



# Indiana University 2006

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**Edited by  
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## 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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# Table of Contents

## Volume I

### Papers

<b>From Evidence to Explanations: Engaging undergraduate Geology Students in Inquiry</b> Xornam Apedoe .....	2
<b>Frames and Games in the Science Museum: A Lens for Understanding Visitor Behavior</b> Leslie Atkins.....	9
<b>Is Externally-regulated Learning by a Human Tutor Effective in Facilitating Learning with Hypermedia?</b> Roger Azevedo, Jeffrey Greene, Daniel Moos, Fielding Winters, Jennifer Cromley, Pragati Godbole-Chaudhuri.....	16
<b>Didn't I Tell You That? Challenges and Tensions in Developing and Sustaining School - University Partnerships</b> Michael Barnett, Thomas Higgenbotham, Janice Anderson .....	23
<b>Interface Agents to Alleviate Online Frustration</b> Amy L. Baylor, Rinat B. Rosenberg-Kima .....	30
<b>Children's Text Comprehension: Effects of Genre, Knowledge and Text Cohesion</b> Rachel Best, Yasuhiro Ozuru, Randy Floyd, Danielle McNamara .....	37
<b>Characterizing the Quality of Second-Graders' Observations and Explanations to Inform the Design of Educative Curriculum Materials</b> Carrie Beyer, Elizabeth Davis .....	43
<b>Shifting Epistemologies: Examining Student Understanding of New Models of Knowledge and Learning</b> Katerine Bielaczyc, Peter Blake .....	50
<b>Using Log Files to Track Students' Model-based Inquiry in Science</b> Barbara Buckley, Janice Gobert, Paul Horwitz, Amie Mansfield.....	57
<b>Direct-manipulation Animation: Incorporating the Haptic Channel in the Learning Process to Support Middle School Students in Science Learning and Mental Model Acquisition</b> Margaret S. Chan, John B. Black .....	64
<b>Student-generated Animations: Supporting Middle School Students' Visualization, Interpretation and Reasoning of Chemical Phenomena</b> Hsin-Yi Chang, Chris Quintana .....	71



<b>From Mechanical to Meaningful Classroom Questions</b> Elizabeth S. Charles, Janet L. Kolodner, Sabina Karkin, Christopher W. Kramer .....	78
<b>Revealing and Mediating Young Children's Memory and Social Cognition through Digital Photo Journals</b> Cynthia Carter Ching, X. Christine Wang.....	85
<b>Promoting Learning in Informal Learning Environments</b> Tamara Clegg, Christina Gardner, Oriana Williams, Janet Kolodner .....	92
<b>The Impact on Learning of Generating vs. Selecting Descriptions in Analyzing Algebra Example Solutions</b> Albert Corbett, Angela Wagner, Sharon Lesgold, Harry Ulrich, Scott Stevens.....	99
<b>What Makes Groups Learning Effectively in a Videoconference Setting?</b> Ulrike Cress, Hron Aemilian, Friedrich Felix, H. Hammer Karsten.....	106
<b>Unpacking the Mediation of Invented Representations</b> Joshua Danish.....	113
<b>Technology Fluency as Cultural Practice: Bridging Local Understandings in a Diverse Learning Environments</b> Donna DeGennaro .....	120
<b>Collaborative Learning in a 3D Virtual Environment: Design Factors and Evaluation Results</b> Nicoletta Di Blas, Caterina Poggi, Thomas Reeves .....	127
<b>Using Teacher Narrative to Understand Teachers' Uses of Curriculum Materials</b> Corey Drake .....	134
<b>Using an Online Community of Practice to Foster Inquiry as Pedagogy amongst Student Teachers</b> Oliver Dreon Jr., Scott McDonald.....	140
<b>The Role of Domain-specific Knowledge in Promoting Generative Reasoning in Genetics</b> Ravit Golan Duncan .....	147
<b>Making a Difference - Exploiting the Full Potential of Instructionally Designed On-Screen Videos</b> Anna Ertelt, Alexander Renkl, Hans Spada .....	154
<b>Effects on an Individual's Prior Knowledge on Collaborative Knowledge Construction and Individual Learning Outcomes in Videoconferencing</b> Bernhard Ertl, Heinz Mandl .....	161
<b>Fostering Innovation Implementation: Findings about Supporting Scale from GLOBE</b> Barry Fishman, William Penuel, Ryoko Yamaguchi .....	168

<b>A Case Study of Elementary Students' Argumentation in Science</b> Seau Yoon Foo, Dr. Chee Kit Looi .....	175
<b>From Wikipedia to the Classroom: Exploring Online Publication and Learning</b> Andrea Forte, Amy Bruckman .....	182
<b>Shared Knowledge Construction Process in an Open-source Software Development Community: An Investigation of the Gallery Community</b> Xun Ge, Yifei Dong, Kun Huang.....	189
<b>Measuring Students' Scientific Content and Inquiry Reasoning</b> Amelia Gotwals, Nancy Songer .....	196
<b>Adolescents' Use of Self-regulatory Processes and Their Relation to Qualitative Mental Model Shifts While Using Hypermedia</b> Jeffrey Greene, Roger Azeveo .....	203
<b>Exploring Differences Between Gifted and Grade-level Students' Use of Self-regulatory Learning Processes with Hypermedia</b> Jeffrey Greene, Daniel Moos, Roger Azevedo, Fielding Winters.....	210
<b>How Can We Use Concept Maps for Prior Knowledge Activation - Different Mapping-tasks Lead to Different Cognitive Processes</b> Johannes Gurlitt, Alexander Renkl, Michael A. Motes, Sabine Hauser.....	217
<b>Measuring Teachers' Algebraic Reasoning: Development and Preliminary Validation of a Video Assessment Task</b> Alan J. Hackbarth, Sharon J. Derry, Margaret J. Wilsman .....	222
<b>Designing Instructional Support for Individual and Collaborative Demands on Net-based Problem-solving in Dyads</b> Miriam Hansen, Hans Spada .....	229
<b>Press Play: Designing an Epistemic Game Engine for Journalism</b> David Hatfield, David Williamson Shaffer .....	236
<b>Supporting Concept Mapping for Learning from Text</b> Sabine Hauser, Matthias Nueckles, Alexander Renkl.....	243
<b>Motivation in Project-based Classrooms: New Measures Better Coupled to Students' Experiences</b> Phillip Herman, Louis Gomez.....	250
<b>The Story of one Urban High School's Efforts to Improve Student Attitudes, Motivation, Self-efficacy and Perceptions of Self, School, and Science through Project-based Science Instruction</b> Thomas Higginbotham, Janice Anderson, Camelia Rosca, Michael Barnett, Deborah Jencunas, Sandra Copman, John Zinkowski.....	257

<b>A Resources Interpretation of Teachers' Epistemologies of Science</b> Sandra Honda, David May .....	264
<b>Students' Perception of Knowledge Activation on a Guided Collaborative Problem Solving Organizer</b> Wei-Chen Hung, James Lockard.....	270
<b>Characterizing the Nature of Discourse in Mathematics Classrooms</b> Radha Kalathil.....	277
<b>Using Comparisons of Alternate Strategies to Promote Discourse</b> Radha Kalathil.....	285
<b>Changing Conceptual Ecologies with Task-structured Science Curricula</b> David Kanter, Bruce Sherin, Victor Lee .....	293
<b>Insights into the Emergence of Convergence in Group Discussions</b> Manu Kapur , John Voiklis, Charles Kinzer, John Black.....	300
<b>Productive Failure</b> Manu Kapur.....	307
<b>Classroom Goal Structures for Educational Math Game Application</b> Fengfeng Ke .....	314
<b>Using Students' Epistemologies of Science to Guide the Practice of Argumentation</b> Lisa Kenyon, Leema Kuhn, Brian Reiser.....	321
<b>Using Drawings and Interviews to Diagram Entering Preservice Teachers' Preconceived Beliefs about Technology Integration.</b> Elizabeth Keren-Kolb, Barry Fishman .....	328
<b>Scaffolding Learner Motivation through a Virtual Peer</b> Yanghee Kim, Eric Hamilton, Jinjie Zheng, Amy Baylor .....	335
<b>Coercing Shared Knowledge in Collaborative Learning Environments</b> Paul A. Kirschner, Pieter Jelle Beers, Henny P.A. Boshuizen, Wim Gijsselaers .....	342
<b>The Social Formation of Leadership in a Youth Activism Group</b> Ben Kirshner.....	349
<b>Optical Pulsars and Black Arrows: Discovery's Work in 'Hot' and 'Cold' Science</b> Timothy Koschmann, Alan Zemel .....	356
<b>A Role for Professional Development in Sustainability: Linking the Written Curriculum to Enactment</b> Beth Kubitskey, Barry Fishman .....	363

<b>Fostering Scientific Argumentation by Creating a Need for Students to Attend to Each Other's Claims and Evidence</b> Leema Kuhn, Lisa Kenyon, Brian Reiser.....	370
<b>Developing a Sustainable Instructional Leadership Model: A Six-year Investigation of Teachers in One Urban Middle School</b> Hee-Sun Lee, Nancy Songer, Soo-Young Lee.....	376
<b>"Ugly in a World Where You Can Choose to be Beautiful": Teaching and Learning Diversity via Virtual Worlds</b> Joey Lee, Christopher Hoadley.....	383
<b>The Interplay between Self-directed Learning and Social Interactions: Collaborative Knowledge Building in Online Problem-based Discussions</b> Silvia Wen-Yu Lee.....	390
<b>Beyond transparency: How students make representations meaningful</b> Victor Lee, Bruce Sherin.....	397
<b>Lurking as Participation: A Community Perspective on Lurkers' Identity and Negotiability</b> Yu-Wei Lee, Fei-Ching Chen, Huo-Ming Jiang.....	404
<b>Tensions and Tradeoffs in a "Design for Science" Classroom: The "Forces in Balloon" Lecture</b> Mary Leonard, Sharon Derry.....	411
<b>When the Rubber Meets the Road -- Putting Research-based Methods to Test in Urban Classrooms</b> Junlei Li, David Klahr, Amanda Jabbour.....	418
<b>Effects of Part-task and Whole-task Instructional Approaches and Levels of Learner Expertise on Learner Acquisition and Transfer of a Complex Cognitive Skill</b> Jung Lim, Robert Reiser.....	425
<b>Exploring the Relationship between Teachers' Curriculum Enactment Experience and Their Understanding of Underlying Curriculum Design Rationales</b> Hsien-Ta Lin, Barry Fishman.....	432
<b>Effects of Conceptual Representation on Learning from Hypermedia</b> Lei Liu, Surabhi Marathe, Cindy Hmelo-Silver.....	439
<b>Sustaining and Scaling Innovations in Singapore Schools: Issues for School-based Learning Sciences Research</b> Chee-Kit Looi, Wei Ying Lim.....	446
<b>MUSHI: A Multi-Device Framework for Collaborative Inquiry Learning</b> Leilah Lyons, Joseph Lee, Christopher Quintana, Elliot Soloway.....	453

<b>Using Interviews to Investigate Implicit Knowledge in Computer Programming</b>	
Rebecca Mancy, Norman Reid.....	460
<b>Collaborating to Learn, Learning to Collaborate: Finding the Balance in a Cross-disciplinary Design Course</b>	
Emma Mercier, Shelley Goldman, Angela Booker.....	467
<b>TEEMSS2: Technology Enhanced Elementary Math and Science - Year 1 Report</b>	
Shari Metcalf.....	474
<b>Examining the Fluctuation of Strategy Use during Learning with Hypermedia</b>	
Daniel Moos, Roger Azevedo.....	481
<b>Learning with Laptops: The Impact of One-to-One Computing on Student Attitudes and Classroom Perceptions</b>	
Chrystalla Mouza.....	488
<b>Scaffolding Learning from Contrasting Video Cases</b>	
Anandi Nagarajan, Cindy Hmelo-Silver.....	495
<b>Boolean Classes and Qualitative Research</b>	
Mitchell Nathan, Kristi Jackson.....	502
<b>When Observation Beats Doing: Learning by Teaching</b>	
Sandra Okita, Daniel Schwartz.....	509
<b>Computer-Supported Collaborative Video Analysis</b>	
Roy Pea, Robb Lindgren, Joseph Rosen.....	516
<b>The Distribution of Resources and Expertise and the Implementation of Schoolwide Reform Initiatives</b>	
William R. Penuel, Kenneth A. Frank, Ann Krause.....	522
<b>Effects of Task Difficulty and Epistemological Beliefs on Metacognitive Calibration: A Pilot-Study</b>	
Stephanie Pieschl, Elmar Stahl, Rainer Bromme.....	529
<b>“How Do We See?”: Information Architecture as Theory</b>	
Philip Piety, Annemarie Palincsar.....	536
<b>Author Index</b> .....	end of volume
<b>Volume 2</b>	
<b>Papers (continued)</b>	
<b>The Role-Goal-Activity Framework Revisited: Examining Student Buy-in in a Project-based Learning Environment</b>	
Virginia Pitts, Daniel Edelson.....	544

<b>Students' Difficulties in Learning Physics from Dynamic and Interactive Visualizations</b> Rolf Ploetzner, Stefan Lippitsch, Matthias Galmbacher, Dieter Heuer .....	550
<b>True Stories, Storied Truth: Stitching Narrative and Logico-scientific Discourse Together in an Age of "Spin"</b> Joseph L. Polman .....	557
<b>Learning from Digital Text in Inquiry-based Science Classes: Lessons Learned in One Program</b> Sadhana Puntambekar .....	564
<b>Estimation as a Catalyst for Numeracy: Micro-interventions that Increase the Use of Numerical Information in Decision-making</b> Luke Rinne, Michael Ranney, Nicholas Lurie .....	571
<b>Using Transformative Research To Explore Congruencies Between Science Reform and Urban Schools</b> Ann E. Rivet .....	578
<b>Effects of Document Generation and Source Presentation on Historical Understanding and Thinking</b> Cecil Robinson, Gina Raineri .....	585
<b>WWW and Multicultural Democracy: Evaluating U.S. History Websites</b> Cecil Robinson, Douglas McKnight .....	592
<b>Adopt &amp; Adapt: Structuring, Sharing and Reusing Asynchronous Collaborative Pedagogy</b> Miky Ronen, Dan Kohen-Vacs, Nohar Raz-Fogel .....	599
<b>Co-design of Innovations with Teachers: Definition and Dynamics</b> Jeremy Roschelle, William Penuel, Nicole Shechtman .....	606
<b>Blurring the Lines: Learning and Assessing in Quadrant D</b> Ken Rose, Martin Block .....	613
<b>Beyond Essentialist Critiques: The Co-development of Individual and Society within Erik Erikson's Psychosocial Theory of Identity Development</b> Sage Rose, Cecil Robinson .....	620
<b>An Analysis of Standardized Reading Ability Tests: What Do Questions Actually Measure?</b> Michael Rowe, Yasuhiro Ozuru, Danielle McNamara .....	627
<b>Learning to Collaborate in a Computer-mediated Setting: Observing a Model Beats Learning from Being Scripted</b> Nikol Rummel, Hans Spada, Sabine Hauser .....	634

<b>It's Okay to be Wrong: Recognizing Mechanistic Reasoning During Student Inquiry</b>	
Rosemary Russ, Paul Hutchison.....	641
<b>Inquiry into Mediated Action: The Implementation of an Innovative Online Problem-based Unit</b>	
Donna Russell.....	648
<b>Assessment of Argument in Science Education: A Critical Review of the Literature</b>	
Victor Sampson, Douglas Clark.....	655
<b>Teaching Students to Evaluate Source Reliability during Internet Research Tasks.</b>	
Christopher A. Sanchez, Jennifer Wiley, Susan R. Goldman .....	662
<b>Collaborative Learning with Animated Pictures: The Role of Verbalizations</b>	
Mirweis Sangin, Gaëlle Molinari, Pierre Dillenbourg, Cyril Rebete, Mireille Bétrancourt .....	667
<b>Supporting Science Teacher Thinking Through Curriculum Materials</b>	
Rebecca Schneider .....	674
<b>Effects of Innovation versus Efficiency Tasks on Recall and Transfer in Individual and Collaborative Learning Contexts</b>	
David Sears.....	681
<b>The Pasteurization of Education</b>	
David Williamson Shaffer, Kurt D. Squire .....	688
<b>Tools and Task Structures in Modeling Balance Beam</b>	
Ji Shen .....	695
<b>Effects of Handheld Games on Students Learning in Mathematics</b>	
Namsoo Shin, Cathleen Norris, Elliot Soloway .....	702
<b>Self-concept and Self-efficacy in Mathematics: Relations with Mathematics Motivation and Achievement</b>	
Einar M. Skaalvik, Sidsel Skaalvik .....	709
<b>Shared Referencing of Mathematical Objects in Online Chat</b>	
Gerry Stahl, Alan Zemel, Johann Sarmiento, Murat Cakir, Stephen Weimar, Martin Wessner, Martin Mühlfordt.....	716
<b>Fostering Scientific Habits of Mind in the Context of Online Play</b>	
Constance Steinkuehler, Marjee Chmiel .....	723
<b>Increasing Representational Fluency with Visualization Tools</b>	
Mike Stieff, Michelle McCombs.....	730

<b>The Ideal Science Student and Problem Solving</b> Florence Sullivan, Xiaodong Lin .....	737
<b>Congruence and Tension among Activity Systems in a Tripartite Partnership for Systemic Reform</b> Daniel Suthers, Joyce Yukawa, Violet Harada.....	744
<b>Berta's Tower: Developing Conceptual Physics Understanding One Exploratooid at a Time</b> Gina Navoa Svarovsky, David Williamson Shaffer .....	751
<b>Who Knows Whom in a Virtual Learning Network? Applying Social Network Analysis to Communities of Learners at the Computer Clubhouse</b> Elisabeth Sylvan .....	758
<b>Enhancing Learning of Expository Science Texts in a Remedial Reading Classroom via iSTART</b> Roger Taylor, Tenaha O'Reilly, Grant Sinclair, Danielle McNamara.....	765
<b>Multimodal Interaction in Children's Programming with Tangible Artifacts</b> Jakob Tholander, Ylva Fernaus .....	771
<b>The Expert Novice</b> Bobbie Turniansky, Dina Friling.....	778
<b>Does an Interface with Less Assistance Provoke More Thoughtful Behavior?</b> Christof van Nimwegen, Herre van Oostendorp, Daniel Burgos, Rob Koper .....	785
<b>Is Neuroscience a Learning Science?</b> Sashank Varma, Daniel L. Schwartz, Bruce McCandliss .....	792
<b>Design-based Science Learning: Important Challenges and How Technology Can Make a Difference</b> Swaroop Vattam, Janet Kolodner.....	799
<b>Contrasting Cases: What We Can Learn from Students' Perceptions of "Good" Design</b> Joan Walker, Paul King.....	806
<b>The Effect of Multiple-perspective Thinking on Problem Solving</b> Yan Wang, Enis Dogan, Xiaodong Lin.....	812
<b>Designing an Online Service for a Math Community</b> Martin Wessner, Wesley Shumar, Gerry Stahl, Johann Sarmiento, Martin Mühlpfordt, Stephen Weimar .....	818
<b>Communication through the Artifact by Means of Synchronous Co-construction</b> Astrid Wichmann, Markus Kuhn, Ulrich Hoppe.....	825



<b>An Initial Characterization of Engagement in Informal Social Learning Around MIT OCW</b>	
David Wiley, Shelley Henson .....	832
<b>Using Cognitive Ethnography to Study Instruction</b>	
Robert F. Williams .....	838
<b>Ways of Working: A Three-tiered Interpretive Model for Video Research</b>	
Donald Wortham, Sharon Derry.....	845
<b>The Role of the Backchannel in Collaborative Learning Environments</b>	
Sarita Yardi.....	852
<b>A Learning Journey in Problem-based Learning</b>	
Jennifer Yeo, Seng-Chee Tan, Yew-Jin Lee .....	859
<b>Feedback and Adaptation Within a Complex Systems Approach to Designing for Scalable and Sustainable Professional Development</b>	
Susan Yoon, Eric Klopfer.....	866
<b>Comparing Instructional Methods for Teaching Technology in Education to Preservice Teachers Using Logistic Regression</b>	
Dongping Zheng, Michael Young.....	873
<b>Flow Blocks as a Conceptual Bridge Between Understanding the Structure and Behavior of a Complex Causal System</b>	
Oren Zuckerman, Tina Grotzer, Kelly Leahy.....	880
<b>Posters</b>	
<b>Showing Evidence: Analysis of Students' Arguments in a Range of Settings</b>	
Issam Abi-El-Mona, Barbara Hug.....	888
<b>'Hybrid Modeling': Advanced Scientific Investigations Linking Computer Models and Real-World Sensing (an interactive poster)</b>	
Paulo Blikstein, Uri Wilensky .....	890
<b>College Students' Understandings of Pressurized Air Movement: Do Isomorphic Questions Elicit Isomorphic Answers?</b>	
Jason Braasch, Susan R. Goldman .....	892
<b>Metalanguage among Families in a Marine Science Museum</b>	
Carol B. Brandt, Doris Ash .....	894
<b>East Austin Stories Exchange: Facilitating 'Empathy' for Differing Perspectives</b>	
Damien Brockmann, Todd C. Reimer.....	896
<b>The Effects of Base Ratio and Conceptual Structure on Accuracy in Multiplicative Situations</b>	
Reality S. Canty, Susan R. Goldman.....	898

<b>Facilitating Inquiry using Technology and Teams in Exercise Physiology: The FITT Project</b>	
Darla M. Castelli, Ellen M. Evans, Mark M. Mistic .....	900
<b>Active Citizenship through Technology: Collaboration, Connection, and Civic Participation</b>	
Clement Chau, Ashima Mathur, Marina Bers .....	902
<b>Positive Technological Development: A Systems Approach to Understanding Youth Development and Educational Technology</b>	
Clement Chau, Marina Bers .....	904
<b>PD3: A Handheld Observation Tool to Support Instructional Leadership</b>	
Mark Chung, William R. Penuel .....	906
<b>Socio-technical Factors of Practice Transmission in an Online Creative Tool Community</b>	
Eric Cook, Stephanie D. Teasley, Mark Ackerman .....	908
<b>The Role of Technology in Preservice Teachers' Images of Their Future Classroom</b>	
Theresa A. Cullen.....	910
<b>Professional Development, Cognitive Tools, and Thinking Skills</b>	
Katherine McMillan Culp, Lauren B. Goldenberg, Dara Wexler .....	912
<b>The Role of People Knowledge in Learning Narrative and Domain Content</b>	
Joan Davis, Tiffany Lee, Nancy Vye, John Bransford, Daniel L. Schwartz .....	914
<b>Fostering Generative Reasoning about Complex Phenomena in Genetics</b>	
Ravit Golan Duncan .....	916
<b>Mobile Devices to be applied as Supporting tools in Research Methods Class for Undergraduate Students</b>	
Eteokleous Nikleia .....	918
<b>Identities and Astronomy Camp: How Individual Campers Make Meaning of Science Experiences</b>	
Deborah Fields .....	920
<b>Give Learners Questions to Answer While Watching Animated Examples</b>	
Brian D. Gane, Richard Catrambone.....	922
<b>Semiotics: Mediation Tools That Can Fill ELearning Gaps</b>	
Ruth Gannon Cook.....	924
<b>Messy Learning Environments: Busy Hands and Less Engaged Minds</b>	
Christina M. Gardner, Tamara L. Clegg, Oriana J. Williams, Janet L. Kolodner.....	926
<b>Help-seeking Behavior and Learning with Hypermedia</b>	
Pragati Godbole-Chaudhuri, Fielding I. Winters, Roger Azevedo, Neil Hofman.....	928

<b>Learning as Perspective Taking: Conceptual Alignment in the Classroom</b> James G. Greeno, Brian MacWhinney .....	930
<b>Nurses' Informal Argument: Learning to Justify the Claim and Reach Agreement</b> Debra Hagler, Sarah Brem .....	932
<b>Design Principles for the Knowledge-Practices Laboratory (KP-Lab) Project</b> Kai Hakkarainen, Hanni Muukkonen, Hannu Markkanen .....	934
<b>Enhancing Children's Learning in Museums: A Design-based Research Approach</b> Tony Hall, Liam Bannon, Luigina Ciolfi, Paul Gallagher, Kieran Ferris, Ruth Mulhern, Nora Hickey .....	936
<b>Cognitive Effects of Chess Instruction on Students At Risk for Academic Failure</b> Saahoon Hong, William M. Bart .....	938
<b>Automated Social Network Analysis as a Tool for Evaluating Sociability</b> Kirk Job-Sluder .....	940
<b>Seeds of a Computer Culture: An Archival Analysis of Programming Artifacts from a Community Technology Center</b> Yasmin Kafai, Kylie A. Peppler, Mabel Alavez, Omar Ruvalcaba .....	942
<b>A Model for Video-based Virtual Field Experience</b> Ugur Kale, Jung Won Hur, Theano Yerasimou, Thomas Brush .....	944
<b>Visualizing Discussion by the Use of the Conversation Chain Model</b> Sabina Karkin, Elizabeth S. Charles, Janet L. Kolodner .....	946
<b>Individual Differences in Sense of Classroom Community</b> Fengfeng Ke .....	948
<b>Assessing Conceptual Change in an Anchored, Case-based Environment</b> Charles K. Kinzer, Manu Kapur, Dana W. Cammack, Sarah Lohnes .....	950
<b>Systematic Formation of Reading Comprehension in Visually Impaired Children</b> Kari Kosonen, Kai Hakkarainen .....	952
<b>Enhancing Mathematical Discourse in Elementary Classrooms</b> Mitzi Lewison, Ingrid Graves, Lenny Sanchez .....	954
<b>Lessons Learned From Using an Asynchronous Online Discussion Board to Facilitate Scientific Thinking in a Large Cognitive Psychology Lecture Class</b> Jordan Lippman, James Pellegrino, Renee Koziol, Emily Whitehair .....	956

<b>Misconceptions in Natural Selection: Conceptual Change Through Time in Biology Classrooms</b>	
Christine Manzey, Kevin Pugh, Kristin Kelly, Victoria Stewart .....	958
<b>Slides, Sushi, and Sixth-Graders: A Case Study of Elementary Student Art-based Learning in a Museum Setting</b>	
Sandra Toro Martell .....	960
<b>A Comparison of Students' Conceptions about the Nature of Argumentation in School and Professional Science</b>	
Kelli Millwood .....	962
<b>Playshop as Space for Emergent Learning</b>	
Yoshiro Miyata, Nobuyuki Ueda .....	964
<b>Metaskills of Collaborative Inquiry in Higher Education</b>	
Hanni Muukkonen, Minna Lakkala.....	966
<b>Tupelo Enacted: How Teachers Shape Learning Opportunities in Middle Grades Mathematics</b>	
Chandra Hawley Orrill, Holly Garrett Anthony, Andrew Izsák, Ernise Singleton .....	968
<b>Music By Ear: An Interactive System to Teach Old-time Fiddle</b>	
Matthew Osment, Todd Reimer .....	970
<b>Creative Codings: Investigating Cultural, Personal, and Epistemological Connections in Media Arts Programming</b>	
Kylie A. Pepler, Yasmin B. Kafai .....	972
<b>Learning Communities and Laptops: A Design Experiment</b>	
Todd Reimer, Felicia Rader .....	974
<b>A Comprehension Tool for Mathematics?: The Math Forum@Drexel's Online Mentoring Guide</b>	
K. Ann Renninger, Lillian S. Ray, Ilana Luft, Erica L. Newton .....	976
<b>Justification of Socioscientific Claims as the Basis for Assessing Argumentation</b>	
Troy D. Sadler .....	978
<b>Using Handheld PCs and Peer Instruction to Improve Science Teaching and Learning in Higher Education</b>	
Perry Samson, Stephanie D. Teasley, Ben van der Pluijm, Peter Knoop.....	980
<b>Modeling Modern Methods in High School Physics Classes</b>	
Hal Scheintaub .....	982
<b>Facilitating Social Creativity through Collaborative Designing</b>	
Pirita Seitamaa-Hakkarainen, Minna Uotila.....	984

<b>Personalized Identity, Mentoring and Mathematical Conversation: The Math Forum's Online Mentoring Project</b>	
Wesley Shumar.....	986
<b>Learning Science by Participating in Design: A Case Where Multiple Design Subgoals Interfere with Systematic Progress</b>	
Eli M. Silk, Christian D. Schunn.....	988
<b>Adaptive Simulations</b>	
Mark K. Singley, Tracee Vetting Wolf, Peter Fairweather, Richard B. Lam .....	990
<b>Toward a General Student Model: Accounting for Individual Learner Differences across Multiple Learning Environments</b>	
Garrett W. Smith .....	992
<b>Conflicts in Pedagogical and Technical Knowledge: Pre-service Teachers' Understanding and Misconception of Integrating Technology into PBL Lessons</b>	
Hyo-Jeong So, Bosung Kim.....	994
<b>Engineering Girls Gone Wild: Developing an Engineering Identity in Digital Zoo</b>	
Gina Navoa Svarovsky, David Williamson Shaffer.....	996
<b>Formative Assessment: Reducing Math Phobia and Related Test Anxiety in a Geology Class for Non-Science Majors</b>	
Vanessa Svihla .....	998
<b>Helio-Room: Problem Solving in a Whole Class Visual Simulation</b>	
Mark Thompson, Tom Moher.....	1000
<b>Professional Development that Considers Teachers' Attitudes toward an Innovation</b>	
Jeannine E. Turner, ChanMin Kim.....	1002
<b>A Teacher-friendly Interface To Assessment Data</b>	
Jody S. Underwood, Diego Zapata, Waverly Hester.....	1004
<b>Perspectives and Problem Solving in an Algebra Classroom</b>	
Carla van de Sande.....	1006
<b>3D Game Design with Programming Blocks in StarLogo TNG</b>	
Kevin Wang, Corey McCaffrey, Daniel Wendel, Eric Klopfer .....	1008
<b>Learning by Tagging: Group Knowledge Formation in a Self-organizing Learning Community</b>	
Jude Yew, Faison Gibson, Stephanie Teasley.....	1010
<b>A Multi-level Assessment Strategy: (Dis)Continuity in Making Learning Visible Differently</b>	
Steven J. Zuiker, Daniel T. Hickey .....	1012

## Symposia

### **What's a Situation in Situated Cognition? – A Constructionist Critique of Authentic Inquiry**

Dor Abrahamson, Andrea A. diSessa, Paulo Blikstein, Uri Wilensky, David H. Uttal, Meredith M. Amaya, Loren M. Marulis, Allan M. Collins ..... 1015

### **Clubs, Homes, and Online Communities as Contexts for Engaging Youth in Technological Fluency Building Activities**

Brigid Barron, Yasmin B. Kafai, Diana Joseph, Nicole Pinkard, Mitchell Resnick, Caitlin Martin, Colin Schatz, Benjamin Shapiro, Amon Millner, Kylie Peppler, Grace Chiu, Shiu Desai ..... 1022

### **Understanding the Cultural Foundations of Children's Biological Knowledge: Insights from Everyday Cognition Research**

Philip Bell, Leah A. Bricker, Tiffany R. Lee, Suzanne Reeve, Heather Toomey Zimmerman ..... 1029

### **Early Childhood Robotics for Learning**

Marina Bers, Chris Rogers, Laura Beals, Meredith Portsmore, Kevin Staszowski, Erin Cejka, Adam Carberry, Brian Gravel, Janice Anderson, Michael Barnett ..... 1036

### **Whither Education Research? Science Policy Implications of NSF Research Support**

John C. Cherniavsky, Janice Earle, Hari Narayanan, Roy Pea, John Bransford, Marcia Linn ..... 1043

### **Theorizing Games in/and Education**

Richard Halverson, David Williamson Shaffer, Kurt Squire, Constance Steinkuehler ..... 1048

### **Making a Difference with Attention to Content, Technology, and Scale: A Session Honoring the Memory of Jim Kaput**

Stephen Hegedus, Richard Lesh, Jeremy Roschelle ..... 1053

### **Analyzing Collaborative Learning: Multiple Approaches to Understanding Processes and Outcomes**

Cindy E. Hmelo-Silver, Ellina Chernobilsky, Olga Mastov, Clark Chinn, Angela O'Donnell, Gijbert Erkens ..... 1059

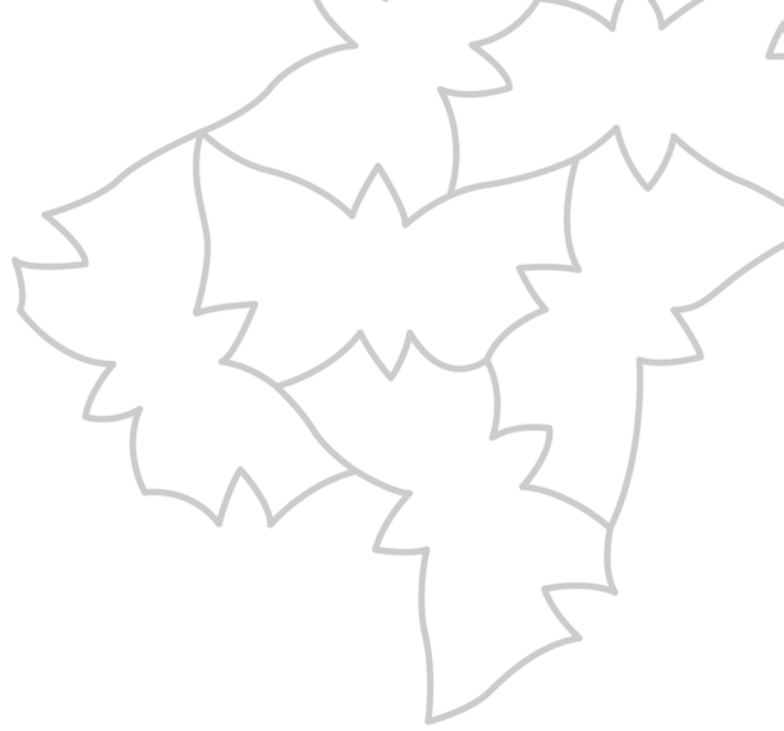
### **Learning at the Nanoscale: Research Questions that the Rapidly Evolving Interdisciplinarity of Science Poses for the Learning Sciences**

Sherry Hsi, Nora Sabelli, Joseph Krajcik, Robert Tinker, Kirsten Ellenbogen ..... 1066

### **Complex Systems in Education: Conceptual Principles, Methodologies, and Implications for Research in the Learning Sciences**

Michael J. Jacobson, Uri Wilensky, Robert Goldstone, David Landy, Ji Son, Richard Lesh, Cindy E. Hmelo-Silver, Roger Azevedo ..... 1073

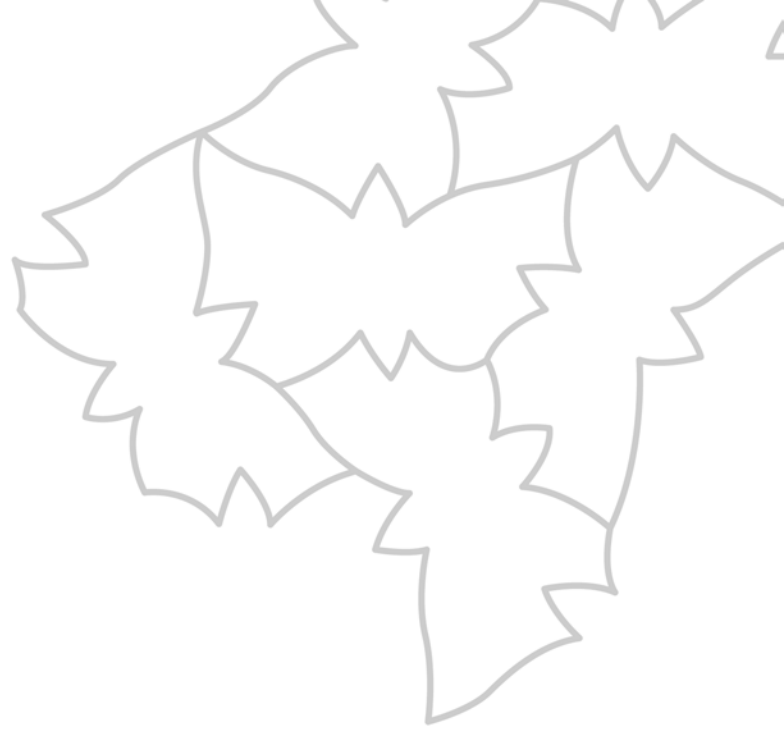
<b>“Theory in Pieces” – the Communal Development of a Theory</b> Orit Parnafes, Andrea diSessa, Joseph Wagner, Jose Mestre, Tom Thaden-Koch, Bruce Sherin .....	1078
<b>Moving Forward: The Learning Sciences and the Future of Education</b> R. Keith Sawyer, Allan Collins, Jere Confrey, Janet L. Kolodner, Marlene Scardamalia .....	1084
<b>At home with Mathematics: Meanings and Uses among Families</b> Reed Stevens, Veronique Mertl, Sheldon Levias, Laurie McCarthy, Shelley Goldman, Lee Martin, Roy Pea, Angela Booker, Kristen Pilner Blair, Na'ilah Suad Nasir, Michael Heimlich, Grace Atukpawu, Kathleen O'Connor .....	1088
<b>Argumentative Knowledge Construction in CSCL</b> Armin Weinberger, Douglas Clark, Gijsbert Erkens, Victor Sampson, Karsten Stegmann, Jeroen Janssen, Jos Jaspers, Gellof Kanselaar, Frank Fischer.....	1094
<b>Author Index</b> .....	end of volume



# Papers

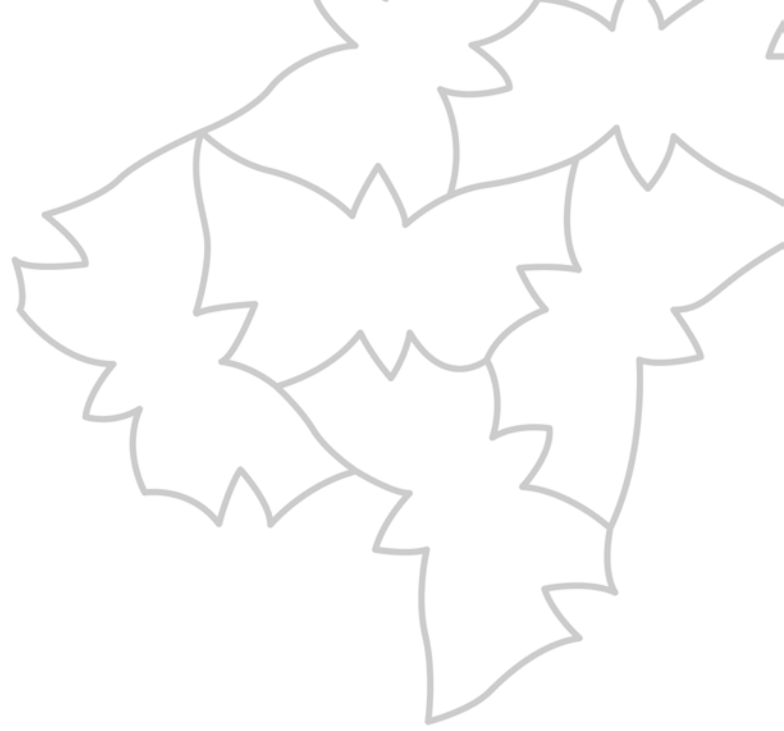
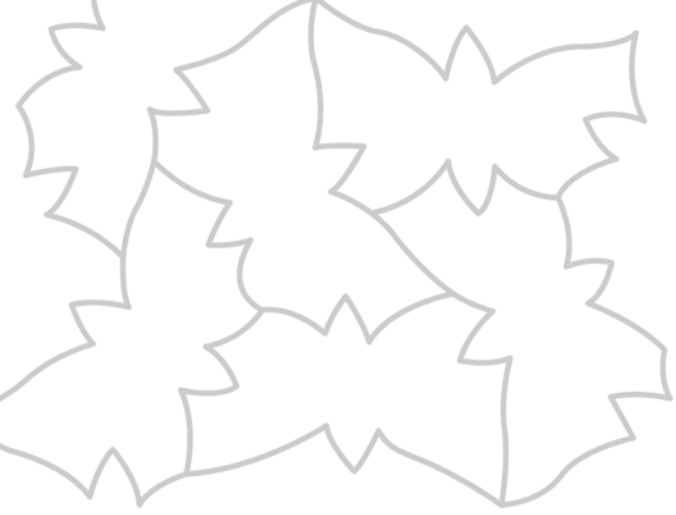






# Posters





# Symposia



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

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**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.

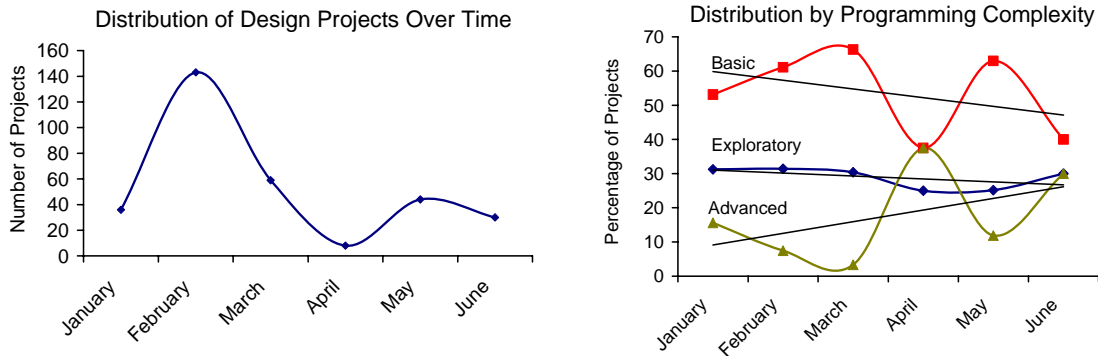
## Methods

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 programs 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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