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Table of Contents

Volume 1

Keynotes
Digital Footprints and Shoes that Don’t Fit ................................................................. Iris Tabak

Developing Ethnographic Eyes: Tracing Learning Processes and Practices Across Multiple Levels of Times, Space, and Sociocultural Configurations .......................................................... Judith Green

Transitioning Education’s Knowledge Infrastructure: Shaping Design or Shouting From the Touchline? Simon Buckingham Shum

Full Papers
Planning to Iterate: Supporting Iterative Practices for Real-world Ill-structured Problem-solving ................................................................................... Daniel Rees Lewis, Jamie Gorson, Leesha V. Maliakal, Spencer Evan Carlson, Elizabeth Gerber, Christopher Riesbeck, Matthew Easterday


Negotiating Epistemic Agency and Target Learning Goals: Supporting Coherence from the Students’ Perspective ......................................................... Aliza Zivic, John F. Smith, Brian Reiser, Kelsey Edwards, Michael Novak, Tara McGill

Exploring the Unknown: Supporting Students’ Navigation of Scientific Uncertainty With Coupled Methodologies ......................................................... Julia Svoboda Gouvea, Aditi Wagh

Science Engagement and Identities in Everyday Family Life ........................................ Dana Vedder-Weiss

A Focus on Contribution Towards Product and Performance in Collaborative Design ......................................................................................... Colin Hennessy Elliott, Sarah C. Radke, Jasmine Y. Ma

Exploring Multimodal Scaffolds Supporting Middle School Students’ Construction of Causal-Mechanistic Scientific Explanations ................................................ .. Nitasha Mathayas, David Brown

Scaffolding Authentic Scientific Inquiry Experiences for Early Elementary Learners Using Wearable Technology ................................................................. Virginia L. Byrne, Seokbin Kang, Leyla Norooz, Rafael Velez, Monica Katzen, Afe Addeh, Jon Froehlich, Tamara Clegg

How Teachers Use Instructional Improvisation to Organize Science Discourse and Learning in a Mixed Reality Environment ........................................ Maggie Dahn, Noel Enyedy, Joshua Danish

Designing for Rightful Presence in 6th Grade Science: Community Ethnography as Pedagogy ................................................................. Angela Calabrese Barton, Edna Tan

Designing Technology as a Cultural Broker for Young Children: Challenges and Opportunities ................................................................. Yanghee Kim, Sherry Marx, Hung Pham Ngoc, Tung Nguyen

Determinants of School Level Success in Design-Based Innovation Networks ................................................................. Nancy Law, Yeung Lee, Constance Wong-Loke
Informing the Design of Teacher Awareness Tools through Causal Alignment Analysis ........................................ 104
Kenneth Holstein, Bruce M. McLaren, Vincent Aleven

The Effect of the Prior Collaborative Experience on the Effectiveness and Efficiency of Collaborative Learning ................................................................. 112
Jimmy Zambrano R, Femke Kirschner, Paul Kirschner

Encountering and Becoming Role Models: Combating Underrepresentation in STEM ........................................ 120
Leighanna Hinojosa

The Influence of Students’ Cognitive and Motivational Characteristics on Differences in Use and Learning Gain in an E-Learning Environment ............................................. 128
Charlotte Larmuseau, Jan Elen, Piet Desmet, Fien Depaepe

Authentic Problem-Based Learning with Augmented Reality ............................................................................. 136
Todd Ogle, David Hicks, Aaron Johnson, Thomas Tucker

Toward a Taxonomy of Team Performance Visualization Tools ............................................................................ 144
Zachari Swiecki, David Williamson Shaffer

Is Scrolling Disrupting While Reading? .............................................................................................................. 152
Katherine Brady, Sun Joo Cho, Gayathri Narasimham, Douglas Fisher, Amanda Goodwin

Exploring Predictors of Secondary School Teachers’ Use of Technology to Support Student-Centered Teaching ................................................................. 160
Yaoran Li, Vitaliy Popov, Veronica Garza, Anne Keicher

STEAM Learning in an In-school Makerspace: The Role of Distributed Spatial Sensemaking .............................. 168
Kay E. Ramey, Reed Stevens, David Uttal

Secondary Students’ Evaluation of Inappropriate Strategies of Reasoning About Evidence Under a Scientific Explanation ........................................................................... 176
Guanzhong Ma, Jan van Adst, Carol Chan, Jing Wang

Flow in Computer-Supported Collaborative Problem-Solving ......................................................................... 184
Gaelle Molinari, Sunny Avry

Epistemic Agency as a Members’ Experience .................................................................................................... 192
Danielle Keifert, Christina (Stina) Krist, Deana A. Scipio, Anna McLean Phillips

Learning Nanoscience Concepts Through a Nanoscale Experience ................................................................ 200
Polly K. Lai, Michael Jacobson, Micah Goldwater

Chinese Character Composition Game for Collaborative Language Learning .............................................. 208
Yun Wen, Wenli Chen

Learning From Errors – The Effect of Comparison Prompts in Instruction After Problem Solving Settings ........................................................................ 216
Katharina Loibl, Timo Leuders

Identifying Reflective and Non-Reflective Group Consensus Strategies for Evidence-Based Scientific Argumentation .............................................................................. 224
Susan Yoon, Miyoung Park, Emma Anderson

Mon-Lin Ko, Christina (Stina) Krist

Examining the Role of Explicit Epistemic Reflection in Promoting Students’ Learning from Digital Text ....... 240
Feng Lin, Dana Gnesdilow, Nicole D. Martin, Catherine Louise Dornfeld Tissenbaum, Sudhana Puntambekar

Bringing Practices of Co-Design and Making to Basic Education ................................................................ 248
Sini Riikonen, Pirite Seitamaa-Hakkarainen, Kai Hakkarainen
Trade-offs in Using Mobile Tools to Promote Action with Socioscientific Issues.......................................................... 256
Susan Yoon, Jooeun Shim, Noora F. Noushad

Martina A. Rau, Miranda Renee Zahn

A Collaboration Script for Nonverbal Communication Enhances Perceptual Fluency with Visual Representations................................................................................................................................................... 272
Martina A. Rau, Purav Patel

Teachers’ Mediation of Students’ Interactions with Physical and Virtual Scientific Models in Biology.................................. 280
Nicole D. Martin, Dana Gnesdilow, Sadhana Puntambekar

Designing for and Analyzing Productive Uncertainty in Science Investigations ........................................................................... 288
Eve Manz

Public Peer Review Motivates Higher Quality Feedback ................................................................................................................... 296
Xu Wang, Yali Chen, Amanda Godley, Carolyn Rosé

The Design and Evaluation of Optimal Computerized Guidance for Invention Activities: The Invention Coach ..................................................................................................................................................... 304
Catherine Chase, Helena Connolly, Marianna Lammina, Vincent Aleven

Matching Data-Driven Models of Group Interactions to Video Analysis of Collaborative Problem Solving on Tablet Computers ........................................................................................................................................... 312
Luc Paquette, Nigel Bosch, Emma Mercier, Jiyoon Jung, Saadeddine Shehab, Yurui Tong

Conjecture Mapping the Library: Iterative Refinements Toward Supporting Maker Learning Activities in Small Community Spaces .................................................................................................................................................. 320
Victor R. Lee, Mimi Recker, Abigail Leigh Phillips

Blocks or Text? How Programming Language Modality Makes a Difference in Assessing Underrepresented Populations .................................................................................................................................................. 328
David Weintrop, Heather Killen, Baker E. Franke

Towards a Cognitive Ecological Framework in CSCL ......................................................................................................................... 336
Marcela Borge, Emma Mercier

Youth, Learning and Social Media in K-12 Education: The State of the Field .......................................................................................... 344
Emilia Askari, Diana Brandon, Sarah Galvin, Christine Greenhow

Defining and Assessing Risk Analysis: The Key to Strategic Iteration in Real-World ........................................................................... 352
Spencer Evan Carlson, Leesha V Maliakal, Daniel Rees Lewis, Jamie Gorson, Elizabeth Gerber, Matthew Easterday

A Study of the Design and Enactment of Scientific Modeling Tasks to Support Fourth-Grade Students’ Sense-Making ......................................................................................................................................................... 360
Meredith Baker Marcum

Examining Pre-service Teacher Knowledge Trajectories of Computational Thinking Through a Redesigned Educational Technology Course .................................................................................................................. 368
Hui Yang, Chrystalla Mouza, Yi-Cheng Pan

Interconnecting Knowledge, Experience, and Self in Humanistic Knowledge Building Communities ......................................................................................................................... 376
Yotam Hod, Dani Ben-Zvi, Michal Dvir

A Principled Approach to Designing Assessments That Integrate Science and Computational Thinking .................................................................................................................................................. 384
Satabdi Basu, Kevin W McElhaney, Shuchi Grover, Christopher J. Harris, Gautam Biswas

Investigating the Coupling of Narrative and Locality in Augmented Reality Educational Activities: Effects on Students’ Immersion and Learning Gains ......................................................................................................................... 392
Collaborative Gesture as a Case of Distributed Mathematical Cognition .......................................................... 552
Afterpage A. Walkington, Geoffrey Chelule, Dawn Woods, Mitchell Nathan

Professional Development for Secondary Science Teachers: A Faded Scaffolding Approach to Preparing Teachers to Integrate Computing .......................................................................................................................... 560
Colby Tojel-Grehl, Kristin A. Searle, David F. Feldon

Measuring the Scale Outcomes of Curriculum Materials .......................................................................................................................... 568
Natalie Pareja Roblin, Chris Schunn, Susan McKenney

Developing Assessments that Measure Core Ideas and Scientific Practices: Challenges and Insights ................. 576
Veronica L. Cavera, Ravit Golan Duncan, Clark Chinn, Moraima Castro-Faix

In the Hive: Designing for Emergence When Teaching Complex Systems In Early Childhood ......................... 584
Kylie A. Peppler, Naomi Thompson, Joshua Danish, Armin Moczek

Becoming Facilitators of Creative Computing in Out-of-School Settings ................................................................. 592
Ricarose Roque, Rupal Jain

A Climate of Support: A Process-Oriented Analysis of the Impact of Rapport on Peer Tutoring ......................... 600
Michael Madaio, Kun Peng, Amy Ogan, Justine Cassell

Augmenting Qualitative Analyses of Collaborative Learning Groups Through Multi-Modal Sensing .................. 608
Bin Xie, Joseph M. Reilly, Yong Li Dich, Bertrand Schneider

Multimodal Texts and Tasks in Elementary Project-based Science ........................................................................ 616
Miranda S. Fitzgerald, Annemarie Palincsar

“Ohhh, Now I Can Do It!”: School-age Children’s Spontaneous Mathematical Sensemaking in Construction Play .................................................................................................................................................. 624
Lara Jasien, Ilana Seidel Horn

Teaching with a Fully Digital, Year-long Math Program: Learning Sciences Futures on the Front Line ............ 632
Jeremy Roschelle, Phillip Herman, Karen Bumgardner, Nicole Shechtman

Interlacing Gaze and Actions to Explain the Debugging Process ........................................................................... 640
Kshitij Sharma, Katerina Mangaroska, Michail Giannakos, Pierre Dillenbourg

Teacher Practice Spaces: Examples and Design Considerations ................................................................................. 648
Justin Reich, Yoon Jeon "YJ" Kim, Kevin Robinson, Dan Roy, Meredith Thompson

Mapping Networks to Help Education Leaders Gain Insights into Complex Educational Systems ................ 656
Robbin Riedy, Katie Van Horne, Philip Bell, Bill Pennell, Tiffany Neill, Sam Shaw

Teachers’ Values in Co-Design of an Art-Science-Computation Unit ........................................................................... 663
Lila Finch, R. Benjamin Shapiro, Franziska Carstens

Volume 2

Full Papers (continued)
A New Approach to Lesson Study Practice in Japan from the DBIR Perspective .................................................. 673
Jun Oshima, Ritsuko Oshima, Yuji Chiyonishio, Ayano Ohsaki

Innovative Collaborative Learning Practice: An ‘Innovative’ Delphi Approach ................................................. 681
Rose Luckin, Mutlu Cukurova

Combining Gaze, Dialogue, and Action from a Collaborative Intelligent Tutoring System to Inform Student Learning Processes ........................................................................................................................................ 689
Jennifer Olsen, Kshitij Sharma, Vincent Aleven, Nikol Rummel
Cultural Repertoires: Indigenous Youth Creating With Place and Story ............................................................... 697
   Kristin A. Searle, Teresa Casort, Breanne K. Litts, Bryan McKinley Jones Brayboy, Sequoia Lynn Dance, Yasmin Kafai

Exploring Practices on the Move: Facilitating Learning Across a Neighborhood .............................................. 705
   Lautaro Cabrera, June Ahn, Jason Yip, Tamara Clegg, Kenna Hernly, Elizabeth Bonsignore, Caroline Pitt, Daniel Pauw

From Theory to Practice: How Pre-service Science Teachers Learn to Become Social Justice Educators ........ 713
   Jarod Kawasaki, Kathryn Anderson-Levitt, Linsdey Nenadal, Nadine Tanio, Josephine Pham, Claudia Diera, Annamarie Francois

Design Considerations for Capturing Computational Thinking Practices in High School Students’ Electronic Textile Portfolios ............................................................... 721
   Debora Lui, Gayithri Jayathirtha, Deborah Fields, Mia Shaw, Yasmin Kafai

Revising Biology Misconceptions Using Retrieval Practice and Explanation Prompts ...................................... 729
   Merrin Oliver, Maggie Renken, Joseph Jay Williams

Using Iterative Design to Create Efficacy-Building Social Experiences with a Teachable Robot .................... 737
   Nichola Lubold, Erin Walker, Heather Pon-Burry, Yuliana Flores, Amy Ogan

Rethinking Loafers: Understanding the Productive Functions of Off-Task Talk During Collaborative Mathematics Problem-Solving ............................................................... 745
   Jennifer Langer-Osuna, Emma Gargroetzi, Rosa Chavez, Jen Munson

Reassembling Home-work: Mixing “Newer” and “Older” Technologies in Home Learning Environments ....... 752
   Deborah Silvis, Katie Headrick Taylor

Patterns of Classroom Talk Through Participation in Discourse-Focused Teacher Professional Development ....................... 760
   William A. Sandoval, Alexander J. Kwako, Anahid S. Modrek, Jarod Kawasaki

Changes in Students’ Use of Epistemic Criteria in Model Evaluation ............................................................... 768
   Na’ama Y. Av-Shalom, Hebbah El-Moslimany, Ravit Golan Duncan, Clark Chinn

Enhancing Reflective Learning Experiences in Museums Through Interactive Installations ......................... 776
   Hai Huang, Wei Hong Lo, Kher Hui Ng, Timothy Brailsford, Claire O’Malley

Co-Framing Shared Epistemic Objects of Inquiry to Support Knowledge Building Over a Whole School Year ............................................................... 784
   Dan Tao, Jianwei Zhang, Dandan Gao

Recognizing Competencies vs. Completion vs. Participation: Ideal Roles for Web-Enabled Digital Credentials ............................................................... 792
   Daniel T. Hickey, Grant Chartrand

Solder and Wire or Needle and Thread: Examining the Effects of Electronic Textile Construction Kits on Girls’ Attitudes Towards Computing and Arts ............................................................... 800
   Richard Lee Davis, Chris Proctor, Michelle Friend, Paulo Blikstein

Do Alternative Instructional Approaches Result in Different Learning Progressions? ................................. 808
   Moraima Castro-Faix, Amber Todd, William Romine, Ravit Golan Duncan

Encouraging Revision of Scientific Ideas with Critique in an Online Genetics Unit ........................................... 816
   Emily Jean Harrison, Libby Gerard, Marcia Linn

Designing Dialogues on Writing and College Readiness Across Educational Institutions ............................... 824
   Alecia Marie Magnifico, Christina Ortmieier-Hooper

Power in the Digital Age: A Critical Revision to Productive Disciplinary Engagement (PDE) ......................... 832
   Priyanka Agarwal, Tesha Sengupta-Irving
Design Matters: The Impact of Technology Design on Students’ Inquiry Behaviors ........................................ 839
Engin Bumbacher, Zahid Hossain, Ingmar Riedel-Kruse, Paulo Blikstein

Engineering Discourse Development in an Informal Youth-Driven Maker Club .............................................. 847
Sagit Betser, Lee M. Martin

The Influence of Students’ Transformative and non-Transformative Contributions on Their Problem Solving in Collaborative Inquiry Learning ......................................................................................................... 855
Vitaliy Popov, Wandi Xing, Gaosia Zhu, Paul Horwitz, Cynthia McIntyre

Rethinking the Teaching and Learning of Area Measurement ........................................................................... 863
Nicole Panorkou

Characterizing Computational Thinking in High School Science ........................................................................ 871
Hillary Swanson, Golnaz Arastoopour Irgens, Connor Bain, Kevin Hall, Philip Woods, Carson Rogge, Mike Horn, Uri Wilensky

Developing Productive Discourse among Low Achievers in a Knowledge Building Environment .................... 879
Yuyao Tong, Carol Chan, Jan van Aalst

“We Were on the Same Level”: Young Engineering Researchers Taking Up Agentive Positions in a Diverse Learning Community ......................................................................................................................... 887
Wendy Wakefield, Michelle E. Jordan, Mia DeLaRosa

Knowledge Building Inquiry and Reflection in Developing Children's Epistemology of Science .................... 895
Carol Chan, Cindy Xu, Feng Lin

Short Papers
Building a Team Leadership Index Through Computational Methods .............................................................. 905
Kui Xie, Gennaro Di Tosto, Lin Lu

Equity-oriented STEM-rich Making Among Youth From Historically Marginalized Communities ................. 909
Angela Calabrese Barton, Edna Tan

"Your Turn!": Playing Cooperative Modern Board Games to Promote Perspective Taking and Cooperative Attitudes ............................................................................................................................................................. 913
Yu-Chi Wang, Jenifer Doll, Keisha Varma

Playing and Designing Games for Systems Thinking: A Design Based Research Project ................................. 917
Amanda M. Bell

Forms of Emergent Collaboration in Maker-Based Learning ............................................................................ 921
Erica Halverson, Breanne K. Litts, Brian Gravel

Combining Non-Programming Activities with Programming for Introducing Foundational Computing Concepts ........................................................................................................................................................................... 925
Shuchi Grover, Nicholas Jackiw, Patrik Lundh, Satabdi Basu

Preschool-Age Children Practicing Science: The Intersection of Explanations, Modeling, and Gesture Use ... 929
Julia Plummer, Amy Ricketts

Dynamic Exploration on Self-explanation Prompts in Complex Tasks ............................................................. 933
Hyun Joo, Jinju Lee, Dongsik Kim

Drawing for Learning from Dynamic Visualizations in Science ........................................................................ 937
Mike Stieff, Katharina Scheiter, Shaaron Ainsworth, Claudia Bohrmann-Linde, Max Schall

Making Learning Journeys Visible: Towards Supporting Collective Reflection on Graduate Attributes .......... 941
Roberto Martinez-Maldonado, Theresa Dirndorfer Anderson, Iván Silva Feraud, Simon Buckingham-Shum

Researcher or Fellow Citizen? Looking for a Role Model in the Humanities .................................................... 945
Acceptance and Refusal: Examining Conflicting Goals Within Co-Design.................................................................1025
  Kristina Stamatis

The Quality of Open Online Learning and Education: Towards a Quality Reference Framework for MOOCs.......................................................................................................................................................1029
  Christian M. Stracke, Esther Tan

Taking on the Challenges of Learning in the Digital Age: Grade 5 Students’ Mindsets and Strategies in Knowledge Building Communities ..................................................................................................................................................1033
  Yotam Hod, Jianwei Zhang, Guangji Yuan, He Zhou

Evidence-based Reasoning of Pre-Service Teachers: A Script Perspective .................................................................1037
  Katharina Kiemer, Ingo Kollar

Social Positioning Newcomer Roles on a High School Robotics Team: A Chronotopic Micro-Analysis ......1041
  Colin Hennessy Elliott

Developing a Library of Typical Problems During Collaborative Learning in Online Courses.........................................................1045
  Sebastian Strauß, Nikol Rummel, Filipa Stoyanova, Nicole Krämer

Critique Processes in Digital Journalism ..................................................................................................................................................1049
  Jessie Nixon

Words Mean Things: How Museum Workers’ Discursive Practices Position the Diverse Communities They Seek to Engage ........................................................................................................................................1053
  Krystal Villanosa, Mike Horn

Agent-Based Models to Support Bioscience Learning in Nursing Education.................................................................1057
  Ilana Dubovi, Victor R. Lee

Authentic Learning and Teaching in an Out-of-School Lab - First Steps towards Empirical Investigation of a Theoretical Model..................................................................................................................................................1061
  Valentina Nachtigall, Angelina Keuschnig, Lena Behrendt, Laura Brune

Beyond Analogy: Qualitative Dimensions of Comparing in Math Class ..................................................................................................................................................1065
  Sarah L White

Social Network Analysis for Signaling Pedagogical Shifts in Challenge-Based and Traditional Online STEM Courses.................................................................1069
  Catherine Louise Dornfeld Tissenbaum, Kemi Jona

Sequencing Arithmetic, Area, and Algebraic Instruction for Teaching the Distributive Principle..............................................1073
  Soo-hyun Im, Sashank Varma

Indoor Positioning Technology & Enhanced Engagement in Early Elementary Systems Thinking and Science Learning..................................................................................................................................................1077
  Kylie A. Peppler, Naomi Thompson, Joshua Danish, Armin Moczek, Shenshen Han

Qualitative Measures of Equity in Small Groups ..................................................................................................................................................1081
  Benjamin Archibeque, Mary Bridget Kustusch, Florian Genz, Scott Franklin, Eleanor C. Sayre

Bringing Static Code to Life: The Instructional Work of Animating Computer Programs With the Body ......1085
  Virginia J. Flood, David DeLiemer, Dor Abrahamson

Third Graders' Use of Digital Tools Designed for Multimodal Communication in Project-based Science ....1089
  Miranda S. Fitzgerald, Gabriel P. DellaVecchia, Annemarie Palincsar, Elliot Soloway

Guiding Intent Participation at an Art Crating Company ..................................................................................................................................................1093
  Sarah C. Radke, Jasmine Y. Ma

Using Phenomenography in Educational Technology Research From 2003 to 2017: A Systematic Review and Content Analysis..................................................................................................................................................1097
  Sally Wai Yan Wan, Sancia Wai-San Wan
Teachers’ Views on Supporting Self-Regulated Learning in Early Childhood Science Education .......... 1101
Audrey Kittredge, Natalie Day, Lenka Janík Blaskova, Heyi Zhang, Sara Baker

Exploring the Margins of the Field: Rethinking STEM in Education .................................................. 1105
Christopher Peter Ostrowski, Sandra Becker, Zulay Diaz Caceres, Marilu Lam-Herrera, Stefan Rothschuh

Multimodal Learning Analytics for the Qualitative Researcher ............................................................... 1109
Marcelo Worsley

Exploring Teacher Learning through STEM Teachers’ Exploration of Data Using a Domain Specific Coding Language .......................................................... 1113
Detra Price-Dennis, Charles Lang

Conceptual Patterns of Changes in University Students’ Explanations During DC-Circuit Tasks .......... 1117
Terhi Mäntylä, Tommi Kokkonen

“It Didn’t Really Go Very Well”: Epistemological Framing and the Complexity of Interdisciplinary Computing Activities ................................................................................................. 1121
Serena Thoma, Elise Deitrick, Michelle Wilkerson

Exploring Relevant Problem-Solving Processes in Learning from Productive Failure ................. 1125
Charleen Brand, Christian Hartmann, Nikol Rummel

Reflecting on Epistemic Ideals and Processes: Designing Opportunities for Teachers’ Epistemic Growth .... 1129
Shiri Mor Hagani, Sarit Barzilai

Dealing with Changes and Challenges: Grade 5 Students’ Experience with Knowledge Building Pedagogy in a Yearlong Science Inquiry ................................................................. 1133
He Zhou, Jianwei Zhang

How Does Expansive Curricular Framing Support Productive Epistemological Framing of Computational Modeling Activities? ................................................................. 1137
Aditi Wagh, Julia Svoboda Gouvea

Missing the Brilliance of Scholars of Color: Mathematics Teacher Educator Discourse in a White Zone of Proximal Development ................................................................. 1141
Ashley D. Scroggins, Victoria Hand, Tonya Bartell, Sanghwan Byun, Beth Herbel-Eisenmann, Courtney Koestler

Co-Navigating Mobilized Student Inquiry Across Multiple Contexts .................................................. 1145
Ryan Rish, Aijuan Cun

Assessing Equity in Collaborative Learning Situations: A Comparison of Methods ......................... 1149
Paul Hutchison, Michael Slattery

Open Discussions of Historical Activity Inquiry Questions ....................................................................... 1153
Thérèse Laferrière, Alain Breuleux, Sylvie Barma, Gyeong Mi Heo, Stephanie Beck, Nilou Baradaran, Alice Vanlint

Teachers Collaboratively Creating Micro-Credentials for Professional Development .......................... 1157
Sandy Powell, Heather Leary, Lisa McLachlan, Karen Brock

Infrastructuring for Participatory Design of School Technology Practices: How Students Refined Design Practices ................................................................................................................ 1161
Ung-Sang Lee

Design Math: Middle-School Youth Making Math by Building Yurts .................................................. 1165
Kylie A. Peppler, Mishael Sedas, Tarrence Banks, John Searcy, Scott R. Wallace

Cultivating Formative Intervention Research Partnerships in Mathematics ........................................ 1169
Charles Munter, Cara Haines, Rebecca Bruton
Developing Theory-Practice Understanding Through Online Discourse Among Pre-Service Teachers .......... 1173
Carol Chan, Kennedy Chan, Ka Lok Cheng

Examining Primary Teacher Expertise and Agency in the Collaborative Design of Project-Based Learning Innovations .............................................................................................................. 1177
Samuel Severance, Joseph Krajcik

Towards a Radical Healing Praxis for Black Girls: Imagining Learning Environments That Foster the Sociopolitical Learning of Adolescent Black Girls .................................................................................. 1181
Ginnie I. Logan

Symposia
Designing for Axiological Innovation Within Family-Centered Learning Environments ......................... 1187
Enrique Suárez, Carrie Tzou, Megan Bang, Meixi *, Ricarose Roque, Nichole Pinkard, Raymond McDermott, Brigid Barron, Shelley Goldman, Megan Luce, Tanner Vea, Luke Conlin, Philip Bell, Caitlin Kennedy Martin

Video Data and the Learning Event: Four Case Studies ................................................................................... 1195
Ricardo Nemirovsky, Elizabeth de Freitas, Kate O’Brien, Molly L. Kelton, Jasmine Y. Ma, Francesca Ferrara, Giulia Ferrari, Rogers Hall, Lauren Vogelstein, Nathalie Sinclair

Exploring the Adoption, Spread, and Sustainability of an Informal STEAM Learning Innovation In Schools .................................................................................................................................................. 1203
Reed Stevens, Kay E. Ramey, Peter Meyerhoff, Jaakko Hilppö, Kristiina Kumpulainen, Anu Kajamaa, Antti Rajala, Richard Halverson

The Challenge of Assessing “Knowledge in Use”: Examples from Three-Dimensional Science Learning and Instruction .................................................................................................................................................. 1211
James W. Pellegrino, Brian Douglas Gane, Sania Zahra Zaidi, Christopher J. Harris, Kevin W. McElhaney, Nonye Alozie, Phyllis Haugabook Pennock, Samuel Severance, Knut Neumann, David Fortus, Joe Krajcik, Jeffrey Nordine, Erin Marie Furtak, Derek Briggs, Rajendra Chattergoon, Bill Penuel, Kerri Wingert, Katie Van Horne

Knowledge Analysis Outside the STEM Classroom ........................................................................................ 1219
Eleanor Anderson, Ayush Gupta, Thomas M. Philip, Lina Markauskaite, Yael Kali, Peter Goodyear, Arthur Hjorth, Olivia Levrinti

Orchestration Tools for Teachers in the Context of Individual and Collaborative Learning: What Information Do Teachers Need and What Do They Do With It? ........................................................................................................ 1227
Anouschka van Leeuwen, Nikol Rummel, Kenneth Holstein, Bruce M. McLaren, Vincent Alevén, Inge Molenaar, Carolien Knoop van Campen, Baruch Schwarz, Naomi Prusk, Osama Swidan, Avi Segal, Kobi Gal

Networked by Design: Interventions for Teachers to Develop Social Capital ........................................................ 1235

Moving Forward: In Search of Synergy Across Diverse Views on the Role of Physical Movement in Design for STEM Education ........................................................................................................ 1243
Dor Abrahamson, Alejandro Andrade, Oskar Lindwall, Arthur Bakker, Mitchell Nathan, Candace A. Walkington, Robb Lindgren, David Brown, Asnat R. Zohar, Sharona T. Levy, Joshua Danish, Adam Malteese, Noel Envedy, Megan Humburg, Asmalina Saleh, Maggie Dahn, Christine Lee, Xintian Tu, Bria Davis, Chris Georgen

Unpacking Dimensions of Evidentiary Knowledge and Reasoning in the Teaching and Learning of Science .................................................................................................................................................. 1251
Knowledge Integration in the Digital Age: Trajectories, Opportunities and Future Directions ....................... 1259
Marcia Linn, Bat-Sheva Eylon, Adi Kidron, Libby Gerard, Emily Toutkoushian, Kihyun “Kelly” Ryoo, Kristin Dana Bedell, Amanda Swearingen, Doug Clark, Satyujit Virk, Jackie Barnes, Deanne Adams, Hava Ben-Horin, Yael Kali, Tali Tal, Ornit Sagi, Alisa Acosta, Jim Slotta, Camillia Matuk, Christopher M. Hovey, Talia A. Hurwich, Juan Pablo Sarmiento, Jennifer Chiu, Jim P. Bywater, James Hong, Jonathan Osborne, Dianna Laurillard

Crowdsourcing and Education: Towards a Theory and Praxis of Learnersourcing.......................................... 1267
Shayan Doroudi, Joseph Williams, Juho Kim, Thanaporn Patikorn, Korinna Ostrow, Douglas Selent, Neil T. Heffernan, Thomas Hills, Carolyn Rosé

Affordances of Digital, Textile and Living Media for Designing and Learning Biology in K-12 Education ................................................................................................................................................. 1275
Yasmin Kafai, Mike Horn, Joshua Danish, Megan Humburg, Xintian Tt, Bria Davis, Chris Georgan, Noel Enedy, Paulo Blikstein, Tamara Clegg, Virginia L. Byrne, Leyla Norooz, Seokbin Kang, Jon Froehlich, Justice Toshiba Walker, Debora Lui, Emma Anderson, Engin Bumbacher, Peter Washington, Ingmar Riedel-Kruse

Attunements to the Ethical in Design and Learning ......................................................................................... 1283
Shirin Vossoughi, Ava Jackson, Megan Bang, Ann S Rosebery, Beth Warren, Thomas M. Philip

Life-long Life-wide Learning Within and Beyond the Disciplines .................................................................. 1290
Leslie Rupert Herrenkohl, Kristine S. Lund, Joseph L. Polman, Josh Radinsky, Dan Suthers, Iris Tabak, Adi Kidron

Assessing Prerequisites and Processes of Self-, Co- and Shared Regulation during Collaborative Learning ............................................................................................................................................................ 1296
Liesje De Backer, Ingo Kollar, Christopher A. Williams, Tina Seufert, Armin Weinberger, Nadine Melzner, Martin Greisel, Markus Dresel, Jolique Kielstra, Inge Molenaar, Hilde Van Keer, Martin Valcke, Raija Hämäläinen

The State of the Field in Computational Thinking Assessment ........................................................................ 1304
Mike Tissenbaum, Joshua Sheldon, Mark A. Sherman, Hal Abelson, David Weintrop, Kemi Jona, Mike Horn, Uri Wilensky, Satabdi Basu, Daisy Rutstein, Eric Snow, Linda Shear, Shuch Grover, Irene Lee, Eric Klopfer, Gayithri Jayathirtha, Mia Shaw, Yasmin Kafai, Eni Mustafaraj, Will Temple, R. Benjamin Shapiro, Debora Lui, Clara Sorensen

Community-Based Design Partnerships: Examples from a New Generation of CHAT/DBR  ......................... 1312

Unpacking Signs of Learning in Complex Social Environments: Desettling Neoliberal Market-Driven Educational Methodologies, Epistemologies and Recognitions of Learning .............................................................. 1320
Jennifer D Adams, Sylvie Barma, Marie-Caroline Vincent, Samantha Voyer, Irene Rahm, Ferdous Touioui, Pratim Sengupta, Marie-Claire Shanahan, Stephanie Hladik, Dylan Paré, Rachel Chaffee, April Luehmann, Day Greenberg, Jessica Thompson, Sara Haganah, Angela Calabrese Barton, Kevin O’Connor

Rising Above? Implications of Complexity for Theories of Learning ............................................................. 1328
Michael Jacobson, Manu Kapur, Peter Reimann, Sten Ludvigsen, Stella Vosniadou, Mitchell Nathan, Sasha Barab, Clark Chinn

Playful Mathematics Learning: Beyond Early Childhood and Sugar-Coating ................................................ 1335
Melissa Gresalfi, Ilana Seidel Horn, Lara Jasien, Panchompoo Wisittanawat, Jasmine Y. Ma, Sarah C. Radke, Victoria Guyevsky, Nathalie Sinclair, Anna Sfard
Volume 3

Posters

Equitable Science Outcomes and School Organizational Conditions
John Settlage

Visual Feedback for Asynchronous Online Interaction: Exploratory Study
on the Pattern of Other-regulation
Ji Young Lim, Ji Hyeon Lee, Kyu Yon Lim

Dropping in to Game Design: Iterations of a Skatepark Physics Game for a Children’s Museum Exhibit
Benjamin DeVane, Jeremy Dietmeier, Ben J. Miller, Kristen Missall, Salloni Nanda

The Role of Social-academic Goals in Chinese Students’ Self-regulated Learning
Jing Wang, Kun Liu, Guanzhong Ma

Design of a Virtual Internship to Develop Technological Pedagogical Content Knowledge
Diler Oner

Making Energy Easy: Interacting with the Forces Underlying Chemical Bonding
Using ELI-Chem Simulation
Asnat R. Zohar, Sharona T. Levy

Elementary Science Preservice Teachers’ Use of Evidence From Rehearsals When Reflecting
on Revisions of Their Practice
Anna Maria Arias, Sarah J. Fick, Amanda Benedict-Chambers

Using Machine Learning Techniques to Capture Engineering Design Behaviors
Jim P. Bywater, Mark Floryan, Jennifer Chiu, Jie Chao, Corey Schimpf, Charles Xie, Camilo Vieira,
Alejandra Magana, Chandan Dasgupta

Mapping Research and Writing Mentorship Assemblages in a Mixed Cohort
Course-based Research Experience
Adam Papendieck, Yin Hong Cheah, Chad Eliason, Julia Clarke

Cueing Gestures in a Seasons Simulation: Outcomes of an Embodied Learning Approach to Supporting
Explanations
Robert C. Wallon, Robb Lindgren

The Effects of Inquiry-Based Learning in Higher Education Statistics Tutorials on Students’ Self-Efficacy,
Attitudes, and Achievement Emotions
Petra Bod, Daniel Sommerhoff

Competing Epistemologies in the Construction of Popular Science
Pryce Davis

Measuring Integrated Knowledge – A Network Analytical Approach
Marcus Kubisch, Jeffrey Nordine, Knut Neumann, David Fortus, Joe Krajcik

Comparison of 3D Display Technologies for Embodied Interaction in
Virtual Hands-On Experiential Learning
Yulong Bian, Qiuchen Wang, Chao Zhou, Guowen Qi, Chenglei Yang, Xiangyu Meng, Chia Shen

Contextual Dimensions of an Ambient Intelligent Classroom
Matthew Montebello

Uncovering the Rich Club Phenomenon in an Online Class
Tianhui Huang, Bodong Chen

Peer Tutor Matching for Introductory Programming: Data-Driven Methods to Enable
New Opportunities for Help ................................................................. 1377
Nicholas Diana, Michael Eagle, John Stamper, Shuchi Grover, Marie Bienkowski, Satabdi Basu

Sketching and Gesturing for New Ideas in Collaborative Design ................................................................. 1379
Tellervo Härkki, Pirta Seitamaa-Hakkarainen, Kai Hakkarainen

Developing Assessment Tasks to Promote Student Sensemaking of Phenomena and Flexible Thinking........... 1381
Emily Miller, Susan Codere, Joe Krajcik

Data Moves: Restructuring Data for Inquiry in a Simulation and Data Analysis Environment ......................... 1383
Michelle Wilkerson, Kathryn Lanouette, Rebecca Shareff, Natalya St. Clair, Nicole Bulalacao, Tim Erickson, Joan I. Heller, William Finzer, Frieda Reichsman

Is Student Frustration in Learning Games More Associated with Game Mechanics or Conceptual Understanding? ......................................................................................................................... 1385
Shamya Karumbaiah, Seyedahmad Rahimi, Ryan Baker, Valerie Shute, Sidney DMello

Transitioning to an Integrated Science Teaching Model: Easier Said than Done ........................................... 1387
Ashley Ireland, Elizabeth B. Dyer, Edward Britton, Burr Tyler, Joshua Valcarcel

The Interaction of the Need for Cognitive Closure With Implicit and Explicit Guidance in Wiki-Based Learning ................................................................................................................................. 1389
Sven Heimbuch, Daniel Bodemer

Research Questions to Support Conversational Learning in the Era of Ubiquitous, Mobile Agents ................ 1391
Bob Schloss, Maria D. Chang, Aditya Vempaty, Arup Acharya, Ravindranath Kokku, Lorin Wilde, Nirmal Mukhi

Middle School Student Ideas on the Relative Affordances of Physical and Virtual Models ......................... 1393
Elizabeth McBride, Jonathan Vitale, Marcia Linn

Detecting Patterns of Dynamic Teacher-Learner Interactions in Online Adult Learning Through a Dynamic Systems Approach ........................................................................................................... 1395
Yohei Kato, Michael Tscholl, Saskia Kunnen

Secondary Students’ Model-Based Reasoning about Earth Systems: Practice, Epistemology, and Conceptual Understanding ................................................................................................................ 1397
Cory Forbes, Mark A. Chandler, Devarati Bhattacharya, Tina Vo, Jane Griffin

Exploring Novice Approach to Conceptual Design of Software ....................................................................... 1399
T. G. Lakshmi, Sridhar Iyer

What’s the Difference? A Closer Look at Idea-Centric Analysis of Online Discourse in K12 and Higher Education Settings ........................................................................................................... 1401
Ablyn Vwen Yen Lee, Seng Chee Tan

Enhancing Online Structured Dialogue During Teaching Internships Through Digital Storytelling to Promote Professional Socialization ................................................................................................... 1403
Toshio Mochizuki, Takeshi Kitazawa, Jun Oshima, Hideyuki Suzuki, Hideo Funaoi

Enskilment in the Digital Age: The Interactional Work of Learning to Debug ..................................................... 1405
Virginia J. Flood, David DeLiema, Benedikt Walter Harrer, Dor Abrahamson

Robots That Help: Moving Toward Human-Centered Designs ........................................................................ 1407
Erin Tolar, Andrea Sarah Gomoll, Pei-Jung Li, Benjamin Oistad, Selma Sabanovic, Cindy Hmelo Silver

Child-Coach-Parent Network for Early Literacy Learning ............................................................................. 1409
Juliana Nazare, Anneli Hershman, Ivan Sysayev, Lauren Fratamico, Juanita Butrago, Mina Soltangheis, Sneha Priscilla Makini, Eric Chu, Deb Roy

Learner Expertise and Emotional Design in Multimedia Learning ................................................................. 1411
Thomas K.F. Chiu
Problem Scoping in Designing Biomimetic Robots ................................................................. 1413
Fayette Shaw, Kristen Wendell, Gillian Puttick, Debra Bernstein, Ethan Danahy

Mentor Academy: Engaging Global Learners in the Creation of Data Science Problems for MOOCs .... 1415
Rebecca M. Quintana, Christopher Brooks, Cinzia Villanucci Smothers, Yuanru Tan, Zheng Yao, Chinmay Kulkarni

The Student-Centric Electronic Portfolio in Practice .............................................................. 1417
Auli Saarinen, Pirita Setiamaa-Hakkarainen, Kai Hakkarainen

Designing Learning Environments to Facilitate Creativity ..................................................... 1419
Jonan Phillip Donaldson

Social Comparison Theory as Applied to MOOC Student Writing: Constructs for Opinion and Ability .... 1421
Heeryung Choi, Nia Dowell, Christopher Brooks

Can Speaking Make Learning Easier? Verbal Rehearsal Effects on Cognitive Load, Learning Efficacy
and Performance ..................................................................................................................... 1423
Toni M. Hatten-Roberts, Jason M. Lodge

Visualizations of Community Knowledge for Supporting Middle School Students to Model Phenomena in
Scientific Inquiry ..................................................................................................................... 1425
Michelle Lui, Tom Moher, Brenda Lopez Silva

A New Facet: Building Multifaceted Engineering Identity ..................................................... 1427
Jordan O. James, Vanessa Svihtla, Chen Qiu, Abhaya K. Datye

Pre-service Teachers’ Perspectives on Computer Science Education Within an Equity-Oriented Teacher
Education Program ............................................................................................................... 1429
Kelsey Tayne, R. Benjamin Shapiro, A. Susan Jurow, Max Hollingsworth

Tracing Bodies through Liminal Blends during Play-based Inquiry in a Mixed Reality Environment .... 1431
Danielle Keifert, Noel Enyedy, Joshua Danish, Christine Lee, Maggie Dahn, Lindsay Lindberg

Curiosity Practice: A Powerful New Lever for Fostering Science Engagement ......................... 1433
Leema K. Berland, Rosemary S. Russ, Noah Weeth Feinstein

The Assessment of Digital Reading Skills With Cognitive Diagnose for the Reading Achievement
Test in China ......................................................................................................................... 1435
Yan Liu, Chuxin Fu, Xiaqing Gu

Translating Theory to Practice: Technology Solutions to Solve Practical Issues for Teaching Reading
Comprehension at the Secondary Level ................................................................................ 1437
Donna Caccamise, Megan K. Littrell-Baez, John Weatherly

Student Learning of Computational Thinking in A Robotics Curriculum: Transferrable Skills and
Relevant Factors .................................................................................................................... 1439
Guanhua Chen, Ji Shen

The Challenge of Working With the Future Within STEM Education ..................................... 1441
Giulia Tasquier, Olivia Levrtini, Antti Laherto, Caitlin Wilson, Elina Palmgren

The Role of Instructional Goal Setting for Teaching Computational Thinking in Robotics Classrooms ........ 1443
Eben Witherspoon

Concrete Definition of Beneficial Collaborative Dialogues .................................................... 1445
Michelene T. H. Chi

Concepts Before Coding: The Impact of Classroom Culture and Activity Design on Student Engagement
With Computer Science Concepts ......................................................................................... 1447
Patrik Lundh, Shuchi Grover, Nicholas Jackiw
Multimodal Reflection: Adolescents Remixing and Sharing their Experiences in an Informal STEM+L Academy

Blaine Smith, Ji Shen, Shiyan Jiang, Guanhua Chen, Marie Hamaoui, Juan Torralba

Eliciting Student Explanations in an Undergraduate Biology Laboratory Course

Anna Strimaitis Grinath, Sherry A. Southerland

Developing a Text-Integration Task for Investigating and Teaching Interdisciplinarity in Science Teams

Simon Knight, Kate Thompson

Making Uncertainty Work: How Youth Manage Uncertainty to Shape Learning Trajectories in a School Makerspace

Colin G. Dixon, Lee M. Martin, Sagit Betser

Interdependence as a Treatment Effect: An Example From Group Awareness Research

Lenka Schnaubert, Daniel Bodemer

ORBIT - Overcoming Breakdowns in Teams With Interactive Tabletops

Patrick Sunnen, Béatrice Arend, Valerie Maquil

Growing Teamwork Competency: A Mixed Methods Study of an Iterative Digital Formative Assessment Approach

Elizabeth Koh, Jennifer Pei-Ling Tan, Helen Hong, Yi Huan Tee

Visualizing Knowledge in the Era of Instructional Software and Gamification: Challenges in Design, Method and Practical Use

Eva-Maria Ternblad, Agneta Gulz

Unpacking Why Student Writing Does Not Match Their Science Inquiry Experimentation in Inq-ITS

Haiying Li, Janice Gobert, Rachel Dickler

Science Literacy in Controversial Contexts: An Epistemic Balancing Act

Aviv J. Sharon, Ayelet Baram-Tsabari

Navigating “Disability” in “Intensive Instruction”: Learner Complexity and Small Environments

Jessica Heather Hunt

Increasing the Use of Formative Feedback: Utilizing Game-Based Principles

Man-Wai Chu, Teresa Anne Fowler

Measuring Awe and Critical Thinking in a Science Museum

Aaron Price, Jana Greenslit, Lauren R. Applebaum, Gloria Alicia Segovia, Chaucey Slagel, Kimberly A. Quinn, Sheila Krogh-Jespersen

A Look at the First Two Years of a 5-Year Longitudinal Study of an OST Program’s Impact on STEM Career Interest

Aaron Price, Angela D. Skeeles-Worley, Robert Tai

Talking Past One Another: Looking for Signs of Conversational Mismatch in One 6th Grade Science Classroom

Mon-Lin Ko, Andrew Elby

Uncertainty Management in Science Argumentation

Catherine E. Cullicott, Ying-Chih Chen

The Santa Trap: When Scaffolding Is Not Enough to Challenge Teachers’ Pervasive Beliefs

Chandra Hawley Orrill, Rachael Eriksen Brown

Developing Historical Thinking in PBL Class Supported with Synergistic Scaffolding

Haesol Bae, Fangli Xia, Yuxin Chen, Kalani Craig, Cindy Hmelo Silver

Personal Experience and Emotion in Making Sense of Literary Texts

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Frictional Patterns in the Design of Games for Learning

Adam Mechtle, Matthew Berland

BioSCANN: A Collaborative Learning Platform That Scaffolds Scientific Inquiry in the Context of Interrupted Case Studies

Leslie Schneider, Berri H. Jacque, Jessica Henry

Characterizing Digital Contexts of Collaborative Learning: An Updated Classification Scheme for Computer-Mediated Communication

Alyssa Wise, Trena Paulus

“My Favorite Part is When We Tell the Truth”: Identity and Agency in Middle School Youth’s Climate Science Digital Storytelling

Elizabeth Walsh, Elizabeth Smullen, Eugene Cordero

Examining the Role of Unpacking 3-Dimensional Teaching and Learning in Museum-Based Professional Development

Gauri A. Vaishampayan, Aaron Price, Kyle Kauffman, Patricia Messersmith, Laura Rico-Beck, Brian Douglas Gane

The Impact of a Lego Exhibit on Awareness of the Roles and Identities of Engineers

Gloria Alicia Segovia, Aaron Price, Jana Greenslit, Rabia Ibtasar

Community Science Identity: Becoming Community Scientists in a Museum-based Genetics of Taste

Leighanna Hinojosa, Rebecca D. Swanson, Joseph L. Polman

Bridging Multiple Ecologies to Support and Research Learning in Contested Spaces

Joanna Weidler-Lewis, Cynthia Story Graville, Mary Gould

Learning to Think Computationally: Comparative Outcomes of a Robotics Workshop for Girls

Florence R. Sullivan, Kevin Keith, Ali Soken, Duy Pham

Measuring Maker Mindset: Establishing Content Validity with Card Sorting

Jonathan Cohen, Lauren E. Margulieux, Maggie Renken, Shaunna F. Smith, W. Monty Jones

Preparing Students for Learning Statistics with Adventure Game: Learning Cycle Model of Gaming, Watching, and Practicing

Hiroki Oura, Ryohei Ikejiri, Kae Nakaya, Ryota Yamamoto, Yuhei Yamauchi

Recounting Counting: Situated Self-Appraisal in Math-Adjacent Discourse

Suraj Utamchandani, Kylie A. Peppler

Beyond Copy Room Collaboration: A Case Study of Online Informal Teacher Professional Learning

Robin Keturah Anderson


Srinjita Bhaduri, Katie Van Horne, Tamara Sumner, Randy Russell, John D. Ristvey Jr.

Towards a Critical Sociocultural Theory of How Teachers Understand Inequity, Power, and Oppression

Grace A. Chen

Learning Scientific Practices Through Participation as a Volunteer Community Scientist

Rebecca D. Swanson, Leighanna Hinojosa, Joseph L. Polman

Mobility, Diversity, and Openness: Distilling Design Principles for Equitable and Accessible Makerspaces

Kylie A. Peppler, Anna Keune, Justin Whiting

Developing Interdisciplinary Competencies for Science Teaching and Learning: A Teacher-Researcher Professional Learning Community
Donald J. Wink, Brian Douglas Gane, Mon-Lin Ko, MariAnne George, Laura Zeller, Susan R. Goldman, James W. Pellegrino, Raymond Kang

Europa Universalis IV the Grandest LAN Party: A Case Study
Magdalene Moy

Revitalizing Japanese Lesson Study through Shared Tools Embedded in Design-Based Implementation Research
Shinya Ikubo, Moeji Saito, Hajime Shirozu, Erika Atarashi

Improving Elementary Students’ Literacy through Knowledge Building
Pei-Yi Lin, Leanne Ma, Yu-Hui Chang, Huang-Yao Hong, Chiu-Pin Lin

Investigating the use of Anchoring for Promoting Design Thinking
Chandan Dasgupta

Learning Loops: Affordances and Challenges of Project Bloks
Veronica Lin, Paulo Blikstein

Architectures for Learning and Successive Processes of Scaling
Pakon Ko, Khe Foon Hew

Collaborative, Multi-perspective Historical Writing: The Explanatory Power of a Dialogical Framework
Yifat Ben-David Kolikant, Sarah Pollack

Eye Tracking Students’ Gazes on Feedback in a Digital Assessment Game
Maria Cutumisu, Krystle-Lee Turgeon, Lydia Marion González, Tashire Saiyera, Steven Chuong, Daniel L. Schwartz

Promoting Cognitive Processes of Knowledge Integration
Shitanshu Mishra, Sridhar Iyer

Co-Designing Orchestration Support for Social Plane Transitions with Teachers: Balancing Automation and Teacher Autonomy
Jennifer Olsen, Nikol Rummel, Vincent Aleven

Exploring How Students Learn Estimation Using a Modelling-based Learning Environment
Aditi Kothiyal, Sahana Murthy

Leveraging MOOCs for Blended Learning: Capturing Effective ‘Wrapping’ Strategies With a Learning Design Pattern Language
Ling Li, Nancy Law

Leave Some Space to Think: Can Less Guidance Bring More Product?
Jinju Lee, Hyun Joo, Dongsik Kim

ERCHI: A Framework for Identifying Observable Signifiers of Student Engagement in Practice Based Learning to Inform the Design of Learning Analytics
Rose Luckin, Mutlu Cukurova

How Learning Outcomes are Measured in Digital Learning Environments in Higher Education
Elke Kümmel, Gabriele Irlé, Johannes Moskaliuk, Joachim Kimmerle, Ulrike Cress

Rethinking TPACK in the Digital Age: Non-Linear Relationships between Learning by Design, Teachers’ Technology-Related Knowledge and Technology Integration in the Classroom
Joan Bruner-Timmons, Nicolae Nistor, Ionut Dorin Stanciu

The Difference That Counts: Guiding Knowledge Exchange by Visualizing Levels of Co-Learners’ Knowledge
Melanie Erkens, Malin Kimberley Schneitzer, Daniel Bodemer

“Sorry if I’m Leaving You in the Dust”: Toward Understanding the Importance of Student Goals in Collaborative Problem Solving
Mehmet Celepkolu, Kristy Elizabeth Boyer

Biohacking Food: A Case Study of Science Inquiry and Design Reflections About a Synthetic Biology High School Workshop .................................................................................................................. 1559

Justice Toshiba Walker, Mia Shaw, Yasmin Kafai, Debora Lui

How Groups Regulate Their Learning: The Influence of Achievement Goals on Self-, Co- and Shared Regulation Strategies ........................................................................................................ 1561

Martin Greisel, Nadine Melzner, Ingo Kollar, Markus Dresel

“Things Are Made to Fail”: Constructive Failures in a Middle School Robotics Curriculum .......................................................... 1563

Andrea Sarah Gomoll, Erin Tolar, Cindy Hmelo Silver, Selma Sabanovic

Using a Video-Based Approach to Develop Pre-Service Science Teachers’ Understanding of How to Teach Nature of Science .................................................................................................................. 1565

Kennedy Chan, Ka Lok Cheng, Carol Chan, Benny Yung

Videocase Complexity and Preservice Teacher Noticing: Examining the Effects of Cognitive Load ........ 1567

Alison Castro Superfine, John Bragelman

Effects of Expertise on Teachers’ Technology-Supported Teaching Scripts .................................................. 1569

Christina Wekerle, Ingo Kollar

Space for All: Self Construct While Learning in the Digital Age ................................................................. 1571

Tutaleni I. Asino, Penny Thompson, Kathy Essmiller

Supporting SEL Learning in Progressive Design Contexts ........................................................................ 1573

Dhvani Toprani, Marcela Borge, Yu Xia

If You Add Too Much Science, It Gets Boring: Exploring Students’ Conceptual Change in Game Design Iterations .......................................................................................................................... 1575

Christopher M. Hovey, Camillia Matuk, Talia A. Hurwich

Formative Feedback for Learning. Case Studies of Automated Feedback in Undergraduate Computer Science Education .................................................................................................................. 1577

Omid Mirmotahari, Crina Damsa, Yngvar Berg

Skyscraper Games: Designing Professional Development for Middle School Teachers to Promote Computational Thinking Using Custom Tools .................................................................................. 1579

Matthew Duvall, Frank J. Lee, Brian Smith

Opening the Door to Algebra: The Role of Fraction Knowledge in Algebra Learning ................................ 1581

Julie L. Booth, Kristie J. Newton, Laura L. Pendergast, Christina Barbieri

How to Enjoy Writing Papers: Supporting Literature-Based Inquiry Learning to Reduce Procrastination and Foster Ownership and Positive Emotions ........................................................................ 1583

Julia Eberle, Tim Schönfeld, Selma Arukovic, Nikol Rummel

Identifying Methods to Induce Productive Confusion for Improving Performance in Physics ................ 1585

Jeremiah Sullins, Katie Console, Rebecca Denton, Clayton Henrichson

Examining Science Identity Development in a Disciplinary Role-taking Multimodal Composing Environment ................................................................................................................................. 1587

Shiyan Jiang, Ji Shen, Blaine Smith, Kristin Watson Kibler

‘I Think It’s Kind of Made Everybody a Little Closer:’ A Virtual Platform Extending Parent Learning as Community of Practice .......................................................................................................................... 1589

Susan Walker

The Effect of Inhibiting Hand Gestures on Mathematical Reasoning ........................................................ 1591

Candace A. Walkington, Dawn Woods, Mitchell Nathan, Geoffrey Chelule, Min Wang

Measuring Students Epistemic Understanding of, and Beliefs About, Political Media ........................................ 1593
Tracking the Flow of Discussion Topics in an Inquiry Science Unit ............................................................... 1595
Jeremy Stoddard, Jason Chen

Supporting the Development of Teacher Candidate Formative Assessment Practice ............................................................... 1597
Kate Henson

A Continuum of Knowledge Structures in an Observation-Based Field Geology Setting ............................................................... 1599
Lauren Barth-Cohen, Sarah Braden

How Do Kindergarten and Primary School Children Justify Their Decisions on Planning Science Experiments? ............................................................... 1601
Heidi Haslbeck, Eva-Maria Lankes, Eva S. Fritzsche, Lucia Kohlhauf, Birgit Jana Neuhaus

Transporting Knowledge: A Case Study of Meaning Making on the Pathways of Science Communication ............................................................... 1603
Pryce Davis

Connected Cosplay: Fan Work as Pathways Toward Opportunity ............................................................... 1605
Sophia Bender, Kylie A. Peppler

An Enhanced Framework for Scale Cognition Leveraging Visual Metaphor Theory and Analogical Reasoning Theory ............................................................................................................................................. 1607
Cesar Delgado, Matthew Peterson

Visualizing Complex Classrooms Through Real Time Observations ............................................................................................................................................. 1609
Joey Huang, Andrea Sarah Gomoll, Erin Tolar, Cindy Hmelo Silver, Selma Sabanovic

Learning With Songo: The African Board Game ............................................................................................................................................................... 1611
Rebecca Yvonne Bayeck

Defining Alternative as More Than At-Risk: Youth Defined Outcomes and Emerging Identities in Alternative Schools ............................................................................................................................................................... 1613
Gavin Tierney

Neurocognitive Task Analysis: What Changes as Medical Trainees Develop Perceptual Abilities? ............................................................... 1615
Liam Rourke

GenEvo - An Emergent Systems Microworld for Model-Based Scientific Inquiry in the Context of Genetics and Evolution ............................................................................................................................................................... 1617
Sugat Dabholkar, Gabriella Anton, Uri Wilensky

Re-Engaging Youth: Using Discourse Analysis to Explore Individual Agency and Community Belonging ............................................................................................................................................................... 1619
Gavin Tierney

Empowering Transformative Agency through Critically Experimenting With Arts in Public Schooling ............................................................................................................................................................... 1621
Raymond Kang

Identifying Shifts in Agency by Analyzing Authority in Classroom Group Discussion ............................................................................................................................................................... 1623
Mary Bridget Kustusch, Eleanor C. Sayre, Scott Franklin

A Method for Determining the Extent of Recent Temporal Context in Analyses of Complex, Collaborative Thinking ............................................................................................................................................................... 1625
Andrew Ruis, Amanda Siebert-Evenstone, Rebecca Pozen, Brendan R. Eagan, David Williamson Shaffer

Rituals, Explorations, and Cultural Resources in the Mathematics Classroom: When Arguing Does Not Help Learning ............................................................................................................................................................... 1627
Nadav Ehrenfeld, Einat Heyd-Metzuyanim

Investigating Third Grade Students' Collaboration in Project-Based Learning to Inform Curriculum Design ............................................................................................................................................................... 1629
Exploring Teacher Presence During Social Regulation of Learning in Science Classrooms ........................................... 1631
Dahila Dragnic-Cindric, Nikki G. Łożekowski, Jeffrey Alan Greene, P. Karen Murphy

Influence of Perceptions of Past Collaborative Experiences on Quality of Pre-service Collaboration and Outcomes .................................................................................................................................................... 1633
Denise Brown, Michelle E. Jordan

Playing With Fractions on an Interactive Floor Application: An Exploratory Case Study in the Math Classroom......................................................................................................................................................... 1635
Marianna Ioannou, Andri Ioannou

Mapping Student Reasoning in Support of Mathematics Teacher Candidate Digital Learning ........................................ 1637
Laurie Overman Cavey, Tatia B. Totorica, Michele Carney, Patrick R. Lowenthal, Jason Libberton

The Visual Test of Science Identity (VTSI) ..................................................................................................................... 1639
Amy R. Semerjian, Luke Duesbery, Jim Slotta

Jessica Roberts, Kevin Crowley, Marti Louw

Design Based Research Approaches Towards Enhancing Social Learning Practices in MOOC Platforms ...... 1643
Philip Tubman, Murat Oztok

Problematic Instruments: Technology, Legitimization, and Citizen Science .............................................................. 1645
Kevin A. Nguyen

Don’t Just Do It, Explain It: A 5th Grade Worked Examples Curriculum Supports Transfer to Algebra Content ......................................................................................................................................................... 1647
Nicole Hallinen, Julie L. Booth

Multimodal Engineering Design Notebooks and Meta-Representational Competence ............................................. 1649
Kristen Wendell, Chelsea J. Andrews, Patricia Paugh

A Geopositioning View of Teachers’ Orchestration in Active Learning Classrooms: Following Teachers’ Position/Location Within the Classroom .................................................................................. 1651
Kevin Lenton, Elizabeth S. Charles, Michael Dugdale, Chao Zhang, Chris Whittaker, Nathaniel Lasry

Domain-General Metacognitive Instruction Reduces Productive Learning Behaviors and Performance? ...... 1653
Darrel Davis, J. Elizabeth Richey, Cristina D. Zepeda

Exploring Ideological Becoming for Youth of Diverse Backgrounds: Documentary Practices as Internally Persuasive Discourse ......................................................................................................................................................... 1655
Amy A. Chang, Wan Shun Eva Lam

From Computational Thinking to Computational Action: Understanding Changes in Computational Identity Through App Inventor and the Internet of Things ......................................................................................................................... 1657
Mike Tissenbaum, Mark A. Sherman, Joshua Sheldon, Hal Abelson

Scientists Expand Professional Vision Through Outreach With People Underrepresented in Science ............ 1659
Shelley Goldman, Tanner Vea, Megan Luce

"This Is for Boys. You Did It?": Agency Under Construction in a Girls-Only Design and Making Program ......................................................................................................................................................... 1661
Sagit Betser, Lee M. Martin

Design-Activity-Sequence: A Case Study and Polyphonic Analysis of Learning in a Digital Design Thinking Workshop ......................................................................................................................................................... 1663
Penny Wheeler, Stefan Trausan-Matu, Jonan Phillip Donaldson, Amanda Barany

LGBT+ in STEM: The Transgender Experience ........................................................................................................... 1665
Vanessa Webb, Apriel K. Hodari, Angela Johnson, Rose Nicole Young, Elizabeth Mulvey

Turning to Experience Negative Signs as Operations ................................................................. 1667
  Julie Nurnberger-Haag

Authentic to Whom and What? The Role of Authenticity in Project-Based Learning in English
Language Arts ................................................................................................................................. 1669
  Joseph L. Polman, Kristina Stamatis, Alison Boardman, Antero Garcia

When Is It Safe Enough? Considering Diversity and Equity When Brokering Pre-Professional
Opportunities to Youth of Color ..................................................................................................... 1671
  Rafi Santo, Dixie Ching, Eda Levenson, Geneva White, Mikey Cordero, Kylie A. Peppler, Christopher
Hoadley

Projected Worlds: How Informal Digital Learning Organizations Conceptualize Organizing Youth
Futures .................................................................................................................................................. 1673
  Rafi Santo, Juan Pablo Sarmiento, June Ahn

Social Reading: Field Study With an In-Home Learning Companion Robot ......................................... 1675
  Joseph E. Michaelis, Bilge Mutlu

Engaging Teachers in Discussions Around Temporality Measures from Analytics to Inform Knowledge
Building Discourse ......................................................................................................................... 1677
  Chew Lee To, Carol Chan, Dingxuan Ng

Constructing Entities in Scientific Models ........................................................................................ 1679
  Leslie Atkins Elliott, Lauren Barth-Cohen

Using Example-based PF Conditions to Investigate Preparatory Effects of Problem-solving Prior to
Instruction ........................................................................................................................................... 1681
  Christian Hartmann, Nikol Rummel, Tamara van Gog

Student Perceptions of Object-based Learning With Digitized Museum Materials During Classroom
Science Instruction ............................................................................................................................... 1683
  Kirsten R. Butcher, Michelle Hudson, Madlyn Runburg

Introducing Bifocal Modeling Framework in Elementary School: Learning Science Using Tangible
Modeling Tools ....................................................................................................................................... 1685
  Tamar Fuhrmann, Engin Bumbacher, Paulo Blikstein

Teaching and Learning Using Virtual Reality: Identifying and Examining Two Design Principles of
Effective Instruction ............................................................................................................................ 1687
  Britte Haugan Cheng, Cynthia D’Angelo, Sarah Zaner, Matthew Kam, Rhonya A. Hamada

Teacher’s Re-design of Virtual Reality Based Curriculum in an Elementary Classroom ......................... 1689
  Insook Han

Studying the Interactions between Components of Self Regulated Learning in Open Ended Learning
Environments ........................................................................................................................................ 1691
  Anabil Munshi, Ramkumar Rajendran, Jaclyn Ocupmaugh, Allison Moore, Gautam Biswas

Mentors in the Making: A Case Study of Heterogeneity in Meaning Making at a Public Library
Makerspace ......................................................................................................................................... 1693
  Tesha Sengupta-Irving, Lauren Vogelstein, Corey Brady, Emily Phillips Galloway

Exploring the Impact of Virtual Internships for Democratic and Media Education ................................. 1695
  Jeremy Stoddard, Jason Chen

Conceptual Goals While Using a Simulation: Three Different Sources and Learning Outcomes .................. 1697
  Robert C. Wallon, Robb Lindgren

Toward the Design of Scaffolds for In-the-World Situated Science Reflections Through Wearables .......... 1699
Sharon Lynn Chu, Brittany Garcia, Beth Nam

Room for Everyone? Identification Processes in Crafting and Math .......................................................... 1701
  Katherine Carr Chapman, Melissa Gresalfi, Amanda M. Bell

Uncovering Students’ Ecological Knowledge Resources .............................................................................. 1703
  Lana Minshew, Kelly Johnson Barber-Lester, Sharon Derry, Janice L. Anderson

Technology to Support Students’ Learning Mathematics From Other Students Work .................................. 1705
  Jeffrey Bush, Brent Milne

Playing Well With Others: An Ethnographic Examination of a Cross-Disciplinary Science-Theatre
  Collaboration .................................................................................................................................................... 1707
  Ariella Flora Suchow

Pedagogically Informed Peer Teaching as a Mechanism for Systematically Maximizing Sociocultural
  Theories of Learning ........................................................................................................................................ 1709
  Soren Rosier

Characterizing Chemistry Practices: How Teachers Design and Perform Chemistry Experiments ............. 1711
  Suna Ryu

Assessment in a Digital Age: Rethinking Multimodal Artefacts in Higher Education ................................. 1713
  Amani Bell, Jen Scott Curwood, Jen Ross

Engaging With Climate Change as a Socioscientific Issue in an Informal Science Learning Environment .... 1715
  Kelsey Tayne, Megan K. Littrell-Baez, Erin H. Leckey, Anne U. Gold

Activity Systems Analysis of the Social Practices by Low-achieving Students in a Knowledge-Building
  Environment Augmented by Reflective Assessment ......................................................................................... 1717
  Yujin Yang, Jan van Aalst, Carol Chan

Criss Crossing Science Domains in Knowledge Building Communities: An Exploratory Study ............... 1719
  Ahmad Khanlari, Gaoxia Zhu, Stacy Costa, Marlene Scardamalia

“How Do We Pack the World Into Words?” Examining the Collective of Humans and Non-Humans in the
  Science Classroom ............................................................................................................................................ 1721
  Donald J. Wink

Investigating Multiple Dimensions of Student Engagement with Embodied Science Learning .................. 1723
  Megan Humburg, Joshua Danish

Relating Social Network Structure to Uncertainty and Social Interaction in an Engineering Design
  Challenge .......................................................................................................................................................... 1725
  Christiana Bruchok, Nicole Bowers, Michelle E. Jordan, Wendy Wakefield, Bernard Ricca

Becoming, Being, and Sometimes Leaving: A Longitudinal Ethnographic Perspective of Climate Scientists’
  Participation in Science and Education ............................................................................................................ 1727
  Elizabeth Walsh

Shifting Educational Activity Systems: A Cross-Case Analysis of Science Education Reform Efforts in
  Large Scale Systems ......................................................................................................................................... 1729
  Deb Morrison, Gina Tesoriero, Philip Bell

Using Web 2.0 Technologies to Facilitate Scaffolding of Student-Led, Collaborative Learning Outside
  of the Classroom .............................................................................................................................................. 1731
  Stephen M. Rutherford, Amber M. Moorcroft, Sheila L. Amici-Dargan

A Learning Sciences Perspective on the Development of Teachers’ Digital Thinking .................................. 1733
  Yu-Hui Chang

Making Mathematical Thinking Visible Through Technology .......................................................................... 1735
  Jeffrey Bush, Brent Milne
Networks in Small-Group and Whole-class Structures in Large Knowledge Building Communities .......................... 1737
Xueqi Feng, Jan van Aalst, Carol Chan, Yuqin Yang

An Initial Examination of Designed Features to Support Computational Thinking in Commercial Early Childhood Toys .............................................................. 1739
Megan M. Marie Hamilton, Jody Clarke-Midura, Jessica F. Shumway, Victor R. Lee

Socialization and Cognitive Apprenticeship in Online Doctoral Programs .......................................................... 1741
Murat Oztok, Kyungmee Lee, Clare Brett

Game Design Literacy as a Problem-Solving Disposition .................................................................................. 1743
Beaumie Kim, Reyhaneh Bastani

Computational Discourse in a Role-Playing Game Podcast .................................................................................. 1745
Joshua Gabai, Matthew Berland

Examining Parent-Child Communication and Affect During Tabletop Gameplay in a Children’s Museum: Implications for Learning ........................................................................ 1747
Kristen Missall, Salloni Nanda, Caitlin Coursenthon, Benjamin DeVane, Jeremy Dietmeier, Ben J. Miller, Michala Brand

Professional Development of Science Teachers in Underserved Communities: An Initial Report From the Field ................................................................................................................................. 1749
Tamar Fuhrmann, Cassia Fernandez, Tatiana Hochgreb-Haegele, Paulo Blikstein

"I Have an Opinion about Science I Think Part is True and Part is Not": Emergent Bilingual/Multilingual Adolescents “Figuring” Science Learning Through Virtual Labs .............................................................................. 1751
Shakhnoza Kayumova, Suzanne Cardello

Linking Identity Resources Across Roles: Family Science Workshops and Badging .................................................. 1753
Gavin Tierney, Theresa Horstman, Carrie Tzou

Accessibility, Making and Tactile Robotics: Facilitating Collaborative Learning and Computational Thinking for Learners with Visual Impairments .................................................................................. 1755
JooYoung Seo, Gabriela Richard

An Analysis of Collective Knowledge Advancement and Emergent Nature of Ideas in Subject-Matter Learning ................................................................................................................................. 1757
Jun Oshima, Takashi Tsunakawa

Facilitation in Informal Makerspaces .................................................................................................................. 1759
Sarah Priscilla Lee, David Bar-El, Kit Martin, Marcelo Worsley

How Do Multilingual Learners Support One Another’s Science Learning and Participation? ................................................................................................................................. 1761
Mavreen Rose S. Tuvilla, Casey E. Wright, Minjung Ryu, Shannon M. Daniel

The Structures of Embodied Play Activities and Their Impact on Students’ Exploration of the Particulate Nature of Matter .............................................................................................................................................. 1763
Bria Davis, Xintian Tu, Joshua Danish, Noel Enyedy

Assessing the Validity of Peer Feedback in a Sixth Grade Mathematics Class ........................................................................ 1765
Melissa Patchan, Karen Rambo-Hernandez, Brianna Dietz, Kennedy Hathaway

Parents’ Decontextualized Talk During Early Childhood Predicts the Neural Basis of Narrative Processing in Later Childhood .................................................................................................................. 1767
Özlem Ece Demir-Lira, Salomi S. Asaridou, Susan C. Levine, Susan Goldin-Meadow, Steven L. Small

The Impact of Evidence-Based Professional Development on Classroom Dynamics ........................................ 1769
Gaowei Chen, Carol Chan, Jinjian Yu, Liru Hu, Sherice Clarke, Lauren Resnick

Game-talk: Media-based Mentoring as a Process of Reframing Relationships and Reframing Perspectives .............................................................................................................................................. 1771
Deena Gould, Priyanka Parekh

Using Multiple Perspectives to Study Identity Development in Digital Environments ........................................ 1773
Mirlanda E. Prudent

Examining Productive Discourse and Knowledge Advancement in a Knowledge Building Community ....... 1775
Yuyao Tong, Carol Chan, Jan van Aalst

Crossover Papers
Towards a Framework for Smart Classrooms that Teach Instructors to Teach .............................................. 1779
David Gerritsen, John Zimmerman, Amy Ogan

Augmenting Formative Writing Assessment with Learning Analytics: A Design Abstraction Approach ......... 1783
Simon Knight, Antonette Shibani, Simon Buckingham-Shum

Distributed Representation of Misconceptions ................................................................................................. 1791
Zachary Pardos, Scott Farrar, John Kolb, Gao Xian Peh, Jong Ha Lee

Envisioning a Learning Analytics for the Learning Sciences ........................................................................... 1799
Alyssa Wise, Yi Cui

Renovating Assessment for the Future: Design-Based Implementation Research for a Learning-in-Class ... 1807
Hajime Shirouzu, Moegi Saito, Shinya Ikubo, Takahiro Nakayama, Kimihiko Hori

Applying Group Communication Analysis to Educational Discourse Interactions at Scale ....................... 1815
Nia Dowell, Oleksandra Poquet, Christopher Brooks

Transhumanism and Education: Embodied Learning in an Era of Altered Bodies ........................................... 1823
Michael Eisenberg

Scaffolding Peer Facilitation in Computer-Supported Problem-Based Learning Environments ..................... 1831
Asmalina Saleh, Cindy Hmelo Silver, Yuxin Chen, Katherine Shanahan, Jonathan Rowe, James Lester

How Gender Cues in Educational Video Impact Participation and Retention ............................................. 1835
Christopher Brooks, Joshua Gardner, Kaifeng Chen

Three Research Directions for Affective Learning Technologies ................................................................ 1843
Amy L. Baylor

Early Career Workshop
Politicization as Learning: Centring Racialization, Colonialism, and Gender in Learning Sciences Analysis .................................................. 1849
Joe Curnow

Reasoning About Uncertainty and Efficient Decision-making in Engineering Design .................................... 1852
Chandan Dasgupta

Studying the Process of Instructional Improvement Through the Lenses of Sense-Making Repertoires and Improvement Practices ........................................... 1854
Elizabeth B. Dyer

Understanding the Role of Embodied Interaction in Preschool Children’s Learning About Science in Informal Settings ............................................................................... 1857
Zayba Ghazali-Mohammed

Identifying Expansive Learning in Democratic Activity: A CHAT/DBR Approach to Community-Based Design Partnerships ........................................................................... 1860
José W. Meléndez

Young Children’s Inquiry Within and Across Settings .................................................................................... 1863
Danielle Teodora Keifert
Understanding, Redefining, and Designing for Broadening Participation ........................................................ 1866

Déana Aeolani Scipio
Creativity as a Lens to Frame Teachers’ Use of Games for Learning .............................................................. 1869

Mamta Shah
Defining, Designing, and Documenting Computational Thinking Across K-12 Education ............................. 1873

David Weintrop
Doctoral Consortium
Fabric-based Computing: New Materials for Learning Computer Science ...................................................... 1879

Anna Keune
Supporting Undergraduate Bioscience Learners in Problem-Solving Process Skills Using a Technology-Enhanced Learning Environment ................................................................. 1880

Anurag Deep
Knowledge Places: Embedding Knowledge in the Space of the Classroom .................................................... 1881

Anthony Perritano
Using Multiple Embodied Representations to Support Learners in Making Connections Across Modeling Activities ..................................................................................................................... 1882

Chris Georgen
Why Can’t We All Just Get Along?: Focusing on Socioemotional Climates to Understand Emotions in Collaborative Learning ........................................................................................................ 1883

Nikki G. Lobczowski
Collaborative Writing in Higher Education: Investigating the Implementation of CSCL Tools and the Role of Prior Individual Experiences and Preferences ........................................................................... 1884

Nore De Grez, Bram De Wever
The Effects of the Productive “Visible-Annotation Tool” (P-“VAT”) for Collaborative Knowledge Construction on Higher-Order Interaction and Collaborative Outcome ................................................................................. 1885

Yoonhee Shin
Computation, Constructivism, and Curriculum Design .................................................................................... 1886

Shayan Doroudi
Exploring the Definition and Measurement of Collaborative Problem Solving .................................................. 1887

Kristin Stoeffler
Making Energy Easy: Interacting With the Forces Underlying Chemical Bonding Using the ELI-Chem Simulation .................................................................................................................................................. 1888

Asnat R. Zohar, Sharona T. Levy
Indexes
Author Index ................................................................................................................................................ A1-A11
Keyword Index ............................................................................................................................................ K1-K16
Design-Activity-Sequence: A Case Study and Polyphonic Analysis of Learning in a Digital Design Thinking Workshop

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Abstract: In this case study, we report on the outcomes of a one-day workshop on design thinking attended by participants from the Computer-Supported Collaborative Learning conference in Philadelphia in 2017. We highlight the interactions between the workshop design, structured as a design thinking process around the design of a digital environment for design thinking, and the diverse backgrounds and interests of its participants. Data from in-workshop reflections and post-workshop interviews were analyzed using a novel set of analytical approaches, a combination the facilitators made by possible by welcoming participants as co-researchers.

Keywords: Design thinking, polyphony, design learning

Designing and running the workshop
We present here some results of the experience had by facilitators and participants in a design thinking workshop held before the Computer-Supported Collaborative Learning conference in Philadelphia in 2017. In structuring the workshop, the facilitators drew on some of the multiple cognitive and procedural strategies that are interwoven in designerly ways of knowing. Each stage of the design thinking process - framing, ideation, prototyping, deploying, and iteration - was structured as a step in the workshop schedule, and each stage was closed by the participants reflecting on their experiences. After the workshop, the facilitators interviewed each participant using a semi-structured interview protocol, and subsequently invited them to join as research partners in the project described here.

Methodological approaches
The collaborative analysis of data from the one-day workshop combined insights from the analytical methods used by the different team members: design case, case study, thematic analysis, and polyphony.

Design case (Howard & Myers, 2011): The ideation stage of the design thinking process takes participants through divergent thinking (idea generation) and convergent thinking (pattern recognition, synthesis, and integration of ideas). Solutions are individually generated and then categorized, synthesized, and integrated by the group, leading to the selection of a target solution. For this workshop, the ill-structured problem of the design case was translating this process from a physical to a digital setting. The design move to use all stages of the design thinking process did create some difficulties, including blurring where the boundary of the problem was set. Similarly, the design decision of ensuring that the participants experienced the affordances of physical tools was made at the expense of using the affordances of digital media that would be a necessary part of a virtual environment solution.

Case study methodology (Merriam & Tisdell, 2016): The experiences of workshop participants can be taken as one case, and, at the next level, the phases of the design thinking process present multiple cases.

Thematic analysis: Transcripts of the interviews and the reflections were entered into the Dedoose qualitative data analysis software (www.dedoose.com/). Three members of the research team each coded all the written data. The codebook and the work of other coders was available to the whole team.

Polyphony analysis: Built on natural language processing, an analysis of the polyphony of discourse was used on the interviews only. Collaborating groups sometimes display a kind of spontaneous choreography (Trausan-Matu, 2013) in their interactions, including convergent and divergent inter-animation patterns (Trausan-Matu, Stahl, & Sarmiento, 2007). The interactions of the members of the group consist in individual and group knowledge construction cycles (Stahl, 2006) and this socially built discourse can be considered as containing several parallel threads (voices) in a discourse, where a voice is a group of one to three words that appear semantically connected in the text. These voices demonstrate divergent/convergent inter-animations in moving towards a shared goal (Trausan-Matu, Stahl, & Sarmiento, 2007).

Findings
Each of the methodologies highlight different aspects of the participants’ responses to the workshop and their findings illustrate different implications for replicating or adapting the workshop on digital design thinking for other groups.

Thematic coding analysis showed the ties of the design thinking process to group dynamics, identity, and distributed cognition. The cycles of divergent and convergent thinking were linked with the affordances of a physical environment (silent individual and group processes) and with productive struggle. Each interviewee recognized the diversity of the group’s backgrounds, along with the challenges and the benefits of group diversity in enhancing the design thinking process and developing better solutions. The analysis confirms the caution that Boon, Chappin, & Perenboom (2014, p. 59) draw from the literature that team members should be different, but not too different.

Polyphonic analysis highlighted divergent and convergent cycles between the “voices”. The most prominent voices, labelled “think, design, thing” and “think, idea, design”, were woven throughout the interviews, along with voices on participation (“talk, communicate, express”; “participate, introduce, enter”).

Participant reflections and interviews also indicated the importance of the tools used in the design thinking process. Tools are important supports first for knowledge discovery and then for communicating and persuading others in the design team. Focusing in on the imagined learning environment, both analyses highlighted in different ways the participants’ conceptions of a multi-part, configurable space, and their assessments of the costs and benefits of physical and virtual environments, including the quality of communication in each environment, and the emotional liberty that an online design thinking space might support.

Implications
Knowledge production, according to Barry, Born, & Weszkalnys (2008), happens through the dialogue of ideas as much as through their synthesis, and our analysis of this design thinking workshop bear this out. Diversity can provoke dialogue, and we therefore encourage the organizers of future workshops to seek out the opportunities that diversity provides; to recruit participants from different backgrounds, languages, disciplines and motivations and connect them through a design thinking process which uses digital tools to build a digital design thinking environment. Diversity can also power the balance between convergence and divergence in a project design (Boon et al., 2014). Despite the special analytical challenges that collaborative design presents (Kapur, Voiklis, & Kinzer, 2011; Strijbos & Fischer, 2007), the divergence-convergence cycle emerged in this workshop as an anchor for a group whose members were new to each other and new to design thinking. Representing and analyzing the divergence-convergence cycle over time was enhanced by combining qualitative and design perspectives with newer analytical models, methods, and tools such as computer systems based on polyphony (Trausan-Matu, Dascalu, & Rebedea, 2014).

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