

HELPING HIGH-NEEDS SCHOOLS PRIORITIZE CS EDUCATION THROUGH TEACHER ADVOCACY & EXPERIENCES

Joseph P. Wilson and Melissa Moritz

Disparities in Access to Computer Science. Most low-income students and students of color in the United States do not receive the high-quality, rigorous computer science (CS) instruction needed for success in college and beyond—despite the reality that five of the fastest growing occupations are in the computing field. Moreover, computing-related jobs are among the highest entry-level salaries of any bachelor's degree [4]. Despite the incredible opportunities presented to students who possess a CS background, less than one-quarter of students nationwide have access to rigorous CS courses [5]. In fact, most students typically learn very basic user skills (e.g. typing, Microsoft Office, etc.) while only a privileged few receive advanced, problem solving-based instruction that is necessary for innovation in this generation's knowledge economy [1,8,9,12,14].

While there has been an increase in the number of U.S. high schools offering the Advanced Placement (AP) test in CS (up 26% from 2013–2014) [2], there still remains an underrepresentation of certain student populations [11]. As of 2014, female students account for only 20% of AP CS test takers and 56% of overall AP test takers. Even more concerning, Latino/a, African-American, and Native American students make up just 8.8%, 3.9%, and 0.4% of all AP CS test-takers, respectively [2]. In 2013, no African-American students took the exam in 11 states, and no Latino/a students took it in eight states [7]. Latino/as, who comprise 30% of the U.S. population, account for only 6.7% of CS bachelor degrees [6]. These stark realities translate into dramatic underrepresentation of minorities in CS at the undergraduate level and eventually in CS careers. Efforts to reverse this injustice must begin with strengthening PK–12 CS education and providing access to all students, especially those of African-American, Latino/a, and Native backgrounds, as well as students from low-income backgrounds.

In 2013, Teach For America (TFA), the national corps of recent college graduates and professionals who commit to teach in high-needs urban and rural public schools, received a National Science Foundation pilot grant to recruit and support a small cohort to teach the *Exploring Computer Science* (ECS) curriculum in New York City. Because TFA's organizational vision is focused on improving educational opportunities for all children, particularly low-income children and children of color, improving access to strong STEM and CS educational experiences is central to TFA and its STEM Initiative.

Barriers to PK–12 CS Education. While the initial pilot in New York City was mainly focused on increasing the number of ECS teachers in high-needs high schools, we learned quite a bit about prioritization of CS education through our conversations with teachers and school administrations. Many schools talked about wanting to be “STEM-focused”, but few schools were able to prioritize CS through course offerings and teacher professional development. School administrators had their students' best interests at heart and didn't need to be convinced that STEM and CS education were important, but there were some fundamental barriers that prevented widespread adoption at the school level, including (but definitely not limited to) the following:

- **Definition of Computer Science in an Educational Context.** Many administrators view computer science solely as the act of *coding*, as opposed to the process of computational thinking, design, and teamwork that typifies the field. Additionally, more than a small number of administrators viewed CS as keyboarding skills, Microsoft Word, Microsoft Powerpoint, and Internet research. Administrators need more opportunities to experience computer science in a variety of contexts—in school and out of school—in order to fully understand and eventually for computer science at their schools.

- **CS Courses & Educational Standards.** Administrators want to know which course(s) is/are best to offer for their school and to understand how CS courses are related to educational standards, whether that is at the national (like Common Core and Next Generation Science Standards) or state levels. The Computer Science Teacher Association, the ECS team, and SRI International have done an incredible job of creating and mapping PK-12 CS standards [3,13] to a variety of educational standards, and we need to make sure these mappings are well-known to administrators.
- **CS Teaching, Support, & Educational Pedagogy.** Even when administrators are supportive of CS in their schools, they still are unclear about what a high-performing CS class looks like and how they should support their CS teachers. Administrators are looking to understand the best practices in CS education but are unclear even where to look to find the start to the answer.

Computer Science @ TFA. With the goals of addressing some of the barriers to wider-spread adoption of CS education and expanding access of CS courses to more high-needs high schools, Teach For America is expanding the pilot program in New York City. Specifically, TFA hopes to support the implementation of the ECS course in urban and rural public high schools in 10 TFA regions over the next three years, beginning with New York City, South Carolina, Kansas City, and the Rio Grande Valley. TFA hopes to prepare more than 75 teachers, designated as ECS Fellows. In their first year as ECS Fellows, participating teachers will advocate for CS instruction in their schools and become advocates for CS experiences through activities like hosting an Hour Of Code or an afterschool CS club. In their second and third years as ECS Fellows, they will teach the ECS curriculum, and in their third year and beyond, they will have the opportunity to become ECS Professional Development Facilitators.

Beyond this specific program implementing ECS, Teach For America hopes to build teacher advocates for CS education in high-need schools, help school administrators prioritize CS, and increase access to CS for students in low-income communities. This work will directly address the inequities in CS education in three ways:

- **Build Capacity.** We will recruit diverse leaders with CS backgrounds and interest to teach in low-income communities and become CS advocates in their communities.
- **Partner to Build CS Communities.** We will actively work with national and local organizations to promote CS experiences for teachers and students, will recruit principals and districts to prioritize CS courses, and will advocate for a continuum of CS courses.
- **Develop & Support CS Teachers.** We will support the professional development of new CS teachers through existing programs including ECS, Code.org, Project Lead the Way, and the National Math & Science Initiative.

Diversifying the CS, Technology, and Innovation Workforce. Early exposure to CS educational experiences is necessary to help diversify the CS, technology, and innovation workforce. As more than 50% of public school students now identify as people of color [10], we need to ensure that all students have the access to CS they deserve but currently do not get. We believe that recruiting and supporting teacher advocates who can help high-needs schools prioritize CS are a major part of the solution, and we look forward to working with the broader CS education community to help level

the playing field for all students, but especially students of color, low-income students, female students, and students with intersections of these identities. **lr**

References

- [1] Barron, B. "Learning Ecologies for Technological Fluency: Gender and Experience Differences." *Journal of Educational Computing Research*, 31 (2004): 1-36.
- [2] College Board "AP Program Participation and Performance Data 2014." <http://research.collegeboard.org/programs/ap/data/participation/ap-2014>. Accessed 2015 March 31.
- [3] Computer Science Teacher Association. "CSTA K-12 Computer Science Standards." <http://csta.acm.org/Curriculum/sub/K12Standards.html>. Accessed 2015 April 21.
- [4] Dohm, A. and Shniper, L. "Employment Outlook: 2006-16." *Monthly Labor Review*, (November 2007): 94-96. <http://www.bls.gov/opub/mlr/2007/11/art5full.pdf>. Accessed 2015 March 18.
- [5] Finkel, S. "Computer Science Education Week 2012 Highlights How Computer Science Fuels the Future." December 10, 2012, <http://www.prweb.com/releases/2012/12/prweb10219767.htm>. Accessed 2015 March 18.
- [6] Finley, K. "Fellowship Backs Minority Computer Science Students." *Wired* (blog). September 25, 2012. <http://www.wired.com/wiredenterprise/2012/09/code-2040/>. Accessed 2015 March 18.
- [7] Heitin, L. "No Girls, Blacks, or Latino/as Take AP Computer Science Exam in Some States." *EdWeek* (blog), Jan 10, 2014. http://blogs.edweek.org/edweek/curriculum/2014/01/girls_african_americans_and_hi.html. Accessed 2015 March 18.
- [8] Margolis, J. et al. *Stuck in the Shallow End: Education, Race, and Computing*. (Cambridge, MA: MIT Press, 2008).
- [9] Moore, J. L. et al. "Bridging the Digital Divide for At-Risk Students: Lessons Learned." *Tech Trends*, 46 (2002): 5-9.
- [10] National Center for Education Statistics, US Dept. of Education. <http://www.pewresearch.org/fact-tank/2014/08/18/u-s-public-schools-expected-to-be-majority-minority-starting-this-fall/>. Accessed 2015 March 18.
- [11] Oakes, J. and Rogers, J. *Learning Power: Organizing for Education and Justice*. (New York, New York: Teachers College Press, 2006): 8-15.
- [12] Pearson, T. "Falling Behind: A Technology Crisis Facing Minority Students." *Tech Trends*, 46 (2002):15-20.
- [13] SRI. "Principled Assessment of Computational Thinking." http://pact.sri.com/?page_id=1096. Accessed 2015 April 21.
- [14] Warschauer, M. *Technology and Social Inclusion: Rethinking the Digital Divide*. (Cambridge, MA: MIT Press, 2003).

JOSEPH P. WILSON

Senior Managing Director, STEM Initiative
Teach For America, 940 Howard Street
San Francisco, California 94103 USA
Joseph.Wilson@teachforamerica.org

MELISSA MORITZ

Vice President, STEM & Education Initiatives
Teach For America, 1805 7th Street NW, 6th Floor
Washington, DC 20001 USA
Melissa.Moritz@teachforamerica.org