

# CS Principles Professional Development: Only 9,500 to go! Lessons Learned from our CS10K Summer 2013 PD

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## 1. SUMMARY

Our grand challenge is to scale high-quality computer science curriculum and instruction to reach all high school students. **CS10K** – an NSF and ACM-sponsored project – is working to do just that by supporting curriculum development, computer education research and professional development through the Computing Education for the 21st Century (CE21) program at NSF [2]. Professional Development (PD) is a key piece of the project, as we need to train 10,000 teachers to teach rigorous computing courses in 10,000 high schools by 2016 – the school year that a new Advanced Placement Course will be rolled out. This panel will provide an overview of the PD landscape and then each panelist will discuss the unique aspects of their PD project for high school teachers.

## 2. DIANE BAXTER

Computing Principles for All Students' Success (*ComPASS*) introduces secondary and lower-division college students to computing principles and computational thinking skills through an Alice-based curriculum and a compelling pedagogy that demands active student engagement through clicker questions, peer

learning approaches, and facilitated, directed discussion. Developed initially as a non-majors course, CSE3 at UC San Diego demonstrated early success at attracting and engaging women and minorities in computing [6]. Comprehensive evaluation showed its effectiveness in teaching students deeper level computational thinking skills and imbuing in them enthusiasm for subsequent programming classes. Project co-PIs Baxter and Simon cultivated partnerships with high school teachers who agreed (or were asked by their administration) to help us translate what worked for UCSD freshmen into a high school-level curriculum. The high school-level curriculum (both the students' "CS Principles - Explorations through Alice" and "CS Principles - Guide through Alice" for teachers) is now available online (with author and publisher permission) to teachers and students without charge [3, 4]. Two cohorts into the project of introducing the new high school ComPASS curriculum into San Diego area schools, we can share many lessons learned at the same time as we celebrate unanticipated success at district-wide adoption.

Professional development for ComPASS teachers requires a series of 8 weekly, 2-hours classes, introducing teachers to Alice, the curriculum, the online community of practice, and additional topics on CS in Society. The course is taught using the pedagogical methods that we ask the teachers to use themselves. Reflection is peppered throughout the course, demanding that teachers recognize and appreciate the role of the pedagogy at the same time as they gain comfort with the content. Class videos from the college-level course are available as podcasts for teachers who need additional time to feel ready to teach. An intensive, 3-day summer Pedagogy Boot Camp demands that the teachers begin using the methods, tools, and curriculum to teach to one another. Each effort is an opportunity for additional discussion and hands-on learning. Teachers develop a course outline for themselves and meet mentors – teachers from UCSD and from the previous year's cohort – who continue to support them through once-a-week conference calls, Piazza, and the CS10K Community of Practice portal throughout the year.

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### 3. DAN GARCIA

*The Beauty and Joy of Computing* (BJC) is a non-majors CS0 course designed independently, and later aligned fully with the CS Principles framework [5, 9]. However, it does not stop there; it introduces the powerful ideas of recursion and functions-as-data through the graphical language of *SNAP!* (Build Your Own Blocks, based on Scratch) [10]. Our students read chapters from the excellent *Blown to Bits* book [1], as well as other relevant articles and videos, and have discussions of the positive and negative impacts of computing, driven by news articles of current events every lecture. The course has had tremendous success in broadening participation at UC Berkeley, highlighted by the spring 2013 offering, the first-ever computing course on campus to have more female than male students (106 to 104)! The course was adapted by co-PI Tiffany Barnes (then at UNC Charlotte) and augmented with *App Inventor* and *GameMaker*.

Our PD requires 6 full-time weeks of commitment from teachers. We follow a “1-4-1” model: one face-to-face setup week, four weeks of an online course (an abbreviated version of our 15-week college course), and one face-to-face concluding week. We spend the time in the face-to-face sessions covering the CS Principles framework and performance-based tasks, giving brief workshop-style tutorials on Snap! and the more difficult programming constructs students will learn. We also spend time with the teachers mapping the course to their situation, talk about techniques to engage women and under-represented minorities, and have veteran teachers share best practices and pedagogical content knowledge. We follow up with all teachers through monthly webinars and daily via the *BJC TEACHERS* Piazza group embedded within the CS10K community of practice.

### 4. JEFF GRAY

The *CS4Alabama* project is a collaboration between the University of Alabama (UA), A+ College Ready (A+CR), and the Alabama State Department of Education (ALSDE). The goal of CS4Alabama is to train 50 teachers over the next three years to introduce the CS Principles course across a geographically and demographically diverse group of Alabama high schools. The PD model is adopted from the National Mathematics and Science Initiative (NMSI), of which A+CR is a member. The NMSI concept of a *Teacher Leader* is being followed whereby a cohort of 10 teachers who already offer rigorous CS courses at their schools assist in training future peer cohorts (with 20 new teachers invited to the project in years two and three) who come from other STEM and CTE backgrounds.

CS4Alabama is currently in its first year and the initial cohort of teachers have participated in a week-long face-to-face PD session, two face-to-face weekend sessions with assignments and bi-weekly meetings occurring over the summer and academic year. Over a dozen new lesson plans have already been created by this first cohort of Teacher Leaders. Additionally, more than 400 students are enrolled during the first year, with some high schools receiving such high demand that multiple sections of CS Principles are being offered by the same teacher. The project has multiple measurements of evaluation through collaboration with Haynie Research and Evaluation. On this panel, I will share some of the early observations made from our PD efforts, and describe our plans for engaging existing STEM teachers in our future cohorts.

### 5. RALPH MORELLI

Mobile Computer Science Principles (*MobileCSP*) is a CS Principles curriculum [8] based on the blocks-based graphical programming language, *App Inventor for Android* [7]. While originally developed and hosted at Google, App Inventor is now based at the Center for Mobile Learning at MIT. It is currently supporting almost 1 million individuals who have created more than 2 million projects. The MIT server currently hosts more than 5000 active users per day. A growing number of teachers at all levels, from grade school to university, are using App Inventor in their computing courses.

Our PD effort is aimed primarily at getting MobileCSP taught in Connecticut schools. It consists of a full-time 6-week in person course. The teachers in this year’s cohort ranged from technology teachers to social studies and graphic arts teachers. Only one of the 10 teachers had any formal training in computer science. Prior to enrolling in the PD, teachers and their principals are required to sign an agreement to teach the MobileCSP course to 11th graders in their schools. During summer 2013 we trained 10 Hartford-area teachers. In addition, a small group of CSTA members from the Boston area participated in the PD by using the online resources. The Hartford-area teachers are supported in their classrooms by our project’s itinerant *Teacher’s Consultant*, who has extensive teaching experience in App Inventor and CS Principles. By the end of this academic year we expect to have data on student attitudes and performance with the MobileCSP curriculum from ~300 students.

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