

Project Summary

This proposal leverages the strengths of two innovative approaches that have been successful in attracting and retaining undergraduate students in computer science: Alice and Media Computation. Alice allows students to build 3D movies and games using drag-and-drop programming while Media Computation uses more traditional programming in Java to manipulate media. In Media Computation, students write programs to alter pictures or sounds, create linked lists of musical phrases, and more. By combining these approaches, students will learn to create special effects for their Alice program using Media Computation. From a student perspective, this is likely to be a highly motivating learning environment; from an educational perspective, students will first learn the algorithmic reasoning of programming using Alice and then the syntax of Java using Media Computation. This creates a natural link between Alice and other text based object-oriented programming languages. This combined approach builds on the advantages of Alice and Media Computation and is likely to create an appealing learning environment for students. The goal of this investigation is to develop a highly motivating first year programming course using Alice that is naturally linked to traditional text based programming through Media Computation. An outcome of this goal is likely to be an increase in the number of students that select to major or minor in computer science and an improved retention of first year computer science majors. The proposed curriculum is likely to also have a strong appeal to undergraduate faculty who are interested in using Alice as an introductory course, but are uncertain as to how to transition students to traditional text based programming.

Intellectual Merit: An important component of this proposal is on-going evaluation. Formative assessment techniques will be used to inform and adjust the research effort, while summative assessment will be used to evaluate the attainment of project goals. The end result of this effort will be a better understanding of what methods work for both teaching introductory programming and for attracting and retaining students in computer science majors. The proposed team is uniquely qualified to conduct this research. Drs. Cooper and Dann have been leaders in the development of curriculum materials for using the Alice software in introductory computer science courses and Dr. Guzdial designed the Media Computation approach. Drs. Cooper, Dann, and Guzdial and Ms. Ericson have considerable experience in the development and implementation of successful workshops and curricular materials, including textbooks. Dr. Moskal is an expert in assessment and evaluation and has a great deal of experience in computer science education projects. As a result of this proposal, undergraduate faculty will have the materials that they need to improve teaching, learning and student retention in the critical first year of undergraduate computer science.

Broader Impact: Through six summer workshops, this project will directly affect 150-210 undergraduate faculty members. If each faculty member has an average of 60 students a year, this impacts approximately 10,000 students. Through the proposed textbook, a website and professional presentations (including workshops at ACM's SIGCSE and the League of Innovation's CIT conferences), this project will impact even more faculty and students, especially women and minorities, at both four year institutions and community colleges. Since 2000, there has been a 40-60% decline in the number of computer science majors. Yet, the US Bureau of Labor Statistics data predicts that 1.2 million new jobs will be created in the field of Information Technology in the next 10 years. This project has the potential of providing information and materials that may be used to better understand and reverse this damaging trend.