A Multi-Tiered Pipeline for K-12 Computer Science Education

Much interest has emerged recently regarding the importance of K-12 Computer Science education, as noted by the national awareness and attention given to the efforts of code.org. Through support from several NSF programs, a pipeline of computing awareness has been ongoing in Alabama over the past decade:

*An ITEST award* initiated the effort in Birmingham by defining a group of student cohorts that continued over three years through a series of activities: Alice and game programming (summer before 10th grade), linear algebra focused on examples from the Alice experience (10th grade in-class), computer visualization in the context of Mechanical Engineering (summer before 11th grade), and introduction to robotics and Java (during 11th and 12th grade). This project also trained teachers in both Alice and linear algebra.

*As a result of the City of Birmingham purchasing XO laptops for each child in elementary school, a DR K-12 award* brought training to teachers and students in elementary schools. With a focus on “Integrating Computing Across the Curriculum,” the DR K-12 project offers summer camps to teachers and students in Scratch, and provides yearlong professional development training to 4th and 5th grade teachers to assist in raising the awareness of computing across all subjects in the elementary school context.

*A BPC award* explored the potential for a multi-tiered mentoring model across several age groups. In this project, students from the computer science team with secondary education math students to learn about teaching computer science (Fall semester). The team of university students teaches a class focused on Alice and CS Unplugged in the spring to local high schools each week. Three different weeklong summer camps are offered to middle school students, where the high school students from the spring assist collegiate facilitators. The concept provides a peer group of mentors from middle school up to college.

In addition to the above activities, the new CS Principles course represents a joint effort by the College Board and NSF to revitalize the national importance of K-12 Computer Science. As compared to the existing AP Computer Science exam, the CS Principles course focuses less on the very specific details of a particular language, and instead concentrates on what many consider to be the fundamental principles of computing – the so-called “Big Ideas” in the CS Principles curriculum. Interest in CS Principles curriculum is growing, with many high schools and universities beginning to offer an initial informal offering of the course, in order to prepare for the expected first exam in a few years. This presentation will provide the background and motivation for all of the above activities, with a special focus on the CS Principles project. The CS Principles discussion will describe our current course, summarize the key Big Ideas, and share lessons learned from implementation of the course since 2011.