Computing in Context

Project Summary

We create value by assembling four new, small, expert, applied computing teams, synthesizing the results from a number of related projects, many funded by NSF's CPATH, CCLI, CISE, NSDL, and TUES programs, and by creating exemplars that can be used in the CS2013 curriculum guidelines and in other widely disseminated material. These exemplars will focus on ***computing in context***. As computing moves into its sixth decade as a formal field of study, a great deal of attention is focused on the breadth of relationships between computing and other disciplines. Descriptors of this relationship include computing in context, computing with a purpose, computing + X, computational X, interdisciplinary computing, multidisciplinary computing, and transdisciplinary computing. Whatever the favorite descriptor, the goals for exploring the relationship between computing and another discipline remain the same: Students need to understand how the power of computing informs and shapes ideas throughout the academy and society. They need to learn appropriate concepts in computing and to see these applied to other areas of study. This learning will be most effective when approached through active participation of the students, as they tackle questions and problems flowing from society's ever-increasing and ever-changing reliance on computationally based devices and modes of interaction.

The project will focus on four areas of collaboration: ăŜŎdzǋƛűè ƛyŦ2ǋΥl·űƛŎă, computing and music, computational linguistics, and web science. It will produce, evaluate, and disseminate modules developed in the style of problem-based learning (PBL) or process-oriented guided inquiry (POGIL) or in a classroom response system (clicker) format that build on a realization that the most effective interdisciplinary learning comes with actively engaged students representing a mix of disciplines, working together in teams.

Intellectual Merit: A strong and consistent theme in the interdisciplinary computing community is the success of active learning approaches to bridge the gulf between disciplines. Although there are some successful projects bringing problem-based learning and similar strategies to computing, dissemination of this effective approach has been limited. By tying this approach to curriculum guidelines through exemplars, the project will provide potentially transformative guidance to the computing community. Because the project is tied to the CS 2013 effort, and since traditionally the ACM/IEEE-CS curriculum guidelines have been used by a substantial number of institutions, the course material developed from the project will be used across the country. Further, our research builds on other projects that have been supported by NSF grants focused on STEM education.; we leverage work in CCLI, CISE, CPATH, NSDL, and TUES projects that address the four Computing + X areas that are the focus of the proposal.

Broader Impact: This project will contribute to a paradigm shift in undergraduate STEM education. This shift will occur through the development of teaching strategies, learning activities, and curricular resources that build upon a growing strong interconnectivity among students (based on their use of smart mobile devices). Activities that pose investigations and creations that are several learning steps away from "Googling" for the answer are essential. Because the project is focused on CS 2013 guidelines and such curriculum guidelines have been heavily used in the past at a large number of institutions across the nation, it is expected that a number of sites will adapt and adopt best practices for active learning strategies. Funding now is essential; the opportunity to include project results in CS 2013 type efforts comes only occasionally, since this family of curriculum documents is on a seven to ten year revision cycle.