Broadening the Field of Computing Through a Design-Based HCI Curriculum

Objective
This panel will explore the opportunities for broadening participation in computing by encouraging girls to pursue computing at an earlier age through an introduction to HCI using design-based projects and principles. The goal of this panel is to discuss opportunities for engaging girls to become interested in the field of computing before they embrace existing societal stereotypical perceptions of what it means to be a computer scientist. Discussion topics will include:

- Why are girls so excited about using computers as socially oriented communication tools yet so averse to using computers for computer science?
- What contexts will motivate and excite girls to further pursue computing careers?
- What are the prerequisite skills that will effectively prepare girls for AP computer science, college level computer science, and later careers in computing?
- What are the fundamental HCI principles that we can teach them and how can we ground these principles in projects that have socially relevant applications?
- What actionable steps can the HCI and Grace Hopper communities take towards realizing this agenda?

Problem Statement
Over 87% of youth in America between the ages of 12 and 17 use the Internet and usage spikes from 60% in the sixth grade to 82% by seventh grade [5]. In addition, girls are more likely than boys to create and share self-authored content, discuss schoolwork over instant message, send and read email, and build relationships and social networks online [4] [5] [9]. Despite their enthusiasm using these online tools and digital technologies, girls convey a significant lack of interest in computer science as an academic field or career path. Numerous studies have described girls' perceptions of computing as irrelevant to their lives [1], lacking creativity [8], and focused on tedious details instead of important and meaningful outcomes [6]. Our research suggests that involving girls in HCI projects by teaching them fundamental concepts such as interface design, user testing, and iterative prototyping in the context of their current uses of technology in their everyday lives may be an effective hook to encourage them towards considering careers in computing in either academia or industry. Girls may become more interested in these opportunities if they are introduced to HCI in the context of relevant, personally meaningful, and authentic real-world projects.

Why HCI? Designing with Children
Design is a fundamental process within the field of Human-Computer Interaction (HCI) [e.g. 10]. It is highlighted as one of the key skills that should be taught to students as part of their computing curriculum [7] [12] and some software industry statistics have suggested that about 70% of a final design solution is determined during the early design stages and that about 50% of the overall development process is driven by the interface design [2]. However, many existing introductory computer science classes do not teach within these contexts, instead focusing on repetitive, unoriginal problem sets that have few or no external real-world applications [e.g. 3]. By incorporating design into the computing curriculum, girls can be exposed to a broader perspective of computer science, develop skills that will guide them towards careers in computing fields such as software engineering, artificial intelligence, or human computer interaction, and can be given more realistic and significant programming design activities [11].

Panelists will describe their experiences in designing with women and girls and the role of HCI in this process. They will discuss the ways in which design-based projects have influenced girls' perceptions of computing and how the broader contexts in which these projects were conducted has affected their levels of engagement. Each of the panelists has over 20 years of experience in the fields of HCI or designing with children and will ground her position statement in context of these experiences. Panelists will also report on the current state of women in HCI, suggesting that the significantly higher ratio of women in HCI versus other computing fields is a compelling argument that it may offer an opportunity for drawing younger women towards computing. Panelists will describe their own paths into HCI and the ways in which their female peers in academia and industry have incorporated HCI into their careers as computer scientists.

Target Audience and Format
The target audience for this panel includes educators in K12 and higher education environments, industry professionals, policy makers, and, in particular, the HCI and CHI communities. Each panelist will give a 6 minute position statement (strictly timed) describing her own research and experience in the field. The moderator will then

initiate a round table discussion that explores the potential of an introductory design-based HCI course for broadening participation in computing. The format of the round table will involve a series of videotaped questions from teenage girls about the role of computing in their lives. The girls will draw from their participation in an Introduction to HCI summer curriculum to pose challenging questions to the researchers, such as: Why should we care about computing? Why would we choose computing over other more interesting subjects? How does computing relate to our lives? Questions from the audience will also be taken during this discussion.

MODERATORS

Sarita Yardi and Amy Bruckman
BIO: Sarita Yardi is a PhD student in the Human-Centered Computing program in the College of Computing at the Georgia Institute of Technology. She is working on an NSF Broadening Participation Computing project to design and teach an "Introduction to HCI for Teenagers" curriculum. Sarita received her Masters in Information Management & Systems at UC Berkeley's School of Information where she worked with the MacArthur funded Digital Youth group. She received her BA in Computer Engineering at Dartmouth College.

BIO: Amy Bruckman is an Associate Professor in the College of Computing at the Georgia Institute of Technology. She and her students in the Electronic Learning Communities (ELC) research group do research on online communities and education. Amy received her PhD from the MIT Media Lab's Epistemology and Learning group in 1997, her MSVS from the Media Lab's Interactive Cinema Group in 1991, and her BA in physics from Harvard University in 1987. In 1999, she was named one of the 100 top young innovators in science and technology in the world (TR100) by Technology Review magazine. In 2002, she was awarded the Jan Hawkins Award for Early Career Contributions to Humanistic Research and Scholarship in Learning Technologies.

PANELISTS

Allison Druin
BIO: Allison Druin is Director of the Human-Computer Interaction Lab, and Associate Professor in the University of Maryland's College of Information Studies, where she has led interdisciplinary research teams of computer scientists, librarians, educational researchers, artists, classroom teachers and children to create new educational technologies for elementary school children. Her work has included: developing digital libraries for children; designing technologies for families; and creating collaborative storytelling technologies for the classroom. Most recently she was appointed by the White House and confirmed by the U.S. Senate to become a Commissioner in the U.S. National Commission on Libraries and Information Science.

POSITION STATEMENT: Over the last two decades I have been developing new technologies for children with children. During that time I've watched as the field of "Interaction Design and Children" has flourished. Not only have more researchers embraced co-design methods with children, but the majority of these researchers have been women. In this panel, I will describe my co-design experiences with children, including our brainstorming techniques, collaboration methods, and formative prototyping. In addition, I will offer an overview of where 23 children as co-designers have gone once they leave my lab and what conclusions we might draw from this for attracting females to the world of computing.

Yasmin Kafai and Kylie Peppler
BIO: Yasmin Kafai is an associate professor at UCLA Graduate School of Education & Information Studies. She has conducted extensive research and policy work on gender issues in IT and produced the report *Under the Microscope: A Decade of Gender Equity Interventions in the Sciences* for the Educational Foundation of the American Association of University Women and participated in the report *Tech-Savvy: Educating Girls in the Computer Age*. She is author of the book *Minds in Play: Computer game Design as a Context for Children's Learning* and *Constructionism in Practice*, co-edited with Mitchel Resnick, and is the lead editor of *Beyond Barbie and Mortal Kombat: New Perspectives on Gender and Computer Games* (forthcoming).

BIO: Kylie A. Peppler is a doctoral candidate in the Urban Schooling Program at the UCLA Graduate School of Education and Information Sciences (GSEIS) and has been appointed assistant professor of learning sciences in the

Department of Education at Indiana University, effective January 2008. She was recently awarded a Spencer Dissertation Fellowship for her dissertation, Creative Bytes: Literacy and Learning in the Media Arts Practices of Urban Youth. Along with Yasmin Kafai and the MIT Media Lab, Kylie is developing and studying Scratch, a new media-rich, networked programming environment designed specifically to enhance the development of technological fluency at Computer Clubhouses.

POSITION STATEMENT: In this panel, we will share the results of investigating a group of minority girls and young women who are already engaged with creative uses of technology at a community technology center. We have used a mixed-methods approach involving case studies, design-based research, and archival data to study their technology interests and practices. Using this information, we have developed and implemented workshops that promote media-rich programming activities and provide opportunities to learn about higher education and careers in science and technology. The findings from this research provide us with a deeper understanding of what attracts minority girls and young women into technology, particularly computer programming, and with models of workshops that promote technological fluency that may be successfully implemented in other educational settings.

Robin Jeffries
BIO: Robin Jeffries is User Experience Lead at Google. Starting with a degree in Math and Computer Science, she became interested in Human-Computer Interaction when she discovered how hard it was to write applications that did not frustrate her users. She has been a researcher at the University of Colorado, Carnegie-Mellon University, and Hewlett-Packard Laboratories and designed products and researched user needs at Sun Microsystems and Google. She also serves as Her Systers' Keeper, an electronic community of 2500 women in computing.

POSITION STATEMENT: The field of engineering can impact society through improving achievements, such as clean water and transportation, but it is harder to come up with them for computing. In this panel, I will discuss reasons for why there are so few women entering the computing field suggesting that the field of computer science needs better public relations and the computing community needs its own "superheroes". I will discuss ideas for solving these problems including how to change existing perceptions in computing, methods for disseminating these changes to young people, highlighting the contributions of computing using real world examples, and how the field of HCI can help to show the ways in which computing adds value to society and impacts people's lives.

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