

Project Summary

Recent statistics from the U.S. Bureau of Labor Statistics predict a rapid increase in Information Technology jobs. On the other hand, statistics that track college degree programs show a dramatic decline in enrollment of computing majors. The decline in the number of students choosing to major in computing maps very well to a corresponding decline in the number of students taking the AP computer science exam. Where is the next generation of high-tech software engineers, computer teachers, programmers, systems engineers, and problem solvers going to come from?

To address this issue, we propose to excite today's high school students about the possibilities in computing careers and provide them a positive experience with computing and programming. Students who have a positive experience with computing in high school are more likely to choose a computing major and are more likely to succeed in their college degree programs. This proposal describes a collaborative, comprehensive project for students and teachers. The project will build a network of college and high school faculty, who will offer workshops and provide continuing support during the academic year. The network will be set up in six different geographic regions, where college faculty will work directly with high school teachers in teaching and learning innovative and effective ways of introducing computing and computer programming. In making computing and computer science and programming more attractive to high school students, we expect to encourage more students to major in computing in college. This proposed innovative approach will use the latest technology and software, media, 3-D graphics, sound, and animation.

Intellectual Merit: The proposed approach in this project will take advantage of high-level interest and motivation in graphics, animation and storytelling (commonly found among students who have grown up in a multimedia world). The major emphasis will be a creative use of visualization, an approach already proven successful at the college-level [13]. The approach focuses on a strong core of fundamental programming concepts and problem-solving techniques in an object-oriented, interactive environment. The free software environment is Alice [25]. Drs. Cooper and Dann will serve as team, curriculum, and professional development leaders. Cooper and Dann (co-PIs of a Level 2 NSF-CCLI grant) are currently having great success at the college level in using this approach with introductory computing majors and with attracting students to major/minor in computing. Effectiveness of this approach will be evaluated by an external, professional evaluator.

Broader Impact: This project holds promise of an effective means of teaching object-oriented programming concepts and better problem-solving skills to a large number of high school students. By training high school teachers in our approach, and by providing support networks and building community, we expect to impact students over six states. These six regions will, in turn, serve as a model for other high school districts to copy. Developed curricular materials will be stored in an online, searchable database [24], to be freely available to all teachers. Cooper and Dann have an existing website for dissemination of such materials, and the high school materials will be added to this site. Materials will also be placed on the Computer Science Teachers Association website. Dissemination of results will be enhanced by paper submissions to computer science education journals and conferences, as well as with creation of a modified version of our successful collegiate text.