

Robot Diaries Proposal - Executive Summary

As technological, interactive artifacts integrate even more tightly in our lives, it is alarming that engineering enrollments continue to drop (Vegso 2006). Even worse, there is increasing inequity; for instance women participate poorly in computer science and engineering, whereas science and business fields show significant improvement (Vegso 2005). One popular movement to stem this tide evolves out of a recognition that the pipeline is both the source of today's trends and the strategic place for leveraging real change: improve the technology experience of students at the primary and secondary level, and the statistics of the subsequent decade may turn around (Adams 2007; Arsenault et al. 2005; Cannon et al. 2007; Doerschuk et al. 2007; Frost 2007; Hylton, Otoupal 2005; Morris, Lee 2004).

Robotics has served as a popular vehicle for such pipeline-based programs because of its ability to attract and inspire the imagination of students who are often unmotivated by conventional classroom curricula (Druin, Hendler 2000). National contests including US First, BEST and Botball, programs have engaged more than 75,000 students (BEST Robotics 2009; Botball 2009; US First 2009). There is no doubt that some have found the contest-driven problem-solving experience to be transformative. However these existing robotics programs share a number of features that limit participant diversity: they are short-term, high-intensity, competition-driven and technology focused. We and others have proposed a complementary class of activities (Buechley 2007, Kim et al 2007; Resnick 2006) that we believe can engage and retain the participation of secondary level students who will not be attracted to currently available interventions. *Robot Diaries* aims to significantly diversify the pipeline: students design affective, programmable tangible communication devices using familiar materials together with motors, lights and computation in novel ways to animate their creations in the context of emotional expression and collaborative storytelling. Robot Diaries motivates middle-school aged children to engage with technology as creators and authors rather than simply as consumers, and increases students' confidence in their ability to be creative with technology.

Over the course of three years, pilot Robot Diaries projects with 61 students have enabled multiple rounds of participatory design with students and teachers as well as collection and analysis of the learning and self-confidence impact of this program. The present proposal represents our desire to significantly broaden the Robot Diaries audience by collaborating with the Pittsburgh public school system and the suburban and rural region of southwestern Pennsylvania to deploy new curriculum together with local teachers through co-design.

The intellectual merit of the proposed activity includes a definition of *technological fluency* aimed at broadening participation in technology creativity, and analyses resulting from deployments to yield models of learning so that we better understand how to co-design technology and curriculum through the teamwork of the university laboratory and public school teacher to benefit *all* students.

The broader impacts resulting from the proposed activity include the training and educational experiences of teachers and students in southwestern Pennsylvania. Teachers will gain technological literacy, materials and curricula for the unconventional use of creative technology in the classroom. Students will be empowered as users of technology for rhetorical and creative means, and will do so in a context of equity across gender and prior technical experience. Middle school curriculum writ large will be indirectly impacted through the complete presentation of a fully documented, *worked out* process for integrating technology fluency successfully in the middle school curriculum and for quantifying how this curriculum impacts diversity and equity.