

Improved STEM Preparation through Humane Gaming Camp and High School Education

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Project Summary

Employment in the US science, technology, engineering and mathematics (STEM) workforce has been growing at a significantly faster rate than overall employment for several decades, yet at the same time American youth are exhibiting a decreasing interest in pursuing education in STEM disciplines. While future IT worker demand is predicted to grow, nationwide computer science enrollments continue to decline. Incoming freshmen computer science majors have declined 60% between 2000 and 2004. Especially troubling is the paucity of women in IT. Incoming female freshmen interested in computer science has dropped to less than 10% in 2005 and minority participation remains especially low. To support IT industries and maintain IT leadership, more American students, especially women and minorities, must obtain higher education in STEM disciplines. To prepare students for STEM disciplines, K-12 education must embrace innovations in both pedagogy and content. Our project aims to attract high school students, especially women and minorities, into IT and game development by using student interest in computer games and art as a “hook” and by focusing on the “helping” aspects of games, which we have coined **Humane Gaming**. By Humane Gaming we mean games developed for education or medical applications, or socially conscious games which raise social awareness or advocate for a cause.

Over 90% percent of our children play games and 43% of all game players are female. Games heavily influence our youth. We propose a new instructional model that uses the *creation* of computer games to integrate mathematics, computer science, and art instruction in a project-based collaborative learning process. There is evidence that students who study math within the context of other courses do better on math achievement tests because they can make the connection between the real-world concepts and math content covered by the test. We believe that by integrating math, computer science, and art into a cohesive curriculum developing computer games, we will capture and direct student passion into greater learning, and higher college matriculation rates in STEM disciplines.

Our interdisciplinary project team, comprised of two computer scientists, a teacher educator, a digital art professor, and an expert in multicultural and science education, propose a Comprehensive Project for Students and Teachers to (1) develop a 2 week summer Game Camp for 135 (45 per year) minority and women 9th or 10th graders using the creation of Humane Computer Games to integrate the instruction of mathematics, computer science, and art; (2) train partner school 60 teachers (20 per year) via 120 hours of professional development in game development and technology-enhanced learning environment design principles; to teach at summer Game Camp; and to actuate similar learning processes at their local high schools; and (3) study the impact of our pedagogical innovations on teacher practice; student attitudes toward advanced study of STEM disciplines and careers; and student matriculation into STEM disciplines in college. The training of the teachers will in turn affect thousands of students in our partner schools for years to come.

Our project’s intellectual merit lies in the innovative use of game development pedagogy; the integration of math, computer science, and art instruction; and our Humane Gaming focus to entice students into STEM disciplines. The broader impact is to serve as a model to attract American students, especially minorities and women, to STEM fields; increase STEM matriculation rates; and improve teacher practice and student learning of STEM concepts.