International Perspectives in the Learning Sciences: Cre8ing a Learning World

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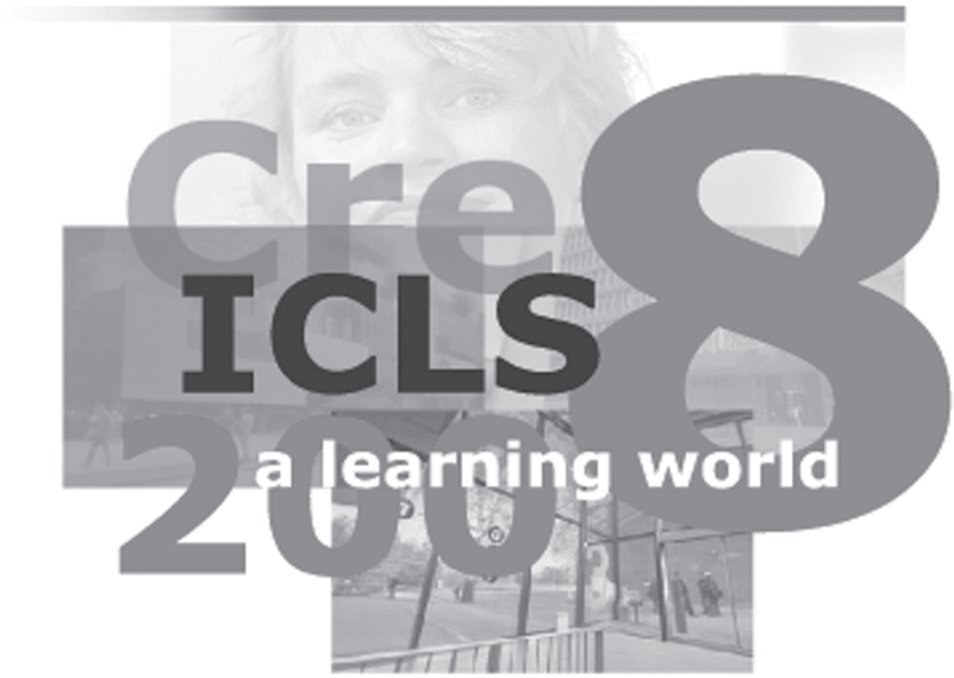

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About ISLS

The International Society of the Learning Sciences, incorporated as a non-profit professional society in September, 2002, unites the traditions started by the Journal of the Learning Sciences, the International Conferences of the Learning Sciences (ICLS), and the Computer-Supported Collaborative Learning Conferences (CSCL) and offers publications, conferences, and educational programs to the community of researchers and practitioners who use cognitive, socio-cognitive, and socio-cultural approaches to studying learning in real-world situations and designing environments, software, materials, and other innovations that promote deep and lasting learning.

Researchers in the interdisciplinary field of learning sciences, born during the 1990’s, study learning as it happens in real-world situations and how to better facilitate learning in designed environments – in school, online, in the workplace, at home, and in informal environments. Learning sciences research is guided by constructivist, social-constructivist, socio-cognitive, and socio-cultural theories of learning.

The society is governed by a Board of Directors elected by the paid-up membership. Officers of the society include the President (chosen by the Board of Directors), Past-President, President-Elect, an Executive Officer. and a Financial Officer. Much of the work of the society is done by committees whose members are drawn from both the Board and the membership at large.

About ICLS

The International Conference of the Learning Sciences (ICLS), first held in 1992 and held bi-annually since 1996, hosts keynotes, symposia, workshops, panels, submitted paper sessions, poster sessions, and demos covering timely and important issues and reporting research findings across the entire field of the learning sciences.

Recent conferences have had invited keynotes and sessions centered on timely themes. The 2000 conference theme focused on the complexities inherent in learning and in studying learning; the 2002 conference theme focused on diversity. The 2006 conference focused on making a difference – issues in scaling learning sciences findings for broad dissemination and impact.

Previous ICLS Conferences

ICLS 2006 – Bloomington, IN, USA
ICLS 2004 – Santa Monica, CA, USA
ICLS 2002 – Seattle, WA, USA
ICLS 2000 – Ann Arbor, MI, USA
ICLS 1998 – Atlanta, GA, USA
ICLS 1996 – Evanston, IL, USA
ICLS 1992 – Evanston, IL, USA

Volume 3
Table of contents

Posters

New Perspectives on Learning Through (Game) Design

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Abstract: This session will explore different approaches to the use of computer game design in formal/informal learning environments. Game design is becoming a popular strategy for enhancing young people's interest and skills with computer technology, and for purposes ranging from deepening their understanding of scientific principles to fostering critical media literacy. The participants will present research findings that highlight similarities and differences in tools, pedagogies, purposes, and outcomes of game design activities. Game design is often presumed to be appealing to learners who ordinarily might not be motivated to learn through traditional instruction, and we will give particular attention to the significance of race, class, and gender in student engagement and learning through design.

Objectives

The objectives of this session are (a) to present research on a variety of approaches to using game design in formal and informal learning environments, and (b) through comparison of these approaches, to elicit more general insights into how game design might be used most effectively to achieve desired educational goals.

Importance

The concept of learning through design has a long history in education, though until recently design activities were more of an isolated practice than widely used in schools (Haury, 2002). Recent educational reform movements have reemphasized the need to pay greater attention to design, particularly in the context of science and technology-related learning (e.g., Denning, 2007; ISTE, 2007; National Research Council, 1996). This emphasis is reflected in the broader scientific and business community, where "design thinking" is now a valued capability (Kelley & Littman, 2001). The call for design-based learning is rooted in the belief that the act of designing is fundamental to the work of all professions and more broadly, to the pursuit of desired social and political ends. As a process, design activities engage students in active construction of new knowledge, as they construct artifacts to achieve specific ends. This knowledge can pertain to a wide range of traditional academic disciplines. As a goal, design or design thinking involves the ability to define and redefine ill-structured design problems, engage in iterative problem-solving, and integrate skills and knowledge from across disciplines.

Past educational approaches to design-based learning tended to emphasize "school situated design;" that is, design located within the context of traditional academic subject matter and ways of thinking. Alternatively, the symposium participants will describe approaches to learning by design that utilize the affordances of new media and popular culture, particularly computer games. Many of these new forms of media and culture involve more sophisticated language, tools, and thinking skills, such as simulation and modeling, than what young people encounter in school. In addition, engaging in production with new media can serve as a starting point for helping young people become more critical consumers of today's media culture (Gee, 2007; Peppler & Kafai, 2007).

These design approaches to learning involve not just new tools, but also new theories of learning. In the past, learning through design was conceptualized in rather simplistic, individualistic terms, as engaging in and mastering a series of linear steps used to solve a problem (Roth, Tobin, & Ritchie, 2001). In contrast, the approaches discussed in this symposium are informed by situated theories of learning, in which learning is a function of the activity, context and culture in which it occurs. From this perspective, learning through design is best viewed as a collaborative process of creating artifacts that have meaning within a broader community. Each set of authors will discuss a different approach to structuring design activities and capturing the learning trajectories of participants. Some key issues that will be addressed include:

- How can we leverage these popular cultural practices to achieve school and societal goals?
- What is the significance of race, class and gender in the content and process of learning through design?
- How can we understand design thinking not only as abstract, disembodied thinking but also as a practice situated among many participating individuals and groups in collaboration?

Symposium Organization

In this interactive symposium, we bring together a group of researchers who have investigated different approaches to learning through design in after school contexts. Different strategies, ranging from free choice to paired programming, have been used to introduce youth to design activities. Different methodologies to capture and understand social and cultural aspects of design learning have been used. We will start our session with an introduction to the topic of the symposium and a brief overview of participant presentations. We will then move to an interactive format in which conference attendees can visit and interact with presenters at poster stations and discuss different aspects of design approaches and findings. The following research studies will be presented.

A Constructionist Approach to Learning through Designing Games: What Videogame Making Can Teach us about Literacy and Learning

Kylie Peppler, Indiana University & Yasmin B. Kafai, University of California - Los Angeles

Learning through designing games is seen as an alternative and complementary pathway for participation in today's media culture (Kafai, 1995; 2006). Using Constructionism (Papert, 1990) as a pedagogy we focus not only on the individual learner but also on the role of social participation. Here the individual, the artifact, and collaborative input of the community shape learning, participation, and sharing. In the case of video game production today, the community could be described as both the distributed online and offline community. Accordingly, a tool such as Scratch that will promote the developmental relationship between the individual and the community will enable youth to express their cultural heritage, have a broad communicative value, and allow for an information and resource exchange (Maloney, Peppler, Kafai, Resnick & Rusk, 2008).

Our analysis draws from a three-year ethnographic study that documented youth designing games with Scratch by collecting observations, design drawings, log files and interviews (Peppler & Kafai, 2007). An archival analysis of Scratch files revealed the range of different game genres produced within the clubhouse culture such as classic arcade, racing action-adventure, fighting, shooter games with the largest number falling into mixed genre. Over time, video game production became a high status marker, local and global game design experts emerged, and work in Scratch established membership within the community. In addition, we began to see peer-to-peer mentoring in video game design for the first time and there was increased appropriation of Scratch as a video game design tool (Ching & Kafai, in press). As a result, new types of hybrid genres emerged and individuals worked together in groups with increased frequency, with some youth specializing in aspects of game design akin to more professional settings. A case study of Jorge, a game designer, illustrates how youth integrate computation and the arts into video game design practices, express personal interests, and shift participation over time within the video game design culture (Peppler, 2007). Jorge's work in Scratch facilitated his understanding of how games are made by professional production specialists and also networked with other fans, like himself, that wanted to create amateur productions. Evidence of this is found in his online web-surfing activities and over 300 downloadable sheets of sprites found in Jorge's folder at the Clubhouse.

We argue that learning through designing games addresses technical, critical and ethnical aspects of participation. While many of the other design activities that took place concurrently in the clubhouse would well qualify clubhouse youth to be members of a participatory culture, for us the most important aspect relates to who is participating in the game design culture. We saw inner-city youth and English language learners engaged in game design activities and become participants in gaming communities. Through the general scope of Clubhouse game production and the extent of Jorge's game designs, we can find evidence that game-making activities can provide a pathway into participation. Furthermore, we also saw critical issues addressed in game-making activities. Jorge's games dealt with a host of complex interface design issues that reveal the underpinnings of software interactions. Such understandings are crucial for today's citizenship, as more aspects of life have moved into the digital domain and youth needs an understanding about media ownership and control issues as well as technology design. Finally, we also addressed ethical concerns prominent in digital culture, as violation of copyright can be just one mouse click away. We argue that game-making activities offer a promising avenue for young people to develop ownership of media and a sense of appreciation what goes into creating them. In the Computer Clubhouse, there is an emphasis on repurposing media akin to a professional context. But there is also a sense of transgression if other members were to copy someone else's work without explicit acknowledgment. Jorge's Metal Slug variations are a good example of how the modifications within a genre can be minimal but still reference its originator.

It is clear from our analyses that video game making can provide a rich context for learning programming, how to collaborate with others, becoming a member of an affinity group, developing sustained engagement, and more. We see the approach of making games for learning as an appropriate and healthy counterpoint to a culture of consumption. While the boundaries between media consumers and producers are perhaps not as distinct as they used to be, there is still a large rift between those who own and control media and those that have the possibilities of creating them. To be a full member in today's participatory culture should mean much more than knowing how to point and click; it should also mean knowing what goes into creating a pointing device – be it a cursor or another object of your imagination.

The Importance of Design in Learning through Game Design

Elisabeth R. Hayes, James Paul Gee, Arizona State University; Ivan Games, University of Wisconsin-Madison & Robert J. Torres, New York University

Often the primary goal of gaming making in education is to enhance young people's fluency with IT, particularly programming. Software used to make games is designed to simplify programming concepts so they can be more readily grasped, and rarely incorporates explicit guidance in elements of game design specifically. We argue that supporting students' understanding of game design itself can be a valuable starting point for learning to think of complex interactions among variables, people, and technology.

We will describe a new software tool, GameStar Mechanic, which is an RPG (Role-Playing Game) style online game where middle and high school age players learn the fundamentals of game design by playing roles as "game mechanics" charged with the making and "modding" (modifying) of games. The game is being developed and tested in a collaborative project between a for-profit game company and a university. Our discussion will draw on data from several after-school programs which included diverse groups of young people, ranging in age from fifth grade through high school, and with varied socioeconomic, racial and ethnic backgrounds.

In this paper, we will report on one aspect of our findings, the evolution of "design thinking" among participants. Using case studies of selected participants, we will illustrate changes in their abilities on several indicators: (a) acquisition of specialist language associated with design, (b) ability to design a dynamic system of rules that results in a playable game, (c) development of specific game design skills and knowledge, (d) participation in a broader affinity space of (emerging) game designers, and (e) engagement in an iterative and collaborative process of design. We will discuss the implications of this work for the use of game design in education, and for design-based learning more broadly.

Using School-based Game Design Projects to Engage Girls in Game Design

Nichole Pinkard, University of Chicago

This paper describes an explicit effort to increase middle school girls' facility and engagement with game design by embedding initial exposure to game design within an in-school class. The motivation for this work stemmed from the analysis of an after-school video game pod (special interest group) that resulted in an all-boys program with girls floating in and out. The few girls who stuck with the program were attending mostly because of parental desire. The lack of girls' engagement led to an examination of the activity structure, teacher bias, peer culture and the role of competition in the pod. This examination informed a questionnaire that asked all sixth and seventh grade students about interest in creating video games and barriers to participating in the existing after-school video game program. While boys expressed more interest, over 65 percent of girls expressed interested in creating games. However, the most common barriers listed by girls for not participating were conflicts with other after-school activities and the assumed "boy" culture of the pod.

In response to the questionnaire and in an attempt to deepen connections between in-school and after-school new media programming, the after-school and school staff designed a 8-week intervention where all 6th grade students would take a simulation/game design course and then be required to work in project teams to create a game or simulation to demonstrate their understanding of global warming. The winning projects would receive ipods. The course design team used lessons learned from Carnegie Mellon's redesign of their computer science program to attract and retain more female computer science majors as basis for the design of the class projects. The author was responsible for teaching game design using the StageCast environment and the science teacher for teaching global warming science content. StageCast was chosen because it allows users to focus on the storyline and learn to program by example without having to spend an inordinate amount of time focusing on the syntax of programming.

The course offered the opportunity to examine the following questions: How do girls engage game design when taught as part of in-school class? What is the quality of the games girls design? How do the games designed by girls differ from those designed by boys? What influences girls' selection of partners for the class project? How does the exposure to game design in the school day impact girls' decision to join the video game afterschool pod? Data collected included both classroom observations from the course and the video game pod, student interviews, computer log files, student assignments, and final projects. While the presentation will go into further detail, the course resulted in two all girls group having the top two winning games, the gender balance shifting to 60/40 in the video game pod and more girls continuing to use StageCast beyond the course.

StarLogo TNG – Making Content-Centered Game and Simulation Development Accessible to Students and Teachers

Eric Klopfer, Massachusetts Institute of Technology & Hal Scheintaub, Governor's Academy

The gap between modern scientific practice and school science is widening as the tools and technique of scientists rapidly advance beyond our realms of direct experience. Scientists use computer models and simulations to understand systems across a range of temporal and spatial scales from the evolution of species across continents to the radioactive decay of elements with half-lives measured in microseconds.

In order to provide a curriculum that makes simulations accessible to teachers and engaging to students, we look towards the intersection between games and simulations. StarLogo TNG provides two important supports for learning not previously available. First, the programming is done with graphical programming blocks instead of text-based commands. StarLogo TNG's second advance is a 3D representation of the world. This provides the ability to model new kinds of physical phenomena, allows students to take the perspective of an individual agent in the environment, and enables a much richer set of interactions.

In this presentation, we will describe how Starlogo TNG was used in a game development-based physics unit. StarLogo TNG basics were introduced through a series of task-oriented activities called Modeling Change. Beginning physics students have a hard time believing that the vertical and horizontal motions of a projectile can be independent of one another. A game programming task was used to introduce the idea of simultaneous but independent change. Students saw that changes in color, size and location which they programmed separately, could be run simultaneously. When students programmed vertical motion in the manner describe above, they were not satisfied. Their agents seemed to float up and down. To get realistic vertical motion, students needed to use procedures for accelerated change that were developed through a series of programming challenges. Assessments (using traditional physics tests, and analysis of student work) showed that the programming experience helped students learn vectors and see horizontal and vertical components of motion operating separately and simultaneously in projectile motion.

Collaborative Game Design: Analysis from a Middle School Programming Project

Maryanna Rogers, Karin S. Forssell, Caitlin Kennedy Martin, Brigid Barron, Wanda Eugene, Shaundra B. Daily, Ugochi Acholonu, Lori Takeuchi, Sarah Walter, Kristen Briggs

Creative technology projects such as game design can serve to engage learners, but it is often difficult to determine what students are learning from this activity. In this paper, we will present the results of a two-week design experiment in which 47 middle school students worked in pairs to design and develop computer-based games using a drag and drop introductory programming environment. Our goal was to expand students' technological fluency in areas such as programming, troubleshooting, and design and to foster important 21st century skills such as planning and collaborating.

We collected rich accounts of students' collaborative design experiences in an attempt to look at student learning, including conducting artifact-based interviews with individual students after the completion of their projects, surveying students about their general and project-specific technology experiences, and obtaining copies of their games during different stages of development.

In this presentation we describe the workshop implementation and our research methods, data analysis, and results to date. Our analysis focuses on learner's perceptions of the knowledge, skills, and affective orientations that are important during game design. We developed a coding scheme to categorize students' descriptions along these dimensions. Six broad categories emerged: Affective stance, collaborative orientation, design process, project management, access of learning resources, and specific knowledge/abilities. We used survey data to create profiles of students based on their reports of satisfaction with their final game product, their learning, and their collaborative experience. We then compared these profile groups with respect to the number and the type of dimensions that students reported as important to successful participation in a long-term game design project. Despite differences in satisfaction levels, students have similar ideas; results suggest that a positive affective stance reflected in patience and persistence, as well as project management skills such as planning and strategies for working with teammates, are recognized as important across student groups.

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