, equity orientation, and instructional confidence without weakening their preparation in their primary certification area (Hardin et al., 2026; Odom-Bartel et al., 2021; Zelkowski et al., 2025).

In this report, we situate the work of the TX CSP initiative within this broader research context. We identify several interconnected challenges that EPPs must address: crowded degree plans and certification requirements; low enrollment in CS teacher certification pathways; limited institutional capacity to offer specialized CS coursework; recruitment challenges created by more lucrative computing careers and limited awareness of CS teaching; outdated and insufficient certification structures; and the need for cross-departmental coordination among education, mathematics, and computer science faculty.

During this second phase of the TX CSP initiative, three working groups proposed solutions to the challenges identified in the research and born out through their own professional experiences. The three groups converged on priority recommendations that address both the immediate need to

expand the CS teacher pipeline and the longer-term conditions required to sustain high-quality preparation pathways:

1. Update the Texas Computer Science 8–12 certification exam to better reflect current computing knowledge and instructional practice.
2. Establish a dual Computer Science/Mathematics (Grades 7–12) certification to expand districts’ staffing flexibility and grow the pool of qualified CS teachers.
3. Build a data-informed recruitment messaging repository that EPPs across the state can adapt locally.
4. Develop and pilot centralized CS educator preparation coursework that can be shared across EPPs.
5. Secure meaningful incentives and support so these pathways are sustainable for both candidates and participating EPPs.
6. Clarify policy and implementation considerations related to certification requirements, assignment authority, accountability, implementation supports, and long-term ownership of shared initiatives.
7. Sustain statewide collaboration among EPPs, state agencies, and K–12 partners through ongoing communities of practice, convenings, or advisory structures.

This report presents each working group’s findings and recommendations in detail.

Introduction

As computer science (CS) education expands nationwide, educator preparation programs face growing pressure to prepare teachers who can deliver high-quality CS instruction, yet research indicates this work remains constrained by gaps in faculty capacity, teacher confidence, program structure, recruitment, and policy alignment. Many teacher education faculty and preservice teachers enter CS preparation with limited CS knowledge and may conflate computer science with general technology use, requiring intentional professional learning before meaningful CS integration can occur (Karlin et al., 2024; Margulieux et al., 2022). Even when introductory CS experiences improve understanding, preservice teachers and novice CS educators often remain uncertain about designing and implementing CS instruction independently, particularly without concrete curriculum materials, coaching, and opportunities to practice teaching CS in authentic contexts (Margulieux et al., 2022; Villavicencio et al., 2025).

Structural constraints within educator preparation programs further complicate implementation. Teacher preparation curricula are already crowded with certification, content, methods, and clinical requirements, making it difficult to add CS coursework without extending time to completion or weakening existing program quality (Margulieux et al., 2022; Odom-Bartel et al., 2021). This challenge is especially salient in secondary mathematics preparation, where programs must preserve rigorous mathematics content and pedagogy while determining whether and how CS can be added as a complementary credential area (Odom-Bartel et al., 2021; Zelkowski et al., 2025).

There are additional constraints at the institutional and policy levels. Program leaders report navigating inconsistent state licensure policies, complex approval processes, cross-departmental coordination challenges, limited funding, and uncertainty about how CS certification should fit within existing teacher preparation structures (Hardin et al., 2026). These barriers contribute to a persistent cycle in which schools struggle to expand CS offerings because they cannot find qualified teachers, while preparation programs struggle to recruit candidates because dedicated CS teaching roles and clear certification pathways remain limited or unevenly defined (Hardin et al., 2026).

A University of Alabama model illustrates one way to interrupt this cycle by embedding CS as an add-on credential within an existing secondary mathematics program, but the authors emphasize that this requires coordination among computer science, mathematics, and secondary education faculty; alignment with state policy; attention to course scheduling; and support from state and professional networks (Odom-Bartel et al., 2021; Zelkowski et al., 2025).

Recruitment and sustainability also remain central challenges. Hardin and colleagues (2026) found that many CS teacher preparation programs struggle to enroll and graduate more than a small number of candidates, particularly because CS majors often have more lucrative industry options and many prospective teachers are unaware of CS teaching as a viable career path. The Alabama studies found, however, that CS teaching can be attractive to secondary mathematics candidates; 44 students pursuing secondary math certification were invited to join a CS add-on pathway, and 29 participated. The outcomes were promising: 24 of 29 participants completed the mathematics teacher preparation program, 20 reported comfort teaching AP Computer Science Principles alongside mathematics, and 15 pursued a full CS teaching endorsement rather than only an AP CSP

permit option. The authors further demonstrated that a carefully structured CS pathway can strengthen candidates' readiness to teach CS without undermining their mathematics preparation (Zelkowski et al., 2025).

Other recent research suggests that the challenge of developing CS educator preparation pathways extends beyond adding CS content to existing programs. Sustainable pathways require coordinated investments in developing faculty capacity, teacher confidence, curriculum resources, clinical and practice-based learning opportunities, cross-departmental collaboration, recruitment strategies, and supportive state policy environments (Hardin et al., 2026; Karlin et al., 2024; Odom-Bartel et al., 2021; Zelkowski et al., 2025).

The emerging evidence from the Alabama dual-certification model suggests that rigorous add-on pathways embedded in strong secondary teacher preparation programs may be a viable strategy for growing the CS teacher pipeline, particularly when candidates experience CS as learners, study CS pedagogy and equity, connect CS to their primary discipline, and receive structured support for certification and early-career teaching (Odom-Bartel et al., 2021; Zelkowski et al., 2025). Without these interconnected supports, programs may generate initial enthusiasm but struggle to scale or sustain long-term impact; with them, preservice pathways can become a durable complement to in-service professional development in meeting the growing demand for qualified CS teachers (Hardin et al., 2026; Zelkowski et al., 2025).

Texas Computer Science Pipeline Initiative

The Texas Computer Science Pipeline (TX CSP) initiative was established to strengthen and expand pathways into the computer science teaching profession through collaboration among educator preparation programs (EPPs), state agencies, and K–12 partners. Recognizing that no single institution can address the state's computer science teacher shortage alone, the initiative provides a structure for EPPs to share expertise, identify common challenges, and develop coordinated solutions that support the preparation of future computer science educators.

The work represented in this report follows a fall 2024 stakeholder convening hosted by the UTeach Institute (now the National Center for STEM Education) and the WeTeach_CS program at the Texas Advanced Computing Center, which brought together representatives from 18 Texas institutions of higher education along with the Texas Higher Education Coordinating Board (THECB) and the Texas Education Agency (TEA) to examine challenges facing preservice CS teacher development. That convening produced an initial report, *Strengthening Computer Science Teacher Preparation Pathways in Texas* (Hughes et al., 2025), which documented challenges across four areas: recruitment, funding, and incentives; policy barriers and gaps; higher education programmatic challenges; and K–12 capacity. The report also outlined several promising strategies for strengthening the pipeline, including exploring dual-subject certification pathways, increasing collaboration across academic departments, and expanding access to computer science teacher preparation opportunities.

Findings from that report were presented to the State Board for Educator Certification (SBEC) in fall 2025. Following that presentation, EPP partners organized into three structured working groups to develop the initial recommendations into concrete tools, frameworks, and proposals that could be implemented and scaled across institutions:

- CS Certification Pathways and Requirements Working Group
- CS Educator Recruitment Working Group
- CS Educator Preparation Coursework Working Group

Each group engaged in collaborative inquiry, resource development, and strategy design to consider barriers and challenges, identify strengths and assets, and identify solutions.

This report captures their shared insights, tools, and recommendations to advance CS teacher preparation statewide.

CS Certification Pathways and Requirements Working Group

The CS Certification Pathways and Requirements working group came together to examine two related charges for strengthening CS certification in Texas: (1) modernizing the content on the Computer Science 8–12 (241) certification exam and (2) exploring the creation of a dual Computer Science/Mathematics (Grades 7–12) certification.

Since the CS (241) certification exam was developed, Texas’s certification and course-assignment landscape has changed. The introduction of the Technology Applications EC–12 (242) certification expanded the courses that may be taught under a Technology Applications credential, including several courses that previously required CS certification. At the same time, state law requires all high schools to offer CS coursework, increasing the demand for CS-certified educators. Together, these changes warrant a formal review of whether the CS (241) exam remains aligned with the courses CS-certified teachers are most commonly expected to teach.

In short, the courses attached to the certification have changed, but the exam has not yet been reconsidered in light of those changes.

The working group analyzed statewide certification data, reviewed secondary CS course enrollment trends, examined teacher assignment patterns, and explored policy models that could strengthen certification pathways while maintaining rigor.

They identified several challenges:

- Low participation in the CS (241) certification exam
- Significantly lower CS certification passing rates compared to comparable certifications
- Misalignment between tested content and typical classroom teaching assignments
- Workforce shortages that limit district ability to offer CS courses
- Limited flexibility for districts seeking to staff both mathematics and CS courses

Charge 1: Computer Science Grades 8–12 (241) Certification Exam: The Case for Change

Texas Education Agency (TEA) data from 2020–2025 show that the Computer Science 8–12 (241) certification exam has both the lowest average pass rate and one of the smallest candidate pools among comparable secondary certifications. The exam’s average pass rate is just 31%, compared to 54% for Technology Applications EC–12 and 61% for Mathematics 7–12 (Texas Education Agency, 2026b).

The working group reviewed statewide course enrollment and assignment data from 2020–2024. The findings were clear: 75.9% of all computer science course sections were CS I, CS II, or CS III. AP Computer Science A accounted for another 22.9%. In contrast, courses such as Digital Forensics and Discrete Mathematics for Computer Science represented only 1.2% of statewide offerings.¹

Fine-Tuning the CS 241 Exam to CS I, CS II, and CS III

The working group recommends targeting the content tested on the CS (241) exam to focus specifically on the knowledge and skills required to teach CS I, CS II, and CS III—the courses that account for the vast majority of statewide CS teaching assignments. Content specific to Digital Forensics, Discrete Mathematics for CS, Robotics I, Game Design, and Mobile Applications Development would no longer be part of the exam’s tested scope. This change would not affect a CS-certified teacher’s ability to teach those courses under the Teacher Assignment Chart. Rather, it would ensure that the certification assessment measures the content most relevant to the teaching assignments educators are most likely to receive.

The intent is not to lower standards. The intent is to create a certification exam that more closely aligns with classroom practice, strengthens the pipeline of qualified CS teachers, and improves candidate success while maintaining rigor.

Proposed Exam Content Framework

Building on the current CS I, CS II, and CS III Texas Essential Knowledge and Skills (TEKS), the working group mapped which strands and course levels should anchor the more targeted exam. This framework is not a final specification, but a preliminary working draft intended to guide formal TEA content validation and standard setting:

- Programming fundamentals and coding practices
- Technology operations and computer science concepts
- Algorithmic thinking and problem solving
- Object-oriented programming and software design

¹ EPIC analysis of longitudinal PEIMS data from The University of Texas at Austin Education Research Center. The conclusions of this research do not necessarily reflect the opinion or position of the Texas Education Agency (TEA), the Texas Higher Education Coordinating Board (THECB), the Texas Workforce Commission (TWC), or the State of Texas.

- Data structures and data management
- Collaboration and communication in programming environments
- Digital citizenship, ethics, privacy, and security
- Testing, debugging, and documentation
- Application design and secure programming practices

Charge 2: Dual Computer Science/Mathematics (Grades 7–12) Certification

The working group explored the development of a dual Computer Science/Mathematics (Grades 7–12) certification pathway as a strategy for addressing Texas’s shortage of qualified CS educators while increasing staffing flexibility for school districts.

The proposed certification would build upon existing secondary mathematics educator preparation programs. Candidates would complete established educator preparation requirements, including pedagogy, classroom management, assessment, and clinical teaching requirements, while also developing the CS content knowledge necessary to teach secondary CS courses. This approach leverages existing certification structures, reduces implementation barriers for educator preparation programs, and creates additional pathways into CS teaching.

The working group identified significant alignment between mathematics and CS. Both disciplines rely on abstraction, logic, modeling, computational thinking, problem solving, and analytical reasoning. As CS education increasingly incorporates data science, artificial intelligence, cybersecurity, and computational modeling, the overlap between the disciplines continues to grow.

The group also concluded that a dual certification could provide meaningful benefits to both educator preparation programs and school districts through the following:

- Expanding the pipeline of qualified CS teachers
- Increasing staffing flexibility for districts
- Supporting implementation in rural and small districts
- Creating additional career opportunities for teacher candidates
- Building upon existing mathematics preparation structures

Proposed Dual Certification Framework

The working group recommends that any future dual certification preserve the core competencies required for secondary mathematics instruction while strategically integrating CS content.

Several overarching priorities emerged:

- Preserve all major mathematics domains.
- Emphasize areas of strong disciplinary overlap, particularly algebra, problem solving, logical reasoning, and data analysis.

- Increase attention to computing-relevant concepts such as algorithms, computational thinking, data literacy, and emerging technologies.
- Maintain rigorous preparation expectations while improving alignment with classroom practice.

Proposed Examination Structure

The working group recommends adopting a structure similar to the existing Physics/Mathematics 7–12 certification examination. A 120-question assessment divided equally between mathematics and computer science would provide balance while maintaining sufficient depth in both content areas.

The mathematics portion would continue to be organized around the six existing mathematics domains, accounting for approximately 50 percent of the examination. Patterns and Algebra should remain the strongest emphasis because of its direct relevance to computer science, while Geometry and Measurement may be streamlined but should remain represented due to likely teaching assignments.

The computer science portion would account for the remaining 50 percent of the examination and would include technology applications, program design and development, programming language concepts, and selected specialized topics. Discrete mathematics should remain within the computer science framework because of its importance to algorithms, logic, and computational reasoning, while other specialized topics may warrant reduced emphasis.

This structure offers continuity with existing Texas certification models while creating opportunities for meaningful integration across the two disciplines.

Considerations

Working group members noted that a dual certification may be particularly beneficial for rural and small school districts, which often face challenges in staffing both mathematics and CS courses. A dual-certified educator could provide districts with greater scheduling flexibility while expanding student access to high-quality STEM coursework.

Clarification regarding teacher assignment authority will be essential. Particular attention should be given to ensuring that dual-certified educators maintain eligibility to teach secondary CS courses and related technology applications offerings where appropriate. Streamlining or reorganizing CS competencies should not unintentionally reduce assignment flexibility or require educators to obtain additional certifications solely to teach courses traditionally associated with CS credentials.

Recommendations

The working group recommends that TEA, SBEC, educator preparation programs, and other stakeholders further explore and evaluate both the proposed updates to the Computer Science 8–12 (241) certification exam and the proposed dual Computer Science/Mathematics (Grades 7–12) certification pathway. Specifically, the group recommends the following:

- Initiate a formal review of the Computer Science 8–12 (241) certification examination and conduct validity and alignment studies.
- Explore development of a dual Computer Science/Mathematics (Grades 7–12) certification pathway.
- Engage stakeholders from K–12 education, higher education, educator preparation programs, and assessment development throughout the review process.
- Further develop and refine the dual certification framework, including examination structure, content standards, and implementation requirements.
- Examine impacts on educator preparation programs, teacher candidates, district staffing flexibility, and rural district workforce needs.
- Clarify teacher assignment authority, allowable course assignments, program approval requirements, and other policy considerations associated with revised certification pathways.

CS Educator Recruitment Working Group

The CS Educator Recruitment Working Group focused on identifying recruitment strategies to strengthen and diversify the CS teacher pipeline while reducing barriers to entry.

Working group members reviewed existing teacher recruitment frameworks, including strategies currently used to recruit in other STEM disciplines such as mathematics and science. Members drew upon prior stakeholder engagement efforts, past interactions with faculty in EPPs and STEM (including in university CS programs), and existing national resources to identify messaging approaches that could be adapted specifically for CS teacher recruitment.

They found that many of the challenges with the recruitment of preservice mathematics and science teachers also apply to recruiting preservice CS teachers. Fortunately, UTeach programs and organizations like Get the Facts Out have years of experience combating those challenges.

The group identified several barriers affecting recruitment into CS teacher preparation pathways:

- Competition from higher-paying careers in computing and technology
- Negative perceptions of the teaching profession
- Limited awareness of CS teaching as a career option
- Inconsistent messaging across institutions
- Limited resources available to support CS-specific recruitment efforts
- Need for stronger partnerships among EPPs, school districts, Education Service Centers (ESCs), and higher education programs

Salary differentials may also constrain recruitment into CS teaching. The average salary of Texas public school teachers is approximately \$64,000 annually, while computer and information technology occupations as a whole had a median annual wage of \$109,470 in 2025 (Texas Education Agency, 2026a; U.S. Bureau of Labor Statistics, 2026). Although these figures represent different

statistical measures (average versus median), they illustrate the substantially higher earnings available in computing-related careers.

One opportunity that could mitigate salary concerns and combat negative perceptions of teaching is the Texas Teacher Incentive Allotment (TIA), which provides a potential salary increase of up to \$32,000 for teachers who meet the requirements.

Evolving workforce conditions may also create new opportunities for recruitment. As artificial intelligence reshapes the technology sector and enrollments in some university CS programs decline, CS majors may be increasingly interested in stable and meaningful career alternatives. Video testimonials could highlight how the rise of AI has made alternative careers more attractive to some CS majors, and CS enrollments were noted to be in decline at multiple universities (Underwood, 2026). Recruiting CS majors to try out teaching can focus on making a difference using CS knowledge alongside transferable skills to other professions, including robust collaboration, problem-solving, creativity, and highly marketable tech literacy.

Recommendations

Successful recruitment will depend on identifying effective ways to combat negative perceptions regarding teaching in general and CS teaching in particular. The working group recommends creating a centralized repository of tested CS-specific recruitment resources that can be adapted for local use while maintaining statewide consistency.

Recruitment messaging should emphasize long-term career stability, meaningful work, strong benefits, and emerging state-funded incentive opportunities. Specifically, messaging should do the following:

- Promote the societal impact of teaching CS.
- Highlight career stability and workforce relevance.
- Emphasize opportunities to shape the future workforce.
- Address common misconceptions about teaching as a career.
- Include region-specific salary and employment data when appropriate.

Salary remains a major concern, and advertising the TIA opportunity needs to be done with care to avoid misrepresentation. A de-emphasis on salary numbers and an emphasis on long-term stability in the age of AI may be a more successful strategy.

Given the low production of CS teachers from university EPPs, the messaging resources should be widely available to allow easy entry for those interested in engaging in this work. Likewise, EPPs will need opportunities to learn, engage with resources, and develop implementation plans.

Audience-Focused Messaging

Different audiences will respond to different messages. Examples:

- **Advisors and counselors:** Focus on creating impact and quality of life through a CS teaching career by using local job outlook information and dual-credit courses and by implementing counseling conversations, pathway planning materials, and scheduling sessions.
- **Parents and families:** Support the idea that an interest in CS can lead to stable, well-paying, future-ready careers, including in CS teaching. Parent outreach letters, postcard campaigns, community open houses, and program flyers currently in use for EPPs can be modified for CS.
- **Administrators and leadership:** Emphasize that expanding CS course offerings strengthens student outcomes, workforce readiness, and overall campus impact. Resources can be created to help EPPs engage with school boards, CTE programs, and district and campus administrators.
- **Education Service Centers:** Connect with ESCs, who can serve as important regional partners by promoting CS teaching pathways, connecting EPPs with district workforce needs, and leveraging existing CS professional learning networks to raise awareness of certification opportunities. Existing partnerships through organizations such as WeTeach_CS may provide opportunities to coordinate recruitment efforts and expand visibility of CS educator pathways.
- **Higher education faculty/EPPs:** Emphasize that embedding CS in teacher preparation enhances graduates' marketability and classroom readiness and that recruiting CS majors into teaching provides a viable alternative career pathway. Collaborative work is recommended on combating negative perceptions of CS teaching and on providing EPP support for CS teacher preparation, such as interactive preservice training, teacher preparation modules, and faculty curriculum alignment.
- **Students/future teachers:** Combat negative perceptions of teaching as a profession. Focus on how teaching CS lets them make a difference and build a meaningful, stable career with excellent and reliable benefits. Examples include "Love CS? Teach It!" posters, vibrant video stories, physical displays, and peer networking opportunities.

Next Steps

The next step for this work is to leverage gathered materials to create a comprehensive, data-driven messaging guide and menu of resources to empower recruiters, educators, partners, and local community advocates for CS preservice pathways. They can deploy resources in their region by selecting the primary audience role and tailoring the materials with locally relevant messaging such as salary metrics and regional workforce needs. Existing relationships with ESCs may provide opportunities to distribute resources, connect with districts, and promote educator pathway awareness across regions. Creating the repository of messaging resources will require a platform on which to host them, research-informed development and testing of recruitment materials, and learning and implementation support forums.

CS Educator Preparation Coursework Working Group

The CS Educator Preparation Coursework Working Group explored strategies for expanding access to CS teacher preparation with two main challenges in mind: (1) very low numbers of students pursuing initial CS certification with insufficient instructional resources and (2) a need for expertise to develop and support CS certification pathways at Texas institutions of higher education.

The group identified several challenges:

- Low enrollment in CS teacher certification pathways
- Limited institutional capacity to offer specialized CS coursework
- Degree plan constraints for teacher candidates
- Uncertainty regarding EPP accountability and recognition
- Logistical challenges associated with cross-institution enrollment
- Questions regarding funding, governance, and long-term sustainability

The working group evaluated existing certification pathways, reviewed statewide needs, and designed a proposed course sequence intended to prepare candidates for both certification success and effective classroom practice.

The group believes a concerted statewide effort is needed to address the shortage of qualified CS teachers in Texas. Pooling instructional resources and expertise across EPPs through a centralized, shared CS pathway represents a promising initial strategy for expanding access to CS teacher preparation, particularly when individual institutions may not have enough interested candidates to sustain their own course sequences.

Recommendations

The working group recommends developing a centralized, shared collection of courses and instructional resources that could be used across institutions to prepare students who are already enrolled in an educator preparation pathway to obtain secondary CS certification by exam. This approach offers a short-term solution to preparing more certified CS teachers while the state considers proposed updated certification requirements and pathways. Preservice teachers would pursue their primary certification through their respective EPPs and be invited to enroll in centralized, online CS education coursework. Upon completion of their primary certification, they would take the CS certification exam, allowing them to enter the job market with at least two teaching certifications.

The pathway should prepare candidates not only to pass the state certification examination but to enter the classroom with appropriate CS content knowledge, pedagogical knowledge, instructional confidence, and experience applying that knowledge in authentic teaching contexts.

The pathway should be flexible, accessible, and designed around the realities of teacher preparation programs. Because most candidates have little room in their undergraduate degree plans for additional coursework, the pathway may be most feasible as a summer opportunity completed after candidates finish their primary degree and certification requirements but before they begin full-time employment.

A pilot is necessary before statewide expansion, and both preservice candidates and participating EPPs will likely require meaningful incentives and clearly defined support structures for participation. Existing statewide STEM teacher preparation networks, including the UTeach network, may provide a useful foundation for identifying institutional liaisons, recruiting candidates, and supporting communication across participating programs.

Proposed Shared Instructional Coursework

The working group considered what coursework would provide preservice teachers with the minimum required pedagogical and content-specific knowledge to successfully pass the CS certification exam and enter the workforce as effective new CS teachers. The following courses are suggested:

1. Foundations of Computer Science Principles
2. Computer Science Curriculum and Pedagogy for Secondary Education
3. Applied Programming and Data for CS Educators
4. Foundations of AI and Emerging Applications for Educators

This pathway would prepare teacher candidates to build CS content knowledge, instructional confidence, and certification readiness for secondary CS teaching.

<i>1. Foundations of Computer Science Principles</i> 40–50 hours	Main purpose Build foundational CS knowledge aligned to AP CSP and Texas CS exam expectations Key learning outcomes Algorithms, abstraction, programming basics, data, networks, cybersecurity, ethics, and impacts of computing Field experience/assessment Recorded lesson observations, short reflections, programming projects, concept checks, and a summative CS project
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<i>2. Computer Science Curriculum and Pedagogy for Secondary Education</i> 40–50 hours	Main purpose Prepare candidates to design and teach effective, inclusive secondary CS lessons Key learning outcomes Standards alignment, lesson/unit design, AP CSP Create Task-style projects, assessment design, and equity-centered CS instruction Field experience/assessment Lesson analysis, microteaching, curriculum artifacts, assessment design, and reflection on instructional decisions
<i>3. Applied Programming and Data for CS Educators</i> 40–50 hours	Main purpose Strengthen programming fluency and data reasoning, especially for classroom application and exam readiness Key learning outcomes Java programming, debugging, arrays/lists, methods, data modeling, and translating technical skills into teachable tasks Field experience/assessment Java labs, programming assessments, data projects, code walkthroughs, microteaching plan, and revised instructional tasks
<i>4. Foundations of AI and Emerging Applications for Educators</i> 40–50 hours	Main purpose Build AI literacy for future CS teachers, with attention to ethics, classroom use, responsible implementation, and emerging advances Key learning outcomes Conceptual AI knowledge, AI capabilities/limitation, ethical use, classroom applications, effective prompting, and expanding future applications Field experience/assessment Scenario-based analysis, AI tool evaluation, quizzes, AI-use policy draft, and prompt/demonstration portfolio

Next Steps

The working group’s primary recommendation is to fully develop, pilot, and refine the centralized course sequence. The pilot should evaluate the following:

- Recruitment and enrollment outcomes
- Course completion rates
- Participant preparedness and confidence
- Certification examination participation and performance, when available
- Employer feedback
- Institutional implementation challenges
- Required incentives and supports for participation

Considerations

- When preservice teachers enrolled in EPPs complete their coursework and pass the required state examinations to earn their initial teaching certification, the EPP receives credit for the successful completion of each candidate. Because the proposed CS pathway would lead to an additional certification, EPPs may not receive comparable recognition or accountability credit when candidates earn the CS certification. This may create challenges in securing institutional buy-in because participating EPPs would be asked to recruit and support candidates without receiving a direct program-completion benefit.
- The proposed courses may not initially be approved as electives or included in participating institutions' degree plans. Because most teacher candidates already have highly structured programs of study, they may not enroll in additional courses that do not count toward graduation or their primary certification requirements. On the other hand, flexible, non-credit options could be more affordable and attractive to students. One possible option is to provide micro-credentials.
- Individual institutions may not have enough interested candidates to meet minimum enrollment requirements for a course to be offered. Although a centralized model is intended to address this challenge, the pilot will need to determine whether statewide participation is sufficient to sustain course sections.
- The timing of participation remains an important consideration. Most candidates are unlikely to have time for a four-course sequence while completing their undergraduate degree, certification coursework, field experiences, and student teaching. A summer pathway after completion of the initial certification program, but before candidates begin full-time teaching, may be more realistic. This option, however, makes institutional participation even trickier, since students are considered graduated at this stage.
- A fully synchronous delivery model could limit participation because recent graduates and teacher candidates may have work, relocation, family, or other scheduling obligations. The pilot should examine whether a hybrid model combining asynchronous coursework, scheduled synchronous sessions, and multiple optional support sessions would provide greater flexibility while preserving interaction and instructional quality.
- Enrollment across institutions must overcome substantial logistical barriers, including admissions processes, registration, tuition payment, transcript documentation, advising, and communication between the centralized provider and the candidate's home institution.
- Even with a local faculty liaison, candidates may need more support than recruitment and encouragement alone. The role of a liaison must be clearly defined, realistic, and limited to responsibilities that faculty members can reasonably assume.
- The value of an additional certification may not be sufficient by itself to generate strong participation. The pilot should determine what incentives are necessary to recruit and retain candidates, including stipends for course completion, scholarships, examination fee support, or additional financial incentives tied to completing the pathway or passing the certification examination.

- The responsibilities of the centralized program, participating EPPs, institutional liaisons, school districts, and state-level partners have not yet been fully defined. Establishing clear governance and coordination structures should be prioritized during a pilot.
- Artificial intelligence is transforming both CS education and the software engineering profession at an unprecedented pace. While there is broad agreement that CS education remains critically important, there is less certainty regarding which knowledge and skills will be most valuable five to ten years from now. Current evidence suggests AI is changing the nature of software engineering rather than eliminating the need for software engineers. Programming tasks are increasingly supported by AI, while human expertise is shifting toward problem formulation, system design, verification, testing, evaluation, ethics, and oversight. As the statewide pathway is developed, the working group recommends the curriculum remain adaptable rather than static. Instead of viewing artificial intelligence as a standalone topic, future revisions should consider how AI reshapes every aspect of CS preparation, including programming, pedagogy, assessment, cybersecurity, data, and computational thinking. A process for regular curriculum review should be established to ensure the pathway evolves alongside changes in technology, workforce needs, and state certification expectations.

Cross-Cutting Themes and Priority Recommendations

Although each working group focused on a different aspect of the teacher preparation pipeline, their findings consistently pointed to the need for stronger statewide coordination, increased access to preparation opportunities, and streamlined certification requirements and pathways into the profession.

The following recommendations represent the highest-priority opportunities identified by the working groups and are intended to guide the next phase of statewide collaboration.

1. Modernize and expand CS certification pathways.

The groups identified opportunities to strengthen certification pathways by aligning certification requirements with current instructional practice and workforce needs. Recommendations include exploring updates to the Computer Science 8–12 (241) certification exam to better reflect the courses most commonly taught in Texas schools and advancing the development of a dual Computer Science/Mathematics (Grades 7–12) certification pathway. Together, these efforts have the potential to increase the number of qualified CS educators while providing greater staffing flexibility for school districts.

2. Strengthen recruitment to CS teacher preparation pathways through shared messaging and outreach resources.

Texas EPPs would benefit from a coordinated recruitment strategy that promotes CS teaching as a meaningful, stable, and future-focused career. The working groups recommend developing a data-

informed recruitment messaging repository that can be adapted for local contexts and audiences, including students, families, advisors, faculty, school administrators, and community partners.

3. Expand access to CS teacher preparation through centralized, shared coursework.

Many teacher preparation programs do not have sufficient enrollment to independently sustain CS certification pathways. The working groups recommend developing a centralized, shared CS course sequence that allows candidates from multiple institutions to access high-quality CS preparation without requiring each EPP to develop a standalone pathway.

4. Provide incentives and supports for candidates and participating EPPs.

Expanding the CS teacher pipeline will require meaningful investments in both teacher candidates and educator preparation programs. Potential supports include scholarships, stipends, certification exam assistance, completion incentives, and implementation funding for participating institutions. The working groups also noted that additional consideration should be given to how EPPs receive recognition or accountability credit when candidates earn CS credentials as supplemental certifications.

5. Clarify policy and implementation considerations.

Several recommendations emerging from this work require collaboration with the Texas Education Agency and other stakeholders in areas such as certification requirements, assignment authority, accountability measures, implementation supports, and long-term ownership of shared initiatives. Clear policy guidance will help districts, candidates, and teacher preparation programs make informed decisions as these recommendations move forward.

6. Sustain statewide collaboration.

The initial work of the Texas Computer Science Pipeline initiative demonstrates the value of ongoing collaboration among teacher preparation programs, state agencies, and K–12 partners. Continued statewide engagement will be essential as pilot programs are launched, certification proposals are refined, and new resources are developed. The working groups recommend establishing sustainable mechanisms for ongoing collaboration, such as communities of practice, annual convenings, or standing advisory groups to monitor progress, share resources, and build on the momentum generated during this phase of the work.

Conclusion

The Texas Computer Science Pipeline initiative reflects a shared commitment among educator preparation programs, state agencies, and district partners to strengthen the preparation of future CS educators. Through collaboration, research, and the exchange of promising practices, participants identified actionable strategies for expanding access to CS teacher preparation and addressing persistent workforce challenges.

The recommendations outlined in this report are intended to serve as the foundation for the next phase of work. While additional research, pilot testing, and policy discussions will be necessary, the collective efforts of the 2025–2026 working groups demonstrate that meaningful progress is possible when institutions work together around a common goal.

By strengthening recruitment efforts, expanding access to preparation pathways, modernizing certification structures, and sustaining statewide collaboration, Texas has an opportunity to increase the number of qualified CS teachers and expand access to high-quality computer science education for students across the state.

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