

## Rethinking UTeach and Computer Science

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### Abstract

In the 13 years that UTeach has offered certification, only 7 teachers have been certified to teach computer science. Focus groups indicate that although many computer science majors express interest when they learn about UTeach, few are aware of the program. Guided by these exploratory findings, UT Austin’s Computer Science department has implemented changes to increase student interest and participation in the UTeach program. Future plans include support for retention and expansion of computer science certification both in and out of UTeach.

Recent STEM initiatives focus on increasing the supply of well-trained science and mathematics teachers. However, computer science is largely ignored in K-12 education policy decisions, resulting in a disturbing trend in enrollments in high school computer science courses. The percentage of high schools offering “introductory” computer science courses fell from 78% in 2005 to 65% in 2009. Even more alarming, the percentage of high schools offering “rigorous” computer science coursework declined from 40% to 27% in the same period.[1]

One potential cause for this drop is the lack of well-qualified computer science teachers in secondary classrooms. In fact, figures gathered by the Computer Science Teachers Association (CSTA) suggest a positive correlation between states with strong computer science teacher certification standards and high school course enrollments. Only 20 states offer computer science endorsements, however, and of those, only 13 require certification to teach computer science classes.[2]

Texas is well-positioned in K-12 computer science education efforts. The State Board for Educator Certification, in recognizing the need to separate preparation guidelines for computer literacy and the more rigorous computer science courses, discontinued the “Computer Information Systems” certificate in 2004 in favor of more specialized pathways to certification.[3] Currently, Texas offers a specialized teacher certification for computer science. (A separate Technology Applications certificate is offered for computer-oriented coursework outside of the scope of computer science, which includes courses such as Desktop Publishing, Multimedia, and Web Authoring.)[4]

These certificates are aligned to the state education standards, the Texas Essential Knowledge and Skills (TEKS). The state has defined standards for two computer science courses<sup>1</sup> in addition to six technology applications courses[5]. In Texas, high school graduation plans offer core curriculum credit for computer science courses (technology applications or mathematics, depending on the plan).[6] Overall, the state appears accommodating to K-12 computer science education. However, UTeach has only graduated seven computer science certified teachers in its 13 year history.

## Current Recruitment Efforts

In May 2009, the UT Austin Computer Science department conducted focus groups to explore the issues surrounding low participation in UTeach by computer science majors. Students' responses indicated the following:

- At UT Austin, computer science students not enrolled in UTeach courses are typically unaware that they can earn teaching certification through UTeach.
- Even those who have heard of the program are unaware of some of its defining characteristics, such as:
  - Degrees earned with and without teaching certification would be equivalent (i.e., Bachelor of Science in Computer Science).
  - No additional time is needed to earn certification.
  - Field experiences are incorporated early and throughout.
  - There is no commitment to remain in the program.
  - Tuition for the first two courses is reimbursed.
- Advertising these characteristics greatly increases interest among computer science majors.

Incorporating this information into a plan of action, the UT Austin Computer Science department has instituted the following changes in order to recruit more computer science students into the UTeach program:

- A dedicated UTeach-CS Program Coordinator position has been established to promote active communication among UTeach, the Computer Science department, and computer science majors.
- A template four-year plan has been drafted to illustrate how students can fit the UTeach professional development sequence into their current degree plans.

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<sup>1</sup>These courses are separate from the independently constructed Advanced Placement (AP) Computer Science A course defined by The College Board.

- Bachelor of Science in Computer Science teaching option degree plans are being drafted to facilitate single certification in computer science or dual certification in computer science and mathematics.<sup>2</sup>
- UTeach is being advertised specifically to computer science students with posters, visits to introductory computer science courses, e-newsletter mailings, a Web presence, and independent information sessions.

Among returning computer science majors alone, these efforts have been fairly successful. Seven computer science majors have enrolled in Fall 2010 sections of Step 1 (only one student had been enrolled in the semester prior to recruiting efforts). Enrollment is anticipated to increase as the program is advertised to incoming computer science freshmen during summer orientation sessions.

## Anticipated Retention and Expansion Efforts

As more computer science students enroll in UTeach courses at UT Austin and recruitment efforts are systematized, we anticipate a shift in focus to retaining existing students. Our plans for expanding computer science in UTeach and retaining students include:

- *Develop and support additional degree plans for computer science teaching certification:* Initially, we intend to construct a mathematics teaching option degree plan that would prepare students to teach both mathematics and computer science. This degree plan will serve as the reciprocal plan to the Bachelor of Science in Computer Science with a computer science and mathematics certification route. Other relevant reciprocal degree plans are also being considered.
- *Improve computer science content support within UTeach courses:* Given the lack of computer science students in UTeach courses, course content is understandable focused on science and mathematics. In courses where computer science field placements are possible, we hope to advise and support students with sample lesson plans, project seeds, and state standards alignment. Throughout the curriculum, we hope to investigate possible supplements to coursework that emphasize the general ideas of “computational thinking”, including abstraction, recursion, algorithms, and induction[7].
- *Consider designing a computer science pedagogical methods course:* Building on the approach Functions and Modeling takes to secondary pedagogical methods in mathematics, we plan to investigate the development of

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<sup>2</sup>Currently, the only route to computer science certification advertised by the UTeach program is through a Bachelor of Science in Interdisciplinary Studies degree. Unlike the other teaching option degree plans at UT Austin, the earned degree in this case is different than that obtained by majors not pursuing teaching certification.

a methods course for computer science certifiers. Recommended for computer science certification programs by the CSTA Teacher Certification Task Force (pp. 33-35)[8], such a course is particularly relevant when the knowledge required to teach a subject differs from that in undergraduate content coursework. Because our intention is to include academic majors outside of computer science in our recruitment and support efforts, this course would also serve as groundwork for introducing the interdisciplinary ideas of “computational thinking” to potential computer science certifiers.

- *Conduct state-wide needs assessment:* Currently, UTeach has five partner universities in Texas. Given that each implements similar frameworks and is subject to the same state standards, we hope to leverage our results state-wide. We hope to conduct a needs assessment to determine which of our efforts are applicable across institutions and which could be adopted for use in other states.
- *Construct and support additional pathways to computer science teaching certification:* Spurred by the goal of creating 10,000 qualified computer science teachers nationwide by 2015[9], we intend to investigate the multiple pathway approach to certification as suggested by the CSTA Teacher Certification Task Force (pp. 56-65).[8] Leveraging the pedagogical knowledge of teachers in similar disciplines (e.g., mathematics), we are investigating the development of a program to train in-service teachers to teach secondary computer science as outlined in the TEKS and AP course descriptions.
- *Improve the quality of high school computer science course offerings in Texas:* We hope to construct a rigorous dual credit course based on established computer science coursework for non-majors at UT Austin. The course would offer high school students the opportunity to satisfy state graduation requirements with a challenging alternative to typical technology applications coursework. Rooted in the principles of “computation thinking,” content would focus on interdisciplinary situations using a problem-based approach.

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## References

- [1] Data/Computer Science Facts, 2009. Retrieved May 18, 2010, from Computer Science Education Week: <http://www.csedweek.org/resources/datacs-facts/>.
- [2] Computer Science Teacher Certification Requirements: CSTA Certification Database, 2009. Retrieved May 18, 2010 from Computer Science Teachers Association, Association of Computing Machinery: <http://csta.acm.org/ComputerScienceTeacherCertification/sub/TeacherCertificationRequi.html>.
- [3] Transition Policy for Technology Applications and Computer Science TExES Exams Available Fall 2004, 2004. Retrieved May 19, 2010 from Texas State Board for Educator Certification: <http://www.sbec.state.tx.us/SBECOnline/transplcynewcertfall04.asp>
- [4] Curriculum: Technology Applications: Educator Standards and Certification, 2007. Retrieved May 18, 2010 from Texas Education Agency: <http://ritter.tea.state.tx.us/technology/ta/edstd.html>.
- [5] Texas Administrative Code (TAC), Title 19, Part II Chapter 126. Texas Essential Knowledge and Skills for Technology Applications, 1998. Retrieved May 19, 2010 from Texas Education Agency: <http://ritter.tea.state.tx.us/rules/tac/chapter126/index.html>.
- [6] State Graduation Requirements: Side by Side Graduation Requirements, 2009. Retrieved May 19, 2010 from Texas Education Agency: <http://www.tea.state.tx.us/graduation.aspx>.
- [7] Wing, J. M. Computational Thinking, *Communications of the ACM, viewpoint*, 49 (3). 33-35.
- [8] Ericson, B., Armoni, M., Gal-Ezer, J. Seehorn, D., Stephenson, C., & Trees, F. (2008). Ensuring exemplary teaching in an essential discipline: Addressing the crisis in computer science teacher certification. New York: The Computer Science Teachers Association.
- [9] Cuny, Jan. Finding 10,000 Teachers: Transforming High School Computer Science. *CSTA Voice*, 5(6). 1-2.