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Edited by
Sasha A. Barab
Kenneth E. Hay
Daniel T. Hickey

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Paul Whitener Jr.
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paul@empoweredmedia.org

Preface

Learning sciences research explores the nature and conditions of learning as it occurs in educational environments, broadly construed. The learning sciences field draws upon multiple theoretical perspectives and research paradigms in order to understand and improve human learning, cognition, and development. Over the last two decades the learning sciences community has developed powerful technological tools, curricular interventions, theories, and methods for understanding and improving teaching and learning as it unfolds in naturalistic contexts.

Learning sciences takes an interdisciplinary approach to the study of learning, cognition, and development in real-world contexts. Learning scientists believe that any investigation of teaching and learning must consider context, cognition, and learning architecture, which we treat as inextricably intertwined. All who are interested in the study of learning in context and the design of learning environments should find the work in these Proceedings to be of interest.

While learning scientists can present rich accounts of learning in complex contexts, convincing policy makers, teachers, and other researchers of the theoretical and practical value of our work; it is not a straightforward process. We must show impact at the local level, while at the same time working to advance claims that have more general value. In other words, we must make clear that the learning sciences make a difference.

Toward this end, the *Seventh International Conference of the Learning Sciences (ICLS 2006)* is explicitly focused on the theme "Making a Difference." Much of the work in these Proceedings demonstrates how our work is making a difference: to students, teachers, schools, and policy makers; to research approaches and methods; to theories and models of learning, instruction, and assessment. Each proposal in these Proceedings was blind reviewed by three independent reviewers to ensure high quality work. We hope that others will find the lessons shared in these pages relevant to their work.

Acknowledgements

Organizing this meeting was a substantial undertaking. Receiving and reviewing proposals, assembling the Proceedings, and organizing the actual conference required many hands. There are many people we owe our sincere thanks in making this year's conference a reality.

We offer special thanks for the tireless hours and work of Melissa Goodnight and Karla Frownfelter in organizing these Proceedings. Similarly, our designer Paul Whitener also made many last-minute changes and developed the artwork. Their hard work has made the editors and the contributors look their best.

We would like to thank members of the Indiana University community for their support, both personnel and monetary. These include IU Learning Sciences Program and Program Head, Dick Lesh; the IU Center for Research Learning and Technology; IU School of Education and Dean Gerardo Gonzalez; IU School of Informatics and Dean Michael Dunn; IU Office of

International Programs; IU Vice President of Research, Michael A. McRobbie; and IU Office of the Chancellor.

Putting on a conference for the first time can be an overwhelming and complex enterprise. Mary Morgan of the IU Conferences office has been an amazing resource and help in juggling all of the demands of a conference co-chair. We would like to extend our sincere thanks for her tireless work, patience and persistence. We would also like to thank IU Learning Sciences Professor Tom Duffy for his initial involvement in organizing the conference.

The National Science Foundation has been a consistent supporter of past and current meetings the ICLS. We would like to once again recognize the foundation and program officers (particularly Elizabeth VanderPutten, Robert Sherwood, and Larry Suter) for their commitment to the field through the significant support of *ICLS 2006*. Special recognition should be mentioned for their support of graduate students and early career scholars. Their forward thinking and support will pay great dividends in the quality of our future.

This is the first ICLS that has had the benefit from a fully formed International Society of the Learning Sciences (ISLS) organization to support and guide the development of the conference. In particular, we would like to thank ISLS members Janet Kolodner, Roy Pea, Claire O' Malley, Nancy Songer, William Sandoval, Chris Hoadley, Danny Edelson, and Cindy Hmelo-Silver for their help and guidance. We would also like to acknowledge the suggestions and help of other ISLS members, particularly our international colleagues, including Paul Kirschner, Sanna Jarvela, Bronwyn Stuckey, and Hans Spada.

We would also like to give a special thanks to the *ICLS 2004* chair, Yasmin Kafai, in helping us plan for the hills and valleys of conference work. Her wisdom in handling the many issues of the *ICLS 2006* has been much appreciated. We hope to do the same for the *ICLS 2008* chairs.

Finally, we would like to recognize the many individuals who reviewed the submitted proposals for all their hard work and the contributors that make the ICLS an exciting conference. We are sure that their creativity and scholarship will make the *ICLS 2006* and these Proceedings a significant contribution to the Learning Sciences community.

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Symposia

Seeds of a Computer Culture: An Archival Analysis of Programming Artifacts from a Community Technology Center

Yasmin B. Kafai, Kylie A. Peppler, Mabel Alavez, & Omar Ruvalcaba
University of California, Los Angeles 2331 Moore Hall Los Angeles, CA 90095
kafai@gseis.ucla.edu, peppler@gmail.com, m_1080@yahoo.com, indigo@ucla.edu

Abstract: We examined the genre and complexity of computer programs created by members of a community technology center. We collected 240 projects during a six-month period. The program genres reflected animations, games, and graphics in about equal numbers. While the number of computer programs decreased over time, the number of advanced programs remained constant suggesting that members either abandoned programs or paired up with more experienced programmers and continued to develop more complex programs.

About 25 years ago, Seymour Papert (1980) described the necessity of creating computer cultures rather than isolated experiences to learn with and about technology. He defined a computer culture as a place promoting access to technology fluency — in contrast to computer literacy — and by emphasizing technology production and personal expression as essential catalysts for learning. As the history of school classrooms has shown the creation of such cultures has proven to be a challenging enterprise, in particular what concerns programming activities. Even in informal learning environments such as community technology centers dedicated to technology fluency, computer programming has rarely become part of design activities.

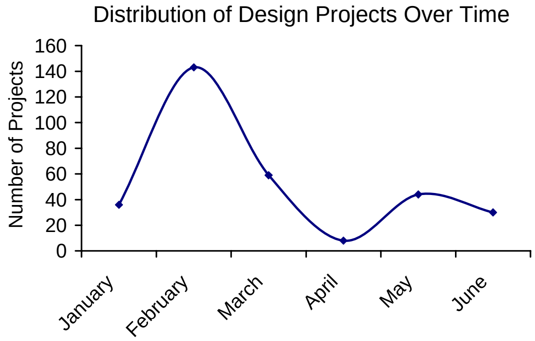
Our research was situated in a Los Angeles community technology center (CTC) visited by a predominantly Latino/a and African-American youth ages 8-18. The center, where children and youth are considered "members" (as opposed to students) of a learning community, encourages them to devise multi-media, multi-application activities that are founded upon their personal interests (Resnick, Rusk, & Cooke, 1998). We introduced Scratch, a new programming environment oriented towards media production (Resnick, Kafai & Maeda, 2003). In Scratch, programmers do not need to write program code; rather they select and manipulate blocks to create scripts that control objects or characters on the screen. These blocks also facilitate manipulation of existing media such as imported graphics from the Internet or creation of videos, animations, and music. For this poster we will focus on the programming projects created by CTC members over the course of the six months. We considered these projects to be potential seeds, or indicators, of a computer culture that would tell us about members' interest in programming and their development of programming skills.

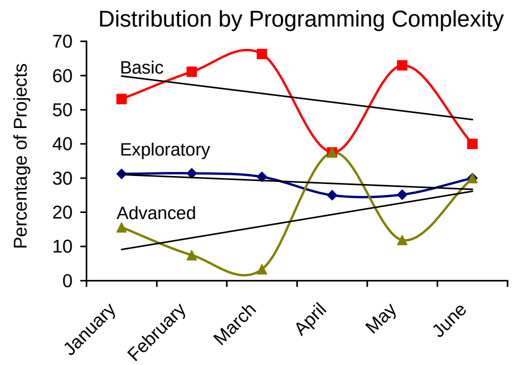
Methods

A member of the research team collected, on a regular basis, all of the Scratch projects stored on the central server by doing a file search for files with .scratch extensions. By collecting projects on a weekly basis we were able to track the number of projects and possible progress of individual projects, gathering multiple copies of a single project that had been reworked over a longer period of time. For the analysis, we took screenshots of program graphics and code and entered them into a spreadsheet along with short descriptions of content and functionality. In addition, we noted the name, gender, and age of programmer (if known) and possible collaboration with a mentor. Programs were coded into four categories based on project type (animation, game, story, graphics, and other) and classified into three levels of programming complexity: *exploratory* with no programming and only graphics, *basic* with simple programming scripts and of short length, and *advanced* with programming structures such as looping, conditionals, and random.

Findings

Over the course of six months, we collected 240 programming projects created by members of the CTC, some designed alone others with mentors. We found that 44% of these projects fell into the category animations with and without user manipulation, followed by 23% of graphics projects, and 15% of game projects focusing on fighting, sports and adventure; 14% or 34 projects escaped a clear categorization because they did not provide enough detail. In terms of program complexity, 30% or 72 projects were considered exploratory, 59% of the projects fell into the basic category, followed by 11% advanced projects. A longitudinal analysis revealed that over the time period of six months the total number of program projects decreased (see Figure 1a) while the number of advanced projects remained constant (see Figure 1b).





Figures 1a and 1b. The left graph illustrates the distribution of designed projects from the start of introducing Scratch (in January) with reaching a peak in February and a slow down in the second quarter from April to June. The right describes the distribution of projects in terms of programming complexity with the lines capturing general trends.

Discussion

We realize that this archival analysis of programming artifacts provides us only with a partial access to a computer culture for multiple reasons: to begin with, our archive while extensive did not capture all Scratch program designed but only those saved. The archive does not tell us what motivated CTC members to create their programs, what they value in their designs, and how they compare them to their other design projects. We also could not address the equally important social and local influences at work that contributed to the design of the programs. Notwithstanding these limitations, the large number of Scratch programs provides a compelling example that members were active in creating numerous programs over an extended period of time and that even without explicit curricular goals, grades or instruction. More importantly, the complexity of programs created remained constant while the total number of program projects decreased over time suggesting at least several explanations: members who generated exploratory programs dropped out of the CTC, members decided to team up with more experienced members or mentors to work on programs, or members developed their exploratory and basic programs into more complex projects. Our next steps will be to construct case studies for a select number of Scratch programs and to collect information from field notes about the design process and context and to conduct interviews with members about their projects and about programming in general.

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Resnick, M., Rusk, N., and Cooke, S. (1998). Computer Clubhouse: Technological fluency in the inner city. In D. Schoen, B. Sanyal, and W. Mitchell (eds.), *High Technology and Low-Income Communities*. Cambridge, MA: MIT Press.

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