A Model for Statewide Deployment of CS Principles Courses

Jeff Gray, University of Alabama, Department of Computer Science, gray@cs.ua.edu
Mary Boehm, Tammy Dunn, and Carol Crawford, A+ College Ready, {mary, tammy, carol}@aplusala.org
External Evaluator: Kathleen Haynie, Haynie Research and Evaluation, kchaynie@stanfordalumni.org

http://csprinciples.cs.ua.edu

PROJECT SUMMARY

This CS 10K project is centered on teacher preparation for CS Principles and will develop the knowledge base and needed infrastructure for wide-scale deployment across a state with historically low participation in the current Java-based AP CS exam. The project will adopt a successful AP professional development model created by the National Math and Science Initiative (NMSI) that will be refined to the unique challenges of K-12 CS Education (e.g., broadening participation and teacher preparation). The project will provide year-long professional development among cohorts of peer teachers who will collaborate on shared experiences both in-person and through an existing distance learning network. The project has the full support of the Alabama State Department of Education to provide needed resources and statewide advocacy of the project goals. The project also has the support of NMSI, whose nationwide adoption would assist with the general scalability and sustainability issues that often hamper CS education efforts.

The proposed research has the potential for broad impact by leveraging the network of existing high schools covered by A+ College Ready (A+CR), which is the Alabama NMSI affiliate. Through partnership with A+CR, the project has the potential to train 50 teachers and 1,350 students during the project duration (yr1:150+y2:450+y3:750); an additional 20 schools will be trained after project completion, with a nationwide opportunity for adoption by 320 NMSI schools in 6 states. Through formative and summative assessment by Haynie Research and Evaluation, the project will offer intellectual merit by providing insights into a model that supports scalability and sustainability of teacher professional development for the CS Principles course.

MOTIVATION AND PROJECT GOALS

Motivation and Background:

- Alabama participation in CS AP traditionally low (<50 students per year over past 5 years)
- Yet, clusters of national tech leadership (Huntsville #4 in USA per capita in STEM workers)
- Successful AP Training and Incentive Program across Alabama high schools, as implemented by A+ College Ready as part of the National Math and Science Initiative (see figures to right): Alabama’s success in improving AP math, science and English scores from 2008-2011 for both all students and minority students leads the nation (% increase in qualifying scores).
- University of Alabama participation as an NSF/College Board CS Principles Pilot Site (Pilot II and III); sharing of results with southeast teachers through Google CS4HS support

Project Goals and Scope:

- Train 50 high school teachers through extended Professional Development (beyond 1-week AP) over a three-year period, while introducing 1,350 students to CS Principles content
- Sustainability and scalability through leverage and continued adoption of A+ College Ready
- Broadening participation through open access to AP courses using the NMSI model
- Dissemination of curricular materials and results of evaluation assessments to support PD

ACTIVITIES AND IMPLEMENTATION DETAILS

The project is driven by the following core activities: 1) Master Teacher mentoring and vertical teaming using face-to-face and online collaboration; 2) Open enrollment to increase diversity of participation; 3) Rigorous course content for year-long professional development; 4) Student mentoring through weekend skills development; 5) Incentives for teachers and students.

- Year 1: Ten Teacher Leaders with CS AP experience assist in developing CS Principles curricula resources and Piloting a course
- Years 2 and 3: Twenty teachers each year collaborate with assigned Teacher Leaders for year-round professional development and mentoring while introducing a new Pilot
- Undergraduate students in both CS and Education pre-service teachers, and a CS PhD student, assist PIs in training and curricular development resources

EVALUATION PLAN AND EXPECTED OUTCOMES

The goals of the project evaluation are to: (1) conduct an ongoing formative evaluation that assesses the extent to which goals are being met; (2) conduct a yearly summative evaluation that includes communicating to the NSF and other stakeholders the extent to which processes, activities, and goals are met; and (3) communicate evidence-based results with stakeholders, based on their identified informational needs.

- An extensive set of evaluation questions and associated measurement instruments will be used to assess evidence of project success (see table at right)
- Teachers will perform self-assessment of their own curricula artifacts compared to the learning objectives of CS Principles Big Ideas
- An advisory board of K-12 administrators and CS Education leaders will provide annual feedback from evaluation reports