

The workshops will be held on the University of Washington campus. Transportation will be provided to the campus from the hotel. Times and arrangements for pick-up and return will be emailed to people who have signed up for workshops.

Tuesday, October 22.

8:30-4:30 (all day sessions)

**Pre-Conference Workshop:
Studying learning in interaction**

Tim Koschmann, Rogers Hall, Gerry Stahl, and Reed Stevens

This is a one-day workshop designed to provide opportunities for those who do videoethnographic research to share samples of their data and to sharpen their analytic skills. The workshop will focus on what would count as evidence of 'learning' as an accountable achievement of talk-in-interaction. That is, if we divide the terrain for analysis on the traditional dimensions of microgenesis, ontogenesis, and sociogenesis, where do we locate learning and how? We will select four pieces of data to serve as objects for discussion. Following the usual protocol for data sessions conducted in communication studies and microsociology, we will do repeated examinings of the data interspersed with phases of individual and group analytic work. Our approach will be explicitly microanalytic, for both practical and programmatic reasons. Because we will have only a limited time to devote to any one piece of data, we will only be able to carefully analyze relatively brief samples of interaction (2-3 minutes or less). Programmatically we are committed to documenting learning in careful detail, though this does not necessarily imply a specific frame of analysis (i.e., the data sessions will focus on brief isolated fragments but these may be part of longer episodes or components of more elaborate ensembles).

Organization

The first half hour will be devoted to introductions and providing an orientation to the workshop. We will then conduct two 90-min data sessions in the morning and two more in the afternoon. We will conclude with a half-hour open discussion.

Intended participants

Participation is open to all researchers interested in descriptive work focusing on the practices of teaching and learning. While no specific prior experience is required, prospective attendees should be forewarned that the workshop is not intended as a tutorial and everyone will be expected to actively participate. Anyone interested in being one of the four data presenters should contact Timothy Koschmann to discuss this possibility.

8:30-11:30 (morning session)

**Pre-Conference Workshop:
Analyzing Mental Models Using Pathfinder: Rating Scales, Concept
Maps, and Essays**

Sylvia d'Apollonia, Elizabeth Charles, and Gary Boyd

Many researchers in the learning sciences are interested in inferring the way in which people organize domain-specific information; however, the methods are both diverse and laborious. The concepts and relationships relevant to a domain of knowledge can be elicited by essays, concept maps, ordered lists, and pairwise similarity ratings such as described in Pathfinder (Schaneveldt, 1990). However, the conceptual organization, or mental model, must subsequently be inferred and analyzed.

The Pathfinder algorithm generates networks comparable to concept maps and although their equivalency has not been examined mathematically, it is possible to generate proximity matrices from ordered trees, essays, and concept maps and analyze them using these scaling algorithms. The algorithm also generates several measures of coherence and network similarity: (1) the coherence or consistency of the generated network, (2) the similarity between two networks, (3) a test for the probability that the number of links in common between two links could arise by chance.

In this workshop we propose to demonstrate how Pathfinder can be used to collect declarative knowledge, generate a representation of conceptual structures, and quantify the degree of conceptual organization.

Workshop participants (maximum 20) will be expected to prepare a written description of a given domain (Statistics) and construct a concept map of the same domain prior to the workshop. During the “hands-on” workshop, we will use PC-Knot and/or Mac-Knot to capture and analyze the participants’ underlying mental models of statistics. We will subsequently discuss the degree to which the Pathfinder algorithm and software were useful in capturing and analyzing mental models.

Although the Workshop will be given in person, it will also be available as an interactive “lesson” via the web. Thus, participants will be able to subsequently analyze their own data and discuss it with workshop participants.

1:30-4:30 (afternoon sessions)

**Pre-Conference Workshop:
Facet-Based Pedagogy in Image Processing, Math, and Computing**
Steven Tanimoto, Robin Adams, Nick Benson, Earl Hunt, and William Winn

The goal of this workshop is for each participant to gain an exposure to some of the possibilities of both student and teacher experiences in future online learning environments. Online learning has brought to research and practice in the Learning Sciences not only new interactive experiences for students but new methods for teachers to monitor and guide learning as it occurs. This workshop will engage participants first as students, learning about image processing, and then as teachers, assessing the learning using experimental tools.

The workshop will be based on experimental software under development at the University of Washington's Online Learning Environments Laboratory. One system provides students with an introduction to digital imaging that connects computer science, mathematics, and art. The PixelMath software presents a JPEG or GIF image as not only a visual object, but also as an array of numbers, with three numbers (for red, green, and blue) per pixel. Operations are performed using a special scientific calculator. Effects such as contrast and brightness adjustment, geometric distortion, anamorphosis, and stereogram creation can all be produced within the system. Participants using this software will not only gain understanding about how digital images work and relate to other disciplines, but they will lay down a data log of activity events that will form the basis of the assessment activity in the second half of the workshop. A second system, INFACT Forum, allows students and instructors to interact in a threaded discussion, to which students post questions, solutions to problems, and generally collaborate with each other on PixelMath exercises. One exciting new member of the INFACT suite is INFACT-SKETCH, an online sketching tool for students. This tool is fully integrated into INFACT, allowing sketches to be posted as parts of group discussions, and offering the basis for a new dimension of assessment by teachers. The workshop will include an opportunity for each participant to play the role of a student using INFACT-SKETCH as well as an opportunity to try assessing learning from online sketches.

During the first half of the workshop, participants will use PixelMath and INFACT Forum in the same manner as students do, to complete exercises that demonstrate the systems' capabilities. During the second half of the workshop, each participant will use the experimental tools of the INFACT online learning system to examine and assess the learning that will have taken place during the first half of the workshop. These tools include an event viewer, a facet-based-assessment markup tool, and an automatic markup tool. The workshop leaders will explain how "facet-based" assessment works, and will give each participant an opportunity to make facet diagnoses using the INFACT markup tool. The workshop will conclude with a description of the way in which the tools have been used in a freshman programming course. This will be followed by a discussion of the potential of these and similar tools to monitor learning continuously and unobtrusively, and to inform students of their progress in real time.

**Pre-Conference Workshop:
Social Activity in Educational Digital Libraries: Community, Tools, and
Resources for Learning**

Wes Shumar, Chris Hoadley, Mimi Recker, K. Ann Renninger, and Mark Schlager

Much recent research has focused on the design, development, and evaluation of online sites dedicated to contributing to the improvement of teaching and learning. Examples of such sites exist along a continuum from resource-oriented educational digital libraries (such as the Math Forum and CILTKN) to community-oriented discussion sites (such as Tapped In). This workshop will focus on role of such sites in supporting community building, and the social context of learning. In particular, the workshop will focus on identifying and categorizing participant activity structures, including user interactions, communication patterns, and resource use. An activity structure, for example, might include “recommending a resource,” “jointly constructing artifacts from resources,” or “identifying a collaborator”.

Such activity structures will be examined in the context of different types of online learning sites. For the purposes of this workshop, online learning sites will be viewed on the above-mentioned continuum that ranges from informational to communicative. An informational site is primarily a collection of resources, a communicative site is primarily a place for social interaction, and some sites blend both types of features. In addition, the workshop discussion will focus on the nature of evidence and methods used to identify and understand these activity structures.

Participants in the workshop will be asked to bring to the meeting information they have on their users and their activities. Outcomes of the workshop will lead to preliminary model, identifying, and describing activity structures within a range of sites for online learning. This list of activities will help both digital library researchers and online community researchers find common ground on what their tools do or might support, and will help these two research communities to begin building collaboration for future research. In addition, knowledge about the social context of online learning will aid in the identification of design principles that can be used to build environments that support *communities* of learners.

Wednesday, Oct. 23.

8:30-12:00

Pre-Conference Workshops:
Designing Next-Generation Educational Computer and Video
Games: An MIT Workshop
Kurt Squire and Eric Klopfer

While learning scientists struggle with how to build scalable and sustainable interventions that meet teachers' needs, products such as *SimCity*, *Oregon Trail*, or *Reader Rabbit* are used by thousands, if not millions of students across the country (Prensky, 2001; Sabelli & Dede, 2000). Research on computer gaming used in educational contexts has shown that games can foster motivation and engagement (Malone, 1981), but how to use them to support academic learning has been a struggle for learning scientists (Clegg, 1991; Wentworth & Lewis, 1973). Isolated examples exist describing the successful implementation of digital game environments (e.g. Colella, Klopfer, & Resnick, 2001; Frederickson & White, 1999; Lightspan, 2002), however, most studies of game-based learning environments have failed to find learning gains in academic content areas, although a large body of research shows that most students find game-based learning environments engaging (Clegg, 1991; Ehman & Glenn, 1991; LightSpan, 1991; Mayer, et al., 1999). Several educators have noted that most educational games lack the design or production value of their counterparts in entertainment (Prensky, 1991; Rieber, 1996; Resnick, 1996) and suggested that researchers in the learning sciences might benefit from leveraging design knowledge developed in digital gaming (Dede, 2001).

This workshop combines work done at MIT in modeling and participatory simulations with wearable computers and Star Logo (Colella, Klopfer, and Resnick, 2001), with research in the Games-to-Teach Project (<http://cms.mit.edu/games/education/>), an interdisciplinary consortium of educators, media scholars, and game designers exploring opportunities for designing next-generation educational video games. Based in MIT Comparative Media Studies, the Games-to-Teach team has been engaging in collaborative brainstorming and game design exercises with nearly a dozen creative leaders in the games industry over the past year, including Will Wright (*Sim City / The Sims*), Brenda Laurel (*Purple Moon*), Doug Church (*Thief*, *System Shock*) Eric Zimmerman (*Blix*, *Lego*, *Sissyfight 2000*), Brian Sullivan (*Age of Empires*), Matthew Ford (*Asheron's Call*), Chris Weaver (*Morrowind*), Steve Meretzky (*Hitchhiker's Guide to the Galaxy*) and others. Supported by Microsoft Research, this workshop is an evolution of earlier workshops conducted with Houghton Mifflin has been included at The Games Developer's Conference and the Electronic Entertainment Exposition.

Workshop participants will take part in brainstorming exercises used in the games industry and at MIT to generate ideas for educational games. We will briefly demonstrate state-of-the-art design across a range of gaming genres, working in small groups to derive design principles for educational media, brainstorm ways that existing applications in the learning sciences might be improved, and generate new ideas for educational games. Next, we will examine issues in game

rules design and balancing game play by playing traditional face-to-face games, participatory simulation games, and computer-mediated games, including some of those developed at MIT. After demonstrating these games, we will share our experiences developing educational games, and lead a discussion on development issues and strategies for game design. Included in this discussion will be information on licensing and using commercial gaming tools and technologies. We will conclude by discussing limitations using games in education, focusing particularly on unresolved issues or issues that participants believe need further research. The workshop will culminate with participants taking a game demonstrated at the workshop or designed by participants and outlining research methodologies for examining the impact of learning through game play on cognition.

We expect that this workshop will be of interest to learning scientists interested in using design principles, technologies, and tools developed in gaming to support learning. We are not assuming any computer programming experience among participants, nor any particular level of research experience, although participants current with contemporary thinking in the learning sciences, particularly with the implementation of emerging technologies will find the workshop most beneficial. The workshop will address the development of paper-based, offline, and PocketPC games, in addition to PC and console games.