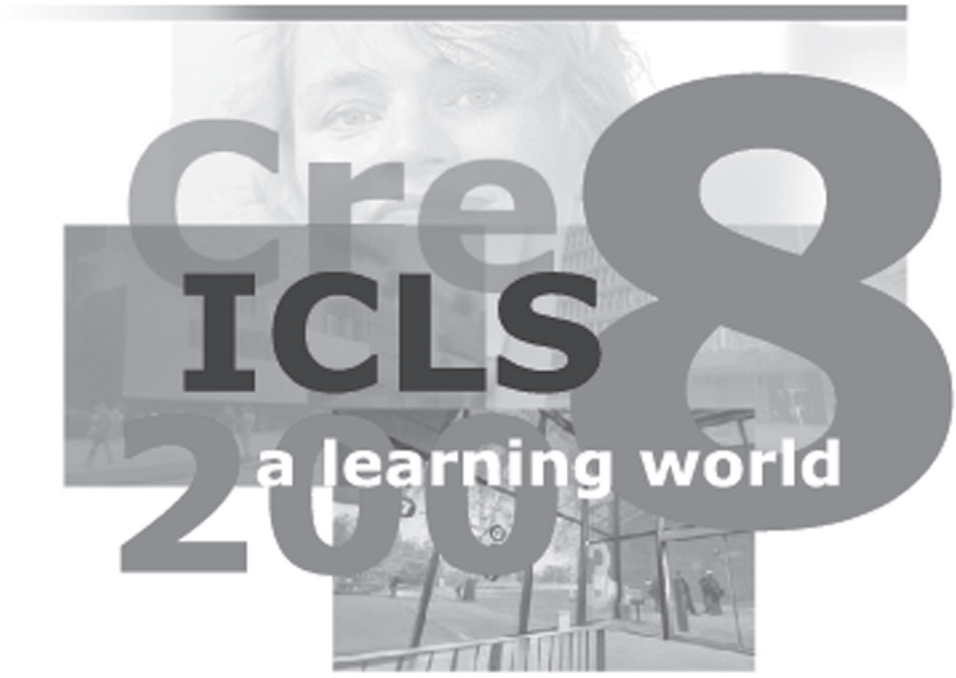
International Perspectives in the Learning Sciences: Cre8ing a Learning World

PROCEEDINGS of the Eighth International Conference for the Learning Sciences – ICLS 2008

Volume 3



Colofon

Title: International Perspectives in the Learning Sciences: Cre8ing a learning world. Proceedings of the Eighth International Conference for the Learning Sciences – ICLS 2008

Published by: International Society of the Learning Sciences, Inc.

www.isls.org

Printed Proceedings Printed and Distributed by: Lulu

www.lulu.com

ISSN: 1573-4552

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

Media Designs with Scratch: What Urban Youth Can Learn about Programming in a Computer Clubhouse

John Maloney, Mitchel Resnick, Natalie Rusk, MIT Media Laboratory,
77 Massachusetts Ave. E15-020, Cambridge, MA 02139, USA
Email: jmaloney@media.mit.edu, mres@media.mit.edu, nrusk@media.mit.edu
Kylie A. Peppler, Indiana University, 201 N Rose Ave, Wright 4024,
Bloomington, IN 47405, USA, kpeppler@indiana.edu
Yasmin B. Kafai, UCLA Graduate School of Education and Information Studies, 2128 Moore Hall,
Box 951521, Los Angeles, California 90095-6293, USA, kafai@gseis.ucla.edu

Abstract: We report on the programming learning experiences of urban youth ages 8-18 at a Computer Clubhouse located in South Central Los Angeles. Our analyses of the 536 Scratch projects, collected during a two-year period, documents the learning of key programming concepts in the absence of instructional interventions or experienced mentors. We discuss the motivations of urban youth who choose to program in Scratch and the implications for introducing programming at after school settings in underserved communities.

Numerous approaches to broadening participation in computing have been discussed in K-12 and college education, such as mentoring, revised curricula, tool development outreach programs, and programming courses for non-majors (Margolis & Fisher, 2003). A surprisingly neglected area of research is the learning of programming in community technology centers. In these venues, the learning of programming is more casual and takes place at the discretion of the learner rather than part of a formal curriculum. Such out-of-school activities also present opportunities for youth to succeed who may not flourish in traditional school environments. As a case in point, we focus on the use of Scratch (see Figure 1 or www.scratch.mit.edu), a block-based programming language designed to facilitate media manipulation for novice programmers (Resnick, Kafai, & Maeda, 2003), at a Computer Clubhouse—an urban community technology center (Resnick, Rusk, & Cooke, 1998). Scratch is not the first programming environment aimed at novice programmers (for an extensive overview, see Kelleher & Pausch, 2005). It follows the Logo tradition (Papert, 1980) but emphasizes media manipulation and supports youths' interests, such as creating animated stories, games, and interactive presentations. The Scratch vocabulary of roughly 90 commands includes commands for relative motion like the Logo turtle, image transformations, cell animation, recorded-sound playback, musical note and drum sounds, and a programmable pen, in addition to standard control structures, global and local variables, and simple Boolean operations.

During a period of two years, we collected youths' Scratch projects, which included animations, digital art, and games, on a weekly basis in order to track which programming concepts were taking root in the Clubhouse culture over time. As information sources for this study, we exported project summary files, which contained text-based information such as the date, file name, and author of the project as well as information about the number and types of commands that were used and the total number of stacks, sounds, and costumes used in the project. During the study, mentors were regularly at the site. The mentors had little or no experience programming and were new to Scratch (Kafai, Desai, Peppler, Chiu, & Moya, 2008).

Findings

We collected 536 Scratch projects, which constituted 34% of all the projects created at the Computer Clubhouse during the course of this study. Scratch was more heavily used than any other media-creation tool, including Microsoft Word, which was the next most widely adopted software (n = 461 files). These findings demonstrate that Scratch became a successful part of the local culture. It's also one of the few programming initiatives that successfully engaged equal numbers of boys and girls – all of them youth of color. Of the 536 Scratch projects, 111 of them contained no scripts at all. These "pre-scripting" projects illustrate the use of Scratch simply as a media manipulation and composition tool. Of the remaining 425 projects, all of them make use of sequential execution (i.e., a stack with more than one block) and most (374 projects, 88%) also show the use of threads (i.e. multiple scripts running in parallel). These are core programming concepts that confront every Scratch user when they begin scripting. In addition, we examined a number of other programming concepts: user interaction, such as use of keyboard or mouse, was used in 228 projects (53.6%), loops in 220 (51.8%), conditional statements in 111 (26.1%), communication and synchronization in 105 (24.7%), boolean logic in 46 (10.8%), variables in 41 (9.6%), and random numbers (4.7%). Unlike sequential execution, the aforementioned concepts are not needed in every project and were therefore used less frequently.

We also examined programming trends over time. When we compared the percentage of projects containing the various programming concepts over time, we found that five out of the seven concepts that we targeted for our analyses demonstrated significant gains ($p < .05$) during the second school year. Among these

were the less obvious concepts of variables, Boolean logic, and random numbers. Chi-Square tests were used to analyze differences in the percentages of projects containing targeted programming concepts from Year 1 to Year 2 (see Figure 2). Overall, four of the seven programming concepts (Loops, Boolean Logic, Variables, and Random Numbers) demonstrated significant gains in the number of projects utilizing the targeted concepts ($p < .001$). One of the remaining concepts (Conditional Statements) had marginal gains ($p = .051$) and one concept (Communication/Synchronization) demonstrated a reduction in the projects utilizing this concept.

Figure 1. Screenshot of the *Scratch* User Interface

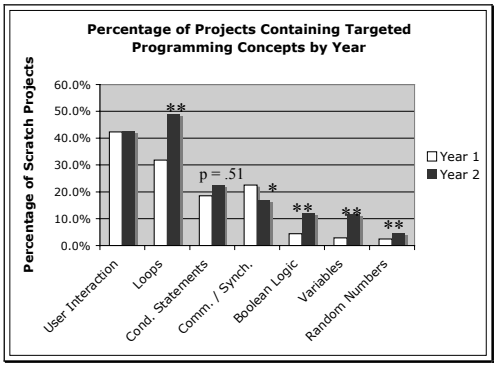


Figure 2. Graph demonstrating the change in the percentage of projects that used various programming concepts over time
**p < .001 *p < .05

Discussion

Our findings illustrate youths' sustained participation in programming activities. Clubhouse youth utilized commands demonstrating the concepts of user interaction, loops, conditionals, variables, Boolean logic, random numbers, and communication & synchronization. These findings are remarkable given the lack of formal instruction and the mentors' lack of prior programming experience. A more pressing question is: why did Clubhouse youth choose to get involved in Scratch programming given that they had many other software options? The best answer might have been provided by Kelleher and Pausch (2005) who noted how systems can make programming more accessible for novices "by simplifying the mechanics of programming, by providing support for learners, and by providing students with motivation to learn to program" (p. 131). We think that Scratch addresses all three of these areas. The design of the Scratch blocks simplifies the mechanics of programming by eliminating syntax errors. The social infrastructure of the Computer Clubhouse is also important in providing support for novice programmers. Finally, the multimedia aspect of Scratch facilitated urban youth's participation in programming. The project archive provided evidence that youth interest in technology starts with digital media and serves as a promising pathway into programming. The broad spectrum of media designs – from video games to music videos and greeting cards – is a true indicator of youth's interest in not only consuming digital media but in becoming creators themselves, a role often denied to urban youth.

References

Margolis, J. & Fisher, A. (2003). *Unlocking the Clubhouse: Women in Computing*. Cambridge, MA: MIT Press.

Kafai, Y. B., Desai, S., Peppler, K., Chiu, G. & Moya, J. (2008). Mentoring Partnerships in a Community Technology Center: A Constructionist Approach for Fostering Equitable Service Learning. *Mentoring & Tutoring*, *16*(2), 191-204.

Kelleher, C. & Pausch, R. (2005). Lowering the barriers to programming: a taxonomy of programming environments and languages for novice programmers. *ACM Computing Surveys, 37*(2), 88-137. Papert, S (1980). *Mindstorms.* New York: Basic Books.

Resnick, M., Kafai, Y. B., & Maeda, J. (2003). ITR: A Networked, Media-Rich Programming Environment to Enhance Technological Fluency at After-School Centers. Proposal [funded] to the National Science Foundation, Washington, DC.

Resnick, M., Rusk, N., & Cooke, S. (1998). Computer Clubhouse: Technological fluency in the inner city. In D. Schon, B. Sanyal and W. Mitchell (Eds.), *High technology and low-income communities*. Cambridge, MA: MIT Press.

Papert, S. (1980). *Mindstorms.* New York: Basic Books.

Acknowledgments

This work was supported by a grant from the National Science Foundation (NSF-0325828) to Mitchel Resnick and Yasmin Kafai and by a dissertation fellowship from the Spencer Foundation to Kylie Peppler. The views expressed are those of the authors and do not represent the views of the supporting funding agencies or universities. We wish to thank Zrinka Bilusic for her preparation and initial analysis of the Scratch archive.

Cross-cultural online collaboration: Challenges and strategies

Larissa V. Malopinsky, Gihan Osman, Indiana University, P.O. Box 5877, Bloomington, IN 47407-5877 USA
Email: lmalopin@indiana.edu, gosman@indiana.edu

Abstract: In this presentation, we share the experience of a partnership project between two teams representing Azerbaijani and American higher education institutions. The researchers (a) examine the challenges of collaborative work in the context of cultural differences related to applying learner-centered pedagogy, sustaining collaboration and managing learning process, and (b) introduce the strategies developed for addressing those challenges. This study seeks to advance educators' understanding of the critical aspects of cross-cultural collaboration in online learning environments.

Introduction

Teaching and learning processes are seen as grounded in the unique social practice of the cultures involved. Epistemological dissonance can make it challenging for representatives of different cultures to establish effective communication and collaboration (Kanu, 2005). These challenges are often compounded when a partnership project takes place online. The three-year partnership project between Indiana University and the Azerbaijan Research and Education Network Association had two goals: developing online teaching capabilities in Azerbaijani universities and implementing learner-centered pedagogical concepts. The project was focused on offering an online certification program for a group of Azerbaijani faculty and staff who would lead the distance education (DE) implementation effort in the country. Since gaining independence from the Soviet Union in 1991, Azerbaijan, has been seeking to reform and westernize its educational system (Bagirov, 2001). Although in its infancy, DE in Azerbaijan is viewed as the strategy for overcoming a rapid decline of participation in education and training due to increased societal difficulties (ANHD Report, 2003).

Research Project

Early project experience revealed the differences in the approaches to learning and collaborative work between the U.S. and Azerbaijani teams and suggested a systematic study of the challenges experienced by the partner teams from the cross-cultural perspective. A greater understanding of the role of cultural attributes in educational contexts can provide guidance for researchers and practitioners involved in international educational projects in terms of the design and implementation of instructional interventions. The following research questions guided the study: (a) What are the challenges experienced by the project partners in the process of collaborative design of learner-centered instruction for online delivery? (b) What cultural differences are relevant to understanding those challenges? (c) What strategies can be used to respond to those challenges to ensure successful implementation of the project goals?

The challenges were analyzed from epistemological, social interaction and learning management perspectives applying Hofstede's (2001) and Trompenaars and Hampden-Turner's (1997) frameworks of cultural dimensions: high vs. low power distance, individualism vs. collectivism, masculinity vs. femininity, high vs. low uncertainty avoidance, achievement vs. ascription, universalism vs. particularism, external vs. internal control and specific vs. diffuse orientation. The cross-cultural researchers find that these dimensions have an impact on learning situations (Chapman *et al*., 2005; Paulus *et al*., 2005). Language proficiency and difficulties using online technologies were also considered in our analysis as non-culture aspects affecting collaboration. The study utilized a case study approach (Stake, 1995) and used mixed methods of data collection and analysis (Creswell, 2003). Study participants were four Azerbaijani faculty members who were students in the certification program and three U.S. facilitators (one senior faculty member and two advanced graduate students). The research project was led by the U.S. team. Several types of data were collected: (a) background survey (epistemological beliefs (Schommer, 1990), demographics, DE implementation strategies); (b) pre- and post-chat student surveys focused on individual work efforts, challenges, and learning needs; (c) pre- and post-chat facilitator surveys focused on assessment of students' design work, learning needs and strategies for upcoming chat sessions; (d) transcripts of 1.5 hour weekly chats focused on pedagogical and instructional design issues; and (e) semi-structured interviews with students focused on project experience and expectations for learning transfer. Data was collected during 12 weeks. Epistemological questionnaires were analyzed quantitatively. Qualitative data was independently coded by two researchers to identify emergent themes. These were subsequently modified upon reaching 96% agreement resulting in three categories and six sub-categories that reflected major challenge areas: (a) adopting a learner-centered pedagogy (concept of learning process, teacher-student roles); (b) communication and collaboration (teamwork and peer feedback, collaboration with a foreign partner team); and (c) managing learning process (independent work, time management). Every item was discussed from the cultural dimensions perspective and alternative causes were explored.

Findings

The Azerbaijani team demonstrated strong dependence on the U.S. facilitators as providers of "right" information and step-by-step guidance, which was characteristic of the beliefs grounded in high power distance, external control and high uncertainty avoidance. These findings were consistent with reluctance of the Azerbaijani students to reflect on facilitators' performance and their frequent concerns with ill-structured learning tasks. The greatest difficulties in collaboration for the Azerbaijani students came in developing an instructional product as a team and having to critique each other's ideas. While the students expressed strong competitiveness and preference for individual projects, they often hesitated to critique peers' performance, regarding such feedback as a breach of peer-loyalty or disrespect to varying levels of expertise and positions in the team. The students' explanations could be linked to a high-context, particularistic and ascriptive cultural tradition, where tasks are inseparable from personal relationships and individuals hesitate criticizing a friend, a senior person or a higher-ranking colleague. Azerbaijani and U.S. teams had different expectations regarding the amount of support required for students for organizing their learning process. The students' comments indicated frequent confusion with guidance to set their own learning goals and establish a process for accomplishing them. Student expectations grounded largely in earlier experiences in didactic education were consistent with uncertainty-avoiding cultures where people feel uncomfortable in new learning situations and prefer direct guidance. Time management was another area where the teams' approaches differed. An analysis of chat sessions revealed that socializing took approximately 30% of a chat session (Osman & Herring, 2007). While the U.S. facilitators expressed concerns with overly lengthy socializing periods, the Azerbaijani students felt that facilitators were too task-focused. This difference in managing the time planned for the task-related activity presents communicational difficulties between low-context (specific) and high-context (diffuse) cultures that can put a strain on cross-cultural collaborative work and lead to interpersonal conflicts.

In order to help students develop more learner-centered approach to designing instruction, facilitators presented materials in multiple ways, modeled the constructivist approach and encouraged self critique. Several strategies, such as using real life examples and real-life metaphors, encouraging peer facilitation, peer critique and self-reflection were implemented to both provide structured support and challenge the students to develop independent learning skills. Both teams continuously worked on implementing strategies for managing learning processes more effectively while addressing the needs for social interaction: providing forums and setting specific time for discussing personal matters during online learning sessions and developing structured agendas for face-to-face and online meetings. Although the differences between the teams challenged collaborative work in a number of ways, they provided useful insights into the importance of considering the values and beliefs of people working on cross-cultural educational projects. Awareness of the differences led both teams to discuss the feasibility of applying new pedagogical approaches in the Azerbaijani context and helped the U.S. participants consider the implications of cultural differences in the design and facilitation of cross-cultural instruction.

References

ANHD Report, 2003. Available at: http://www.un-az.org/undp/nhdr2003/content_eng.html.

Bagirov, H. (2001). The birth of Western University. *Azerbaijan International, 9(4)*, 38-78.

Chapman, D.W., Weidman, J., Cohen, M., & Mercer, M. (2005). The search for quality: A five country study of national strategies to improve educational quality in Central Asia. *International Journal of Educational Development, 25,* 514-530.

Creswell, J. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches.* Thousand Oaks, CA: Sage.

Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions, and organizations across nations*. London: Sage.

Trompenaars, F. & Hampden-Turner, C. (1997). *Riding the waves of culture. Understanding cultural diversity in global business.* New York, NY: McGraw-Hill.

Kanu, Y. (2005). Tensions and dilemmas of cross-cultural transfer of knowledge: post-structural/postcolonial reflections on an innovative teacher education in Pakistan. *International Journal of Educational Development, 25*, 493-513.

Osman, G., & Herring, S.C. (2007). Interaction, facilitation, and deep learning in cross-cultural chat: A case study. *The Internet and Higher Education, 10,* 125-141.

Paulus, T.M., Bichelmeyer, B., Malopinsky, L., Pereira, M., & Rastogi, P. (2005). Power distance and group dynamics of an international project team: A case study. *Teaching in Higher Education, 10*(1), 43-55.

Schommer, M. (1990). Effects of beliefs about the nature of knowledge on comprehension. *Journal of Educational Psychology, 82,* 498-504.

Stake, R. (1995). *The art of case research*. Thousand Oaks, CA: Sage Publications.