Workshop Proposal:

*Tangible Interfaces for Education – past, present, and future*

Half-day session (3 hours)


**Objectives:**

To bring together designers, educators, industry professionals, and researchers interested in the field of tangible interfaces for education. To present past and current projects in the field (including projects by workshop participants), to discuss different TUI frameworks as well as relevant findings from recent studies, in an effort to understand future challenges in the field.

**Justification:**

In recent years, the decreasing cost of electronics gave momentum to the design of tangible interfaces, in research centers and industry alike. But there is no clear conceptual framework to guide designers in their work. IDC is the perfect community to change that by creating a forum for designers, researchers, and industry professionals. We hope this workshop would serve as a starting point for future work and discussion that will extend the body of work in the field.

**Backgrounds of Workshop Organizers:**

**Oren Zuckerman**, A PhD student working with Mitch Resnick at the MIT Media Lab, is developing new tangible interfaces for education that make abstract concepts visible and manipulable. Inspired by the wooden objects developed by Maria Montessori, used around the world to learn abstract concepts such as number and shape, Oren is creating computationally enhanced blocks that simulate advanced concepts such as accumulation, probabilistic behavior, feedback, and complex causality. Prior to MIT Oren was recognized as one of the World Economic Forum’s “100 Technology Pioneers” for the year 2000, as the founder of an Internet startup that developed an asynchronous group collaboration layer over the Web.

**Dr. Glenda Revelle** (Ph.D. in Developmental Psychology, University of Michigan), has worked in both corporate and academic settings designing, researching and producing interactive products for children. She is currently a Research Scientist at both Sesame Workshop and the University of Arkansas, has led and collaborated on research in the University of Maryland’s Human-Computer Interaction Lab, and has served as an interactive education consultant to a variety of educational media companies. Glenda’s research interests include designing and evaluating interfaces for children and exploring the educational potential of new and emerging technologies.

**Yvonne Rogers** is a professor of information science and informatics at Indiana University. She also retains her chair in computer science and artificial intelligence at the University of Sussex, UK. She is internationally known for her work in the fields of Human-Computer Interaction and Computer-Supported Cooperative Work and has published widely in both. She is interested in new paradigms for computing, especially ubiquitous, pervasive and tangible interfaces. Her research focuses on augmenting everyday, learning and work activities with interactive technologies. In particular, she designs external representations, especially dynamic visualizations, to support more effectively ‘external cognition’. She has also been a visiting scholar at UCSD and a visiting professor at Stanford University, at Apple Research Labs, and at the University of Queensland.

**Mitchel Resnick** explores how new technologies both necessitate and facilitate deep changes in the ways people think and learn. Resnick’s Lifelong Kindergarten group, at the MIT Media Lab, has developed a variety of educational tools, including the “programmable bricks” that were the
basis for LEGO’s award-winning MindStorms robotics construction kit. Resnick also led the
development of StarLogo, a software toolkit for modeling decentralized systems. He is the co-
founder of the Computer Clubhouse project, a network of after-school learning centers for youth
from underserved communities.

**Detailed Description of Topics to be Covered:**

There is a wide range of factors to take into account when designing tangible interfaces for
education. What are the different types of TUIs and what is their relevance to education? What
can we learn from the physical objects currently used in educational settings? Does the
advantages of tangibles overcome their limitations? What does existing research in psychology
and education tells us about physical interaction and learning?

In the workshop we will present and discuss the following topics:

- **A short history of physical objects for education.** Abacus, Froebel gifts, Montessori
  materials, manipulatives at schools today.
- **Early TUIs for education:** Logo turtle, LEGO/Logo, Digital manipulatives.
- **Examples of current projects:** one project by each organizer, selected projects from
  workshop participants.
- **Classifying TUIs:** Roger’s transforms types, Ullmer & Ishii 1997, Heidegger’s “ready-at-
  hand” vs. “present-at-hand”, Marshall’s “expressive” vs. “exploratory”, Zuckerman’s FiMs vs.
  MiMs.
- **Relevant research on symbolic representation and physical manipulation:** Uttal,
  DeLoache, Peirroutsakos, Sedig.

We plan to use these topics as discussion starters. Our goal is to lay the foundations for a new
community of researchers/designers focusing on tangibles for education.

**Schedule of Events:**

- (5 minutes) Welcome message, agenda for the workshop
- (30 minutes) Short introduction of organizers as well as all participants (name, organization,
  research area, why interested in this workshop)
- (15 minutes) overview of artifacts for learning
- (15 minutes) early works in TUI for learning
- (25 minutes) current research projects of organizers
- **30 minutes break**
- (30 minutes) selected projects from workshop participants (submitted prior to workshop)
- (30 minutes) review and discussion of current TUI frameworks and research findings
- (20 minutes) discussion about future potential of the field, needed research
- (10 minutes) closing notes, sign up sheet for mailing list, web site announcement

**Plans for Dissemination:**

We hope to post the issues identified and topics discussed on a dedicated web site, to serve as a
hub for an ongoing email discussion. In this way, we hope to extend the dialogue to involve a
broader group of international industry professionals, researchers and educators and to extend
the body of work in the field.