

The CS10K Project: Mobilizing the Community to Transform High School Computing

Owen Astrachan
Duke University
ola@cs.duke.edu

Jan Cuny
National Science Foundation
jcuny@nsf.gov

Chris Stephenson
Executive Director, CSTA
cstephenson@csta.acm.org

Cameron Wilson
Director ACM Office of Public Policy
cameron.wilson@acm.org

Categories and Subject Descriptors

K.3.2 [Computers and Education]: Computer and Information Science Education – *computer science education*

General Terms

Measurement, Experimentation, Standardization

Keywords

Computer Science Education, K-12 Curriculum, CS Principles, Computational Thinking

1. SUMMARY

The CS10K project is a large-scale, collaborative project bringing together stakeholders from wide-ranging constituencies with the goal of systematically changing the scale, curriculum, and pedagogy of teaching computer science at all levels, but focusing in particular on computer science in U.S. high schools as well as introductory computing at the college level. As part of the systemic changes in teaching computer science the CS10K project aims to have 10,000 teachers in 10,000 high schools teaching a new curriculum by 2015.

The CS10K project will require building substantial collaborations between a consortium of partners – including academia at all levels, government agencies, industry, and private foundations – to assist in all aspects of the effort. In this special session, suitable for teachers and educators from all levels, we will report on the goals of the CS10K project, the motivation for the project, its scope, and progress to date of the project. This builds on work reported on in [1][2] and provides an overarching view of the CS10K project with an appeal to the broad computing community to be involved with the project.

Computer Science and computing education is our field of endeavor. We all work to ensure that our field is vibrant, growing, and successful. If computing is to be part of both the academic and future workforce leading to innovation, there is no stage in the academic pipeline more crucial than high school. Students do begin to lose interest in computing much earlier, but engagement programs for K-8 will not be effective if students who become engaged before high school lose that engagement and interest during their high school years. Likewise, revitalized college

computing programs cannot have a significant impact if too few students take our courses and use our methods.

2. Objectives and Organization

We will report on the CS10K project from four perspectives represented by each of the participants. The goal of the session is to help the computing education community understand the scope and potential of the CS10K project and to appeal to the community to help the project succeed. We will be encouraging feedback and active involvement both as part of the session and in ongoing roles for those interested in participating in the CS10K project.

3. Motivation (Chris Stephenson)

There are several projects aimed at making changes in high school computer science. Many of these are referenced and accessible from the CSTA web site [3]. For example, the *Exploring Computer Science* project based on work by Margolis *et al* [6,7,8] is transforming Computer Science education in the Los Angeles Unified School District. Elsewhere the *Georgia Computes!* [9] Project is having a broad impact in Georgia. The framework provided by the ACM K-12 Model Curriculum [3] guides these projects, but their scope is statewide rather than national. The CS Principles project, a component of the CS10K initiative, is national in scope and leverages College Board's Advanced Placement courses to facilitate widespread changes in high school curricula at a national level. These changes must be accompanied by corresponding changes at the college/university level for reasons outlined in [4]. At this session we will talk about how important it is for the entire community to be involved in this initiative, why the CS10K project is a national (if not international) imperative, and how the different stakeholders are working together.

As the executive director of CSTA, Chris Stephenson is spearheading the active involvement of high school teachers and policy makers at both state and national levels in supporting the CS10K project.

4. CS Principles (Owen Astrachan)

The CS Principles course is the national lever by which we hope to move high school computing. This is a national project, with an advisory board of roughly thirty scientists and educators who are developing a new, rigorous introduction to computer science. The

process guiding the development and implementation of the CS Principles course has been reported previously [1][2] and documents about the course and its 2010-2011 pilots are available from [5]. This proposed course is being developed at the post secondary level before it is taught in high schools, but the development and delivery are being done with tight coordination of high school policy makers and teachers.

At this session we will report on the curriculum framework developed for the CS Principles course using a process designated by the College Board as the method by which Advanced Placement courses are modified, designed, and re-designed. We will be looking to chairs of computer science departments to endorse this effort as part of beginning the second phase of piloting the course. This endorsement will be a prerequisite for the widespread dissemination of the CS Principles course and an effort we hope to actively engage the community in as part of this special session.

As the PI of the CS Principles course, Owen Astrachan is helping to coordinate the group of educators who are developing curricula and tests for a new, national course.

5. 10,000 Teachers in 10,000 Schools (Jan Cuny)

Curriculum, however, is not the biggest challenge. The biggest challenge will be scaling teacher training to reach 10,000 teachers. Many of the current high school computing courses teach only basic literacy and few of our current high school teachers have a formal CS background. We will launch an unprecedented preparation program, working with in-service as well as pre-service teachers in both traditional and alternative certification programs. We will pair face-to-face training with extensive, state-of-the-art online support that includes curricula, materials, and social networking. We will provide high-quality, ongoing professional development. To accomplish this, we will need to call on the resources of university faculty, undergraduate and graduate students in service learning programs, and IT professionals serving as citizen scientists.

Here we will report on the status of the effort to get the proposed new AP course into 10,000 schools by 2015 (which is the earliest date that a new AP course could be available). We will report on efforts supported by the National Science Foundation, as well as possible alignment with programs of other government agencies and foundations. We will also issue a “call to action,” presenting ways for members of our computing community and their students can become involved.

In her role at NSF Jan Cuny is leading the development of the CS10K project and is the principle architect of the initiatives we will report on here.

6. Policy Concerns (Cameron Wilson)

The CS10K project is one aspect of several national and statewide initiatives aimed at increasing the role of computing and computer science in STEM education as well as increasing the number of students from under-represented groups studying computer science. Coordination and understanding of the different initiatives is an important aspect in ensuring the potential for success of the CS10K project. In this session we will report on the synergies between this project and initiatives including the Computing in the Core Coalition, the CS Education Act recently introduced in Congress, and several statewide initiatives built around computing and computer science.

As Director of ACM's Office of Public Policy, Cameron Wilson coordinates and provides guidance on state and national policy aspects relating to the CS10K project.

7. Intended Audience

This special session is a call-for-participation to all computing and computer science educators to help ensure the success of the CS10K project. Educators at every level will be asked to help with the project and will be interested in the different aspects of the project reported in this special session.

8. REFERENCES

- [1] Re-Imagining the First Year of Computing, Astrachan, Haynie, Stephenson, Diaz, Briggs, Proceedings of SIGCSE 2010, 329-330
- [2] Advanced Placement Computer Science: The Future of Tracking the First Year of Computing. Astrachan, Walker, Stephenson, Diaz, Cuny. Proceedings of SIGCSE 2009.
- [3] <http://csta.acm.org>
- [4] NRC, *Learning and Understanding: Improving Advanced Study of Mathematics and Science in U.S. High Schools*, 2002 http://www.nap.edu/openbook.php?record_id=10129
- [5] CS Principles Web Site: <http://www.csprinciples.org>
- [6] Exploring Computer Science, Margolis, Goode, Chapman <http://intotheloop.gseis.ucla.edu/exploring.html>
- [7] Jane Margolis, Rachel Estrella, Joanna Goode, Jennifer Jellison Holme, Kimberly Nao. *Stuck in the Shallow End*. MIT Press, 2008.
- [8] Jane Margolis and Allan Fisher. *Unlocking the Clubhouse: Women in Computing*. MIT Press, 2003.
- [9] Georgia Computes! <http://gacomputes.cc.gatech.edu>