

Janet Kolodner  
Pelle Ehn  
Christopher Hoadley  
Judith Uchidiuno  
Tamara Clegg  
June Ahn  
Daniel Pauw  
Austin Beck  
Kelly Mills  
Joseph Polman  
Angela M. Kohnen  
Michelle P. Whitacre  
Rosemary McBryan Davidson  
Engida H. Gebre  
Helene Gelderblom  
Marti Louw  
Nina Barbuto  
Kevin Crowley  
Juan Pablo Hourcade  
Michelle Hoda Wilkerson  
Lisa Maurer  
Ann Light  
Jos Boys  
Kayla DesPortes  
Allison Druin  
Jon Kolko  
Brenna McNally  
Mona Leigh Guha  
Elizabeth B.-N. Sanders  
Yvonne Rogers  
Christopher Frauenberger  
Chris Quintana

# PARTICIPATORY DESIGN FOR LEARNING

Perspectives  
from  
Practice  
and  
Research

Edited by  
Betsy **DiSalvo**,  
Jason **Yip**,  
Elizabeth **Bonsignore**,  
and Carl **DiSalvo**



# PARTICIPATORY DESIGN FOR LEARNING

Participatory Design is a field of research and design that actively engages stakeholders in the processes of design in order to better conceptualize and create tools, environments, and systems that serve those stakeholders. In *Participatory Design for Learning*, contributors from across the fields of the learning sciences and design articulate an inclusive practice and begin the process of shaping guidelines for such collaborative involvement. Drawing from a wide range of examples and perspectives, this book explores how participatory design can contribute to the development, implementation, and sustainability of learning innovations. Written for scholars and students, *Participatory Design for Learning* develops and draws attention to practices that are relevant to the facilitation of effective educational environments and learning technologies.

**Betsy DiSalvo** is Assistant Professor in the School of Interactive Computing at the Georgia Institute of Technology, USA.

**Jason Yip** is Assistant Professor in the Information School at the University of Washington, USA.

**Elizabeth Bonsignore** is Postdoctoral Researcher in the Human-Computer Interaction Lab and College of Information Studies at the University of Maryland, USA.

**Carl DiSalvo** is Associate Professor in the School of Literature, Media, and Communication at the Georgia Institute of Technology, USA.



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*Edited by  
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# FOREWORD

Christopher Hoadley said it well in Chapter 3 of this book (I summarize): Learning scientists have been really good at being forward-thinking and pluralistic in their understanding of learning and their use of learning theory, taking into account in their research and design what we know about learning at many different levels of abstraction, from neurophysiological to cognitive and social and through to cultural. We pride ourselves in bringing a variety of theoretical perspectives to each of our projects. However, we've taken a far more "traditionalist" approach to engaging in design itself. When we design curriculum and technology, we hold the power on our design teams. Experience designers help us make it engaging, and teachers and students help us debug our designs and explain what's not working. But, in general, experienced designers, teachers, students, and other stakeholders are not equal members of our teams. How could they be? We're the ones who know learning, and we're aiming to foster learning. So we design *for* our stakeholders and not usually *with* them.

There's good reason for that. Our community of designers has taken more risks than any other community of designers of educational materials; we're designing the future, not merely the next curriculum or curriculum units or technologies that will be used in the educational environments (schools) of today. And we've been engaged in arguing that theory-driven iterative design is a first-class research activity, along with investigative methods. How can we make the case that theory-driven iterative design is a first-class research activity if our teams include as equal members partners who know little or know only narrowly about learning theory? As well, we are usually designing for the far future; we are trying to lay the groundwork for what will be common 10, 15, 20 years from now. Our knowledge of learning can help us imagine that future better than others can; how can others who don't have our kind of imagination help us with that? I am part of that "we";

in fact, the description fits me and my approach really well. And I've been very successful, thank you, at working this way.

But the truth is, it isn't actually working as well as we want it to. First of all, learning scientists are beginning to have some humility about the lack of influence our designs have had on our educational system and are recognizing the need to work more closely with local stakeholders to bring change. Second, one size doesn't fit all, and a really big intellectual challenge we face in designing educational materials is designing them in ways that allow for adaptation. Learners in different communities have had different experiences and therefore bring different prior knowledge to bear. And the places where learners live often offer opportunities for making the educational experience more engaging and connected to their lives. Poor kids in the Midwest, for example, may never have experienced the ocean; using differences in the temperature between sand and water doesn't work for those kids in thinking about heat transfer. And why would kids who live near the Delaware Water Gap in Pennsylvania or New Jersey want to address an ecology challenge that focuses on the Rouge River in the Midwest? And what about those kids in farm communities who have experienced farm ecosystems and the effects of changing weather up close? Or the kids in fishing communities who are experiencing different types of ecosystems and different effects of changing weather up close? Should they learn about ecosystems in the context of an ecosystem they are already familiar with, or some other one? If the one they are in, how can place be taken advantage of? And, if some other one, how should the connections be made to what the kids are already familiar with?

Making the educational materials we design adaptable requires two things, I think: (1) setting up the kinds of infrastructure that support productive adaptation, and (2) learning to design our curriculum materials and technologies so that they are adaptable. I don't think we can do either without learning better how to include our stakeholders as real partners in our deliberations. The first is happening. Design-based implementation and networked-improvement communities are two approaches to adapting mostly designed approaches for local situations, in the process supporting practitioners (teachers) in understanding important theory that underlies those approaches and developing capabilities necessary for their implementation. This is not easy, and the designers of these approaches have taken lessons from participatory design but are not practitioners of the approach; I am hoping that the chapters in this book might introduce some ideas that will ease the load.

Designing so that curriculum units and use of technology are adaptable to place is, I think, much harder, and I'm happy to report that this book provides ideas about how to do that. A lesson that can be learned from work in design-based implementation teams and networked-improvement communities, and from Polman et al.'s work reported in Chapter 6, for example, is that getting to the point where participants can participate as equals doesn't happen quickly. Multi-stakeholder teams, like interdisciplinary ones, develop understanding of

what others bring, understanding of the joint endeavor, and ways of interacting productively only over long periods of time—time counted in years.

Interestingly, both the learning scientists' chapters and those of participatory designers shed light on how to manage evolving partnerships. Participatory designers reflect on what that development looks like, and the challenges and opportunities for fostering joint understanding that arise as understanding emerges among members of a team. For example, Light and Boys (Chapter 12) focus on what collaboration requires and involves when it is happening across and between participants from different disciplinary contexts who are designing toward complex ends, while Sanders's (Chapter 16) autobiographical chapter lays out many of things she's learned, from her long career as a participatory design practitioner, about making teams work.

Learning scientists, on the other hand, reflect on the particular challenges of managing design teams that include experts on learning processes (learning scientists) and the stakeholders they are designing for. Uchidiuno et al. (Chapter 5), Wilkerson (Chapter 10), and Louw et al. (Chapter 8), for example, discuss the work of getting to joint understanding and the roles different participants might play. Uchidiuno et al. discuss how to get to empathy so that joint designing can happen; really hard, but they have ideas about how to do it. Wilkerson focuses on the added complexity of introducing new uses of technology that carry with them the need for teachers to learn new skills and buy into new pedagogies and social configurations. She, too, sheds light on how to include teachers in the planning such that they feel they are part of the decision-making. Louw et al. discuss the level of detail that might go into top-down designs so that local practitioners, leaders, and learners can adapt them to local needs and the roles representative stakeholders can play on those design teams. None of these authors buys in to the radical democratic ideal of participatory design, but they do inform, I think, about ways of managing inclusion, especially when progress is a priority. It's hard to imagine how the radically democratic ideal of participatory design can support large scale-up; these authors discuss the resources to make available to local groups so they can participate in enacting small-scale adaptations and ways of interacting that minimize the power dynamic between participants with different goals, experiences, and expertise.

In a delightful Chapter 17, a participatory design practitioner (Frauenberger), a learning scientist who has done extensive design of learning technologies (Quintana), and just-plain designer of learning technologies (Rogers, who describes herself this way) discuss what they've learned about what works when, and where the synergies between these approaches are. Nicest about that chapter, I think, is that it provides a model of how learning scientists and participatory design practitioners might interact in the future to enhance both endeavors.

In the last chapter, the book's editors express some sorrow that rather than gathering together best practices where the two fields meet, the chapters identify

many new challenges that arise when bringing learning into participatory design and when using a participatory design approach to designing learning technologies and curriculum. I'm not surprised, and I don't think there is anything to apologize for. The book sets the stage for continuing the discussion, and difficult discussions are something academics like a lot. I gather from the book that participatory design practitioners enjoy such discussions just as much. I look forward to the continued discussion.

**Janet L. Kolodner**

Chief Learning Scientist at the Concord Consortium  
and Regents' Professor Emerita in Computing  
and Cognitive Science at the Georgia Institute of Technology

## SECTION I

# Introduction



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# 1

## PARTICIPATORY DESIGN FOR LEARNING

*Betsy DiSalvo, Jason Yip, Elizabeth Bonsignore,  
and Carl DiSalvo*

The goal of the learning sciences is to not only understand the phenomena of learning, but also to impact educational practices and enable more effective learning. To meet these goals, learning scientists use iterative and participatory design methods as they design curriculum approaches, learning technologies, and technology-rich learning environments. Participatory design (PD) is a field of research and design that examines how stakeholders are able to participate with designers on the development of tools, artifacts, and activities that are important to the user group. Design-based research methods allow them to, in parallel, iterate toward better designs and add to foundational understanding of learning processes and how to support learning. Taking a learner-centered approach to design focuses them on the diverse and changing needs of learners (as opposed to sophisticated users) who may be working toward learning disciplinary content and practices at the same time they are getting used to using new software tools. Taking a community-based design approach helps them make sure they are addressing the needs of learners in ways that learners can identify with, that teachers or facilitators find useful, and that are consistent with the culture of the community. Using a combination of these methods, learning sciences researchers design curriculum and activities, technologies, policies, teacher professional development experiences, and other artifacts and systems in support of learning. They and their teams conceive new designs, develop them, put them to work in the world, test them, refine them, and iterate. The best products tend to come from teams that include not only researchers but also students, teachers, parents, community members, and other stakeholders.

Until now, however, the learning sciences community has not focused on design of artifacts for supporting learning as a formal practice, discipline, and

field of research. Nowhere is this oversight more evident than with regard to engaging stakeholders actively in the design process. While some research teams have included learners, their families and communities, teachers, and administrators in the design of new learning environments and technologies, to date, there has been little discussion about how to include *direct input* from these multiple participant stakeholders while designing.

We aim, in this volume, to articulate a design practice that is inclusive of those who will use the designed artifacts we are creating and, with that, to begin the process of developing guidelines for such practice. The authors of chapters in this book have been informed by the practice that the Human-Centered Computing community calls participatory design, or “PD.” In PD, users and other stakeholders in the life of artifacts that are being designed participate directly in design processes. Our goal is to develop and draw attention to design practices that are relevant to participatory design of learning environments and learning technologies and that directly involve learners, teachers, and other community members in all the different steps of designing. Such designing, if done well, will insure that decisions about how to foster learning rely not only on expertise in how people learn, but also on the context in which the designs will be used and the people who will use them. PD at its best offers a way of gathering together and engaging a pluralistic community to collectively imagine and create designs for new technologies, environments, and types of experiences. Practitioners of PD focus, like learning scientists do, on designs for contexts of use. Learner-centered and design-based approaches in the learning sciences are, like PD, founded on the principle that target populations are best served when designs address the needs of community members. PD focuses on giving such stakeholders a high degree of agency throughout the design process, emphasizing the cultivation of knowledge communities in which content and expertise are *co-created* by experts and other participants working in concert. In particular, PD offers methods and practices for discovering, navigating, and *co-creating* goals in direct partnership with participants, while simultaneously revealing the constraints and opportunities that these participants face in complex contexts. But despite what would seem to be a productive fit between the learning sciences and PD, there is little discussion of how to adapt PD into design of learning technologies and environments. Our claim is that PD is a mostly untapped resource that, if used well, can advance the development, implementation, and sustainability of learning innovations.

We claim, conversely, that systematic use of PD practices and outcomes as we design learning technologies and environments will enrich understanding of how people learn in ways that will ultimately contribute to improved PD practices and outcomes. Learning is increasingly important to designers of user experiences and technology that supports learners’ interactions and experiences with knowledge, information, and data. Learning is both an implicit and explicit desired outcome of many designed systems and experiences. But within user design practice and research, there is limited engagement with theories of learning. As a result, claims

about learning and the role of design are often weak, such as what learning theories can inform how successful PD is and if PD can also inform the development of learning theories. This does not need to be so. We believe it is possible to bring together PD and the learning sciences to create a vibrant and robust space of inquiry. We expect this book to help create that space and provide the intellectual infrastructure for its growth.

As a first step in crafting a foundation to increase the interaction between PD and learning sciences, our book benefits from a diverse group of contributors across the fields of the learning sciences and design. We have divided our chapters into five sections. The first and last sections serve as bookends to our core collection: Section I provides an introduction to PD and its history with the learning sciences, and Section V offers closing reflections and a call to action for moving forward. The sections in between provide a wide range of working examples and perspectives that cover design practices, audiences, and challenges that designers, education practitioners, and researchers alike will be able to apply in their work.

The first section of papers, beyond this introduction, includes the inspiring reflections of Pelle Ehn (Chapter 2), one of the founders of the participatory design movement in Scandinavia, on the history of participatory design and its shared foundations and commitments with the learning sciences. Christopher Hoadley continues this historical reflection in Chapter 3, describing and analyzing the long-standing interplay between the fields of design and learning. Chapter 4 is the transcript of a conversation mediated by Jason Yip, between Christopher Hoadley, an expert in the history of design in the learning sciences, and Carl DiSalvo, an expert in the field of design. This conversation provides a unique opportunity to see the ways that the field of learning sciences and design approach participatory design and where some of the fundamental differences and similarities lie.

The second section of the book brings together diverse perspectives on the types of participants that can be included in participatory design and ways of working with them. This includes Chapter 5, by Judith Uchidiuno et al., that speaks to the unique ways that families can contribute to participatory design as a research method to better understand how learning happens between generations in a family. In contrast, Chapter 6, by Joseph Polman et al., demonstrates how the unique power dynamic between learning researchers and teachers produces a very different type of participatory design that takes place over semesters and even years. In Chapter 7, Helene Gelderblom looks at students as participants in designing their own course and how that relationship can shape the learning experience. These three chapters taken together offer an opportunity to reflect on the diversity of methods and approaches to integrating participation in design and how they are interdependent upon the relationships between designers and participants, and among participants.

The chapters in third section of the book are case studies on specific projects or practices of participatory design. Chapter 8, by Marti Louw, Nina Barbuto, and Kevin Crowley, provides a case study of collaboration between researchers

trained in design and the learning sciences and their interdisciplinary approach to designing learning pathways with families. Chapter 9 is a case study by Juan Pablo Hourcade on the unique challenges in designing with children in the autism spectrum. Chapter 10, by Michelle Hoda Wilkerson, is the post analysis that reflects on the participation of after-school professionals in the development of digital tools. In Chapter 11, Lisa Maurer and Elizabeth Bonsignore reflect on the development of Pearson Kids CoLab and how participatory design principles placed the learner as the central player in the education industry's product design process.

The fourth section of the book looks at emerging perspectives on participatory design. Ann Light and Jos Boys (Chapter 12), who are designers and researchers of design practices, present a number of cutting-edge approaches to participatory design and reflect on the learning outcomes and applications for learning that can be gleaned from them. In Chapter 13, Betsy DiSalvo and Kayla DesPortes explore how applying participatory design approaches, in the form of formative and meta-design, can help to shape learning that is driven by the values of the learners. Chapter 14 is a conversation facilitated by Elizabeth Bonsignore between a human-computer interaction researcher, Allison Druin, and a practicing designer and design educator, Jon Kolko. This conversation reflects many of the differences between the goals of academic researchers and those of design professionals in their respective use of participatory design. Brenna McNally and Mona Leigh Guha in Chapter 15 share perspectives on creating and sustaining co-design teams that allow participants to develop expertise.

In the concluding section of the book, Elizabeth B.-N. Sanders (Chapter 16) provides an autobiographical account of participatory design in her work as a design educator and insights into frameworks for radical ways to move forward with participatory design and the efforts to design for conviviality. Chapter 17 is our final conversation. This conversation, facilitated by Elizabeth Bonsignore, highlights three researchers (Christopher Frauenberger, Chris Quintana, and Yvonne Rogers) and provides a personal narrative of how they each came to use PD and its relationship to learning, which highlight conflicts between PD and the learning sciences and what needs to be addressed to move forward. Finally, Chapter 18 is the editors' critical reflection on design for learning and educational environments and their call to action for learning scientists and design researchers alike to seize opportunities for increased cross-pollination and coordinated, interdisciplinary collaboration between their complementary—but currently parallel—research tracks.

For some readers, this will be the first time they have considered their work in learning with a PD lens; for others, PD practices and methods came first, and learning sciences' expertise adds a new dimension to the negotiation of goals and design outcomes among participants. Taken together, our compendium offers a resource that will support researchers who aim to incorporate PD principles into their learning frameworks, as well as PD practitioners who aspire to incorporate learning constructs and theories into their designs.

## Learning in Participatory Design as I Found It (1970–2015)

- Binder, Thomas , Eva Brandt , Pelle Ehn , and Joakim Halse . 2015. Democratic Design Experiments—Between Parliament and Laboratory. In *CoDesign* 11 (3–4), 152–165.
- Bjerknes, Gro , Pelle Ehn , and Morten Kyng . 1987. *Computers and Democracy*. Aldershot: Gower Publishing Company Limited.
- Björgvinsson, Erling . 2007. Socio-Material Mediations: Learning, Knowing and Self-Produced Media within Healthcare. Karlskrona: Blekinge Institute of Technology.
- Björgvinsson, Erling , Pelle Ehn , and Per-Anders Hillgren . 2012. Agonistic Participatory Design: Working with Marginalised Social Movements. In *CoDesign* 8 (2–3): 127–144.
- Braverman, Harry . 1974. *Labor and Monopoly Capital—The Degradation of Work in the Twentieth Century*. New York: Monthly Review Press.
- Dewey, John . 1934/1980. *Art as Experience*. New York: Berkeley Publishing Group.
- Dewey, John . 1938. *Logic: The Theory of Inquiry*. New York: Henry Holt and Company.
- Ehn, Pelle . 1974. Emancipation and the Design of Information Systems. Hindås: Altorg.
- Ehn, Pelle . 1988. Work-Oriented Design of Computer Artifacts. Falköping: Erlbaum.
- Ehn, Pelle . 1998. Manifesto for a Digital Bauhaus. In *Digital Creativity* 9 (4): 207–217.
- Ehn, Pelle , and Morten Kyng . 1991. Cardboard Computers: Mocking-It-Up or Hands-on the Future. In *Design at Work*, ed. J. Greenbaum and M. Kyng (pp. 169–195). Mahwah: Erlbaum.
- Ehn, Pelle , Elisabet Nilsson , and Richard Topgaard (eds.). 2014. *Making Futures—Marginal Notes on Innovation, Design and Democracy*. Cambridge, MA: MIT Press.
- Ehn, Pelle , and Åke Sandberg . 1979. *Företagsstyrning och Löntagarmakt*. Falköping: Prisma.
- Ehn, Pelle , and Dan Sjögren . 1991. From Systems Descriptions to Scripts for Action. In *Design at Work*, ed. J. Greenbaum and M. Kyng (pp. 241–268). Mahwah: Erlbaum.
- Ehn, Pelle , and Peter Ullmark . Forthcoming. *Educating the Reflective Design Researcher*.
- Emilson, Anders . 2015. *Design in the Space between Stories: Design for Social Innovation and Sustainability—From Responding to Societal Challenges to Preparing for Societal Collapse*. Doctoral dissertation. Malmö University.
- Engetröm, Yrjö. 1987. *Learning by Expanding*. Helsinki: Orienta-Konsultit.
- Freire, Paulo . 1971. *Pedagogy of the Oppressed*. New York: Herder and Herder.
- Göranzon, Bo. 1993. *The Practical Intellect—Computers and Skills*. London: Springer-Vorlag.
- Haraway, Donna J. 1991. Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. In *Simians, Cyborgs, and Women*, ed. D. Haraway (pp. 183–202). Abingdon: Routledge.
- Haraway, Donna J. 2007. *When Species Meet*. Minneapolis: University of Minnesota Press.
- Hillgren, Per-Anders . 2006. Ready-made-media-actions: Lokal produktion och användning av audiovisuella medier inom hälso-och sjukvården. Blekinge Institute of Technology.
- Hmelo-Silver, Cindy E. 2004. Problem-Based Learning: What and How Do Students Learn? In *Educational Psychology Review* 16 (3): 235–266.
- Howard, Robert . 1985. Utopia—Where Workers Craft New Technology. In *Technological Review* 88 (3): 43–49.
- Karasti, Helena , and Anna-Liina Syrjänen . 2004. Artful Infrastructuring in “Two Cases of Community PD.” In *Proceedings of the Eighth Conference on Participatory Design 2004* (pp. 20–30). Canada.
- Latour, Bruno . 1999. *Pandora’s Hope: Essays on the Reality of Science Studies*. Cambridge, MA: Harvard University Press.
- Latour, Bruno . 2005. *Reassembling the Social: An Introduction to Actor-Network-Theory*, Clarendon Lectures in Management Studies. Oxford: Oxford University Press.
- Latour, Bruno , and Peter Weibel (eds.). 2005. *Making Things Public: Atmospheres of Democracy*. Cambridge, MA: MIT Press.
- Lave, Jean , and Etienne Wenger . 1991. *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.
- Law, John , and Annemarie Mol . 2001. Situating Technoscience: An Inquiry into Spatialities. In *Environment and Planning D: Society and Space* 19 (5): 609–621.

Lewin, Kurt . 1946. Action Research and Minority Problems. *Journal of Social Issues* 2 (4): 34–46.

Lindström, Kristina , and Åsa Ståhl . 2014. Patchworking Publics-in-the-Making—Design, Media and Public Engagement. Doctoral dissertation. Malmö University.

Marx, Karl . 1845/1888. Thesis on Feuerbach.

Nyggard, Kristen , and Olav Bergo . 1973. Planlegging, Styling og Databehandling. Oslo: Tiden Norsk Forlag.

Nyggard, Kristen , and Olav Bergo . 1975. The Trade Unions—New Users of Research. In *Personal Review*, no. 2.

Sandberg, Åke . 1981. Om arbetslivsforskningens metoder och förutsättningar. In *Forskning för förändring. Om metoder och förutsättningar för handlingsinriktad forskning i arbetslivet*, ed. Å. Sandberg . Stockholm: Arbetslivscentrum.

Schön, Donald A. 1983. *The Reflective Practitioner—How Professionals Think in Action*. New York: Basic Books.

Schön, Donald A. 1987. *Educating the Reflective Practitioner*. San Francisco: Jossey-Bass.

Seravalli, Anna . 2014. *Making Commons—Attempts at Composing Prospects in the Opening of Production*. Doctoral dissertation, Malmö University.

Simon, Herbert A. 1969. *The Sciences of the Artificial*. Cambridge, MA: MIT Press.

Star, Susan L. 1991. Power, Technology and the Phenomenology of Conventions: On Being Allergic to Onions. In *A Sociology of Monsters: Essays on Power, Technology and Domination*, ed. J. Law . London: Routledge.

Stengers, Isabelle . 2005. The Cosmopolitical Proposal. In *Making Things Public*, ed. B. Latour and P. Weibel . Cambridge, MA: MIT Press.

Suchman, Lucy . 1987. *Plans and Situated Actions: The Problem of Human–Machine Communication*. New York: Cambridge University Press.

Telier, A. ( Thomas Binder , Giorgio De Michelis , Pelle Ehn , Giulio Jacucci , Per Linde and Ina Wagner ). 2011. *Design Things*. Cambridge, MA: MIT Press.

Winograd, Terry , and Fernando Flores . 1986. *Understanding Computers and Cognition: A New Foundation for Design*. Norwood: Ablex.

Wittgenstein, Ludwig . 1953. *Philosophical Investigations*. Oxford: Basil Blackwell.

## How Participatory Design Has Influenced the Learning Sciences

Argyris, C. , & Schön, D. A. (1991). *Theory in Practice: Increasing Professional Effectiveness* (1st Classic Paperback ed.). San Francisco: Jossey-Bass Publishers.

Carr, A. A. (1997). User-design in the creation of human learning systems. *Educational Technology Research and Development*, 45(3), 5–22.

Cobb, P. , Confrey, J. , diSessa, A. , Lehrer, R. , & Schauble, L. (2003). Design experiments in educational research. *Educational Researcher*, 32(1), 9–13, 35–37.

Collins, A. (1992). Toward a design science of education. In E. Scanlon & T. O'Shea (Eds.), *New Directions in Educational Technology* (pp. 15–22). New York: Springer-Verlag.

Design-Based Research Collective . (2003). Design-based research: An emerging paradigm for educational inquiry. *Educational Researcher*, 32(1), 5–8, 35–37.

Dewey, J. (1925). Volume I: 1925. In J. A. Boydston (Ed.), *John Dewey: The Later Works* (electronic ed.). Carbondale, IL: Southern Illinois University Press.

diSessa, A. (1991). Local sciences: Viewing the design of human-computer systems as cognitive science. In J. M. Carroll (Ed.), *Designing Interaction: Psychology at the Human-Computer Interface* (pp. 162–202). Cambridge, England: Cambridge University Press.

Gardner, H. (1985). *The Mind's New Science: A History of the Cognitive Revolution*. New York: Basic Books.

Hoadley, C. (2004). Learning and design: Why the learning sciences and instructional systems need each other. *Educational Technology*, 44(3), 6–12.

Hoadley, C. (2005). The shape of the elephant: Scope and membership of the CSCL community. In T. Koschmann , D. D. Suthers , & T.-W. Chan (Eds.), *Computer-Supported*

Collaborative Learning (CSCL) 2005 (pp. 205–210). Taipei, Taiwan: International Society of the Learning Sciences.

Hoadley, C. , & Van Haneghan, J. P. (2011). The learning sciences: Where they came from and what it means for instructional designers. In R. A. Reiser & J. V. Dempsey (Eds.), *Trends and Issues in Instructional Design and Technology* (Third ed., pp. 53–63). New York: Pearson.

Kirby, J. , Hoadley, C. , & Carr-Chellman, A. A. (2005). Instructional systems design and the learning sciences: A citation analysis. *Educational Technology Research and Development*, 53(1), 37–48.

Lagemann, E. C. (2002). *Usable knowledge in education: A memorandum for the Spencer Foundation Board of Directors*. Chicago, IL: Spencer Foundation.

Lindblom, C. E. , & Cohen, D. K. (1979). *Usable Knowledge: Social Science and Social Problem Solving*. New Haven, CT: Yale University Press.

Molnar, A. R. (1997). Computers in education: A brief history. *T.H.E. Journal*, 24, 63–68.

Muller, M. J. , & Kuhn, S. (1993). Participatory design. *Communications of the ACM*, 36(1), 24–28.

National Research Council . (2002). *Scientific Research in Education*. Washington, DC: National Academy Press.

Norman, D. A. , & Draper, S. W. (1986). *User-Centered Systems Design: New Perspectives on Human-Computer Interaction*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Penuel, W. R. , Allen, A. R. , Farrell, C. , & Coburn, C. E. (2015). Conceptualizing research-practice partnerships as joint work at boundaries. *Journal for Education of Students at Risk (JESPAR)*, 20(1–2), 182–197. doi: 10.1080/10824669.2014.988334

Penuel, W. R. , Roschelle, J. , & Shechtman, N. (2007). Designing formative assessment software with teachers: An analysis of the co-design process. *Research and Practice in Technology Enhanced Learning*, 2(1), 51–74.

Scaife, M. , Rogers, Y. , Aldrich, F. , & Davies, M. (1997, March 22–27). Designing for or designing with? Informant design for interactive learning environments. Paper presented at the CHI '97, Atlanta.

Simon, H. A. (1969). *The Sciences of the Artificial*. Cambridge, MA: MIT Press.

Soloway, E. , Guzdial, M. , & Hay, K. E. (1994). Learner-centered design: the challenge for HCI in the 21st century. *Interactions*, 1(2), 36–41.

## Learning about Learning through Participatory Design with Families

Ahn, J. , Clegg, T. , Yip, J. , Bonsignore, E. , Pauw, D. , Gubbels, M. , ... Rhodes, E. (2014). Seeing the unseen learner: Designing and using social media to recognize children's science dispositions in action. *Learning Media and Technology*, 41(2), 252–282.

Barron, B. , Martin, C. K. , Takeuchi, L. , & Fithian, R. (2009). Parents as learning partners in the development of technological fluency. *International Journal of Learning and Media*, 1, 55–77.

Beech, S. , Geelhoed, E. , Murphy, R. , Parker, J. , Sellen, A. , & Shaw, K. (2004). *The Lifestyles of Working Parents: Implications and Opportunities for New Technologies*. HP Tech report HPL-2003-88 (R. 1). Retrieved from [www.researchgate.net/profile/Abigail\\_Sellen/publication/228827452\\_The\\_Lifestyles\\_of\\_Working\\_Parents\\_Implications\\_and\\_Opportunities\\_for\\_New\\_Technologies/links/0912f511a2ced9eb3e000000.pdf](http://www.researchgate.net/profile/Abigail_Sellen/publication/228827452_The_Lifestyles_of_Working_Parents_Implications_and_Opportunities_for_New_Technologies/links/0912f511a2ced9eb3e000000.pdf)

Bronfenbrenner, U. (1986). Ecology of the family as a context for human development: Research perspectives. *Developmental Psychology*, 22(6), 723.

Brown, T. (2009). *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*. New York: Harper Collins.

Brown, T. (2008). Design thinking. *Harvard Business Review*, 86(6), 84–92.

Clegg, T. , Bonsignore, E. , Ahn, J. , Yip, J. , Pauw, D. , Gubbels, M. , ... Rhodes, E. (2014). Capturing personal and social science: Technology for integrating the building blocks of

disposition. In J. Polman , E. Kyza , K. O'Neill , I. Tabak , W. Penuel , S. Jurow , ... L. D'Amico (Eds.), *Learning and Becoming in Practice: The International Conference of the Learning Sciences (ICLS) 2014*, Volume 1 (pp. 455–462). Boulder, CO: International Society of the Learning Sciences.

Dalsgaard, T. , Skov, M. B. , & Thomassen, B. R. (2007). eKISS: Sharing experiences in families through a picture blog. In *Proceedings of the 21st British HCI Group Annual Conference on People and Computers: HCI ... But Not as We Know I*. Volume 1 (pp. 67–75). British Computer Society.

Davidoff, S. (2010). Routine as resource for the design of learning systems. In *Proceedings of the 12th ACM International Conference Adjunct Papers on Ubiquitous Computing—Adjunct* (pp. 457–460). New York: ACM.

Davidoff, S. , Zimmerman, J. , & Dey, A. K. (2010). How routine learners can support family coordination. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 2461–2470). New York: ACM.

Druin, A. (1999). Cooperative inquiry: Developing new technologies for children with children. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 592–599). New York: ACM.

Druin, A. (2002). The role of children in the design of new technology. *Behaviour & Information Technology*, 21(1), 1–25.

Faste, R. A. , Roth, B. , & Wilde, D. J. (1993). Integrating creativity into the mechanical engineering curriculum. In C. A. Fisher (Ed.), *ASME Resource Guide to Innovation in Engineering Design* (pp. 93–98). New York: American Society of Mechanical Engineers.

Friedman, B. , Kahn, P. , & Borning, A. (2002). Value sensitive design: Theory and methods. University of Washington Technical Report, 02–12.

Gardner, F. (2000). Methodological issues in the direct observation of parent–child interaction: Do observational findings reflect the natural behavior of participants? *Clinical Child and Family Psychology Review*, 3(3), 185–198.

Goldman, S. , & Booker, A. (2009). Making math a definition of the situation: Families as sites for mathematical practices. *Anthropology & Education Quarterly*, 40(4), 369–387.

Goldman, S. , Pea, R. , Blair, K. P. , Jimenez, O. , Booker, A. , Martin, L. , & Esmonde, I. (2010). Math engaged problem solving in families. In *Proceedings of the 9th International Conference of the Learning Sciences*, Volume 1 (pp. 380–387). Chicago: International Society of the Learning Sciences.

Guha, M. L. , Druin, A. , Chipman, G. , Fails, J. A. , Simms, S. , & Farber, A. (2004). Mixing ideas: A new technique for working with young children as design partners. In *Proceedings of the 2004 Conference on Interaction Design and Children: Building a Community* (pp. 35–42). New York: ACM.

Guha, M. L. , Druin, A. , & Fails, J. A. (2013). Cooperative Inquiry revisited: Reflections of the past and guidelines for the future of intergenerational co-design. *International Journal of Child-Computer Interaction*, 1(1), 14–23.

Holtzblatt, K. , & Jones, S. (1993). Contextual inquiry: A participatory technique for system design. In A. Namiokoa & D. Schuler (Eds.), *Participatory Design: Principles and Practices* (pp. 177–210). Hillsdale, NJ: Lawrence Erlbaum Publishers.

Leong, T. W. , & Iversen, O. S. (2015). Values-led participatory design as a pursuit of meaningful alternatives. In *Proceedings of the Annual Meeting of the Australian Special Interest Group for Computer Human Interaction* (pp. 314–323). New York: ACM.

Liedtka, J. , & Ogilvie, T. (2011). *Designing for Growth*. New York: Columbia Business Press.

McQueen, R. J. , Rayner, K. , & Kock, N. (1999). Contribution by participants in face-to-face business meetings: Implications for collaborative technology. *Journal of Systems and Information Technology*, 3(1), 15–34.

Muller, M. J. (2003). Participatory design: The third space in HCI. *Human-Computer Interaction: Development Process*, 4235, 165–185.

Neustaedter, C. , Brush, A. J. , & Greenberg, S. (2009). The calendar is crucial: Coordination and awareness through the family calendar. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 16(1), 1–48.

Odom, W. , Zimmerman, J. , & Forlizzi, J. (2010). Designing for dynamic family structures: Divorced families and interactive systems. In *Proceedings of the 8th ACM Conference on*

Designing Interactive Systems (pp. 151–160). New York: ACM.

Park, S. Y. , & Zimmerman, J. (2010). Investigating the opportunity for a smart activity bag. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (pp. 2543–2552). New York: ACM.

Spera, C. (2005). A review of the relationship among parenting practices, parenting styles, and adolescent school achievement. *Educational Psychology Review*, 17(2), 125–146.

Swartz, M. I. , & Crowley, K. (2004). Parent beliefs about teaching and learning in a children's museum. *Visitor Studies Today*, 7(2), 1–16.

Yarosh, S. , Chieh, Y. , & Abowd, G. D. (2009). Supporting parent–child communication in divorced families. *International Journal of Human-Computer Studies*, 67(2), 192–203.

Yip, J. , Ahn, J. , Clegg, T. , Bonsignore, E. , Pauw, D. , & Gubbels, M. (2014). "It helped me do my science": A case of designing social media technologies for children in science learning. In Proceedings of the 13th International Conference of Interaction Design and Children (pp. 155–164). New York: ACM.

Yip, J. C. , Clegg, T. , Ahn, J. , Uchidiuno, J. O. , Bonsignore, E. , Beck, A. , ... Mills, K. (2016). The evolution of engagements and social bonds during child-parent co-design. In Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (pp. 3607–3619). New York: ACM.

Yip, J. , Clegg, T. , Bonsignore, E. , Gelderblom, H. , Rhodes, E. , & Druin, A. (2013). Brownies or bags-of-stuff?: Domain expertise in cooperative inquiry with children. In Proceedings of the 12th International Conference of Interaction Design and Children (pp. 201–210). New York: ACM.

## **Evolving Curricular Designs through Teacher Adaptation and Implementation with Students over Time**

Bødker, S. (1996). Creating conditions for participation: Conflicts and resources in systems development. *Human-Computer Interaction*, 11(3), 215–236.

Brown, M. , & Edelson, D. (2003). Teaching as design: Can we better understand the ways in which teachers use materials so we can better design materials to support their change in practice? (Design Brief). Evanston, IL: Center for Learning Technologies in Urban Schools.

Bryk, A. S. , Gomez, L. M. , Grunow, A. , & LeMahieu, P. (2015). *Learning to Improve: How America's Schools Can Get Better at Getting Better*. Cambridge, MA: Harvard University Press.

Carroll, J. M. (1996). Encountering others: Reciprocal openings in participatory design and user-centered design. *Human-Computer Interaction*, 11(3), 285–290.

Davidson, R. M. (2014a). Researching the real: Transforming the science fair through relevant and authentic research. Doctoral dissertation, University of Missouri-St. Louis.

Davidson, R. M. (2014b). Using infographics in the science classroom: Three investigations in which students present their results in infographics. *The Science Teacher*, 81(3), 34–39.

Fischer, G. (2013). Meta-design: Empowering all stakeholders as co-designers. In R. Luckin , P. Goodyear , B. Grabowski , S. Puntambeker , J. Underwood , & N. Winters (Eds.), *Handbook on Design in Educational Computing* (pp. 133–145). London: Routledge.

Kali, Y. , & McKenney, S. (2012). Teachers as designers of technology-enhanced learning materials. In J. van Aalst , K. Thompson , M. J. Jacobson , & P. Reimann (Eds.), *The Future of Learning: Proceedings of the 10th International Conference of the Learning Sciences* (Vol. 2, pp. 582–583). International Society of the Learning Sciences.

Kirshner, B. , & Polman, J. L. (2013). Adaptation by design: A context-sensitive, dialogic approach to interventions. In B. Fishman , W. R. Penuel , A. Allen , & B. H. Cheng (Eds.), *Design-Based Implementation Research: Theories, Methods, and Exemplars*. National Society for the Study of Education Yearbook, Volume 112, Issue 2 (pp. 215–236). New York: Teachers College Press.

Kohnen, A. M. (2012). Teachers as editors, editors as teachers. In C. Bazerman , C. Dean , J. Early , K. Lunsford , S. Null , P. Rogers , & A. Stansell (Eds.), *International Advances in*

Writing Research: Cultures, Places, Measures (pp. 303-317). Fort Collins, CO: The WAC Clearinghouse.

Kohnen, A. M. (2013a). The authenticity spectrum: The case of a science journalism writing project. *English Journal*, 102(5), 28–34.

Kohnen, A. M. (2013b). Content-area teachers as teachers of writing. *Teaching/Writing: The Journal of Writing Teacher Education*, 2(1), 29–33.

Kohnen, A. M. (2013c). "I wouldn't have said it that way": Mediating professional editorial comments in a secondary science classroom. *Linguistics and Education*, 24(2), 75–85. doi: 10.1016/j.linged.2012.12.007

Kohnen, A. M. (2013d). Informational writing in high school science: The importance of genre, apprenticeship, and publication. *Journal of Adolescent and Adult Literacy*, 57(3), 233–242. doi: 10.1002/JAAL.220

Kohnen, A. M. , Saul, E. W. , & Singer, N. (2016). Developing support for teachers and students in secondary science classrooms through writing criteria. In S. Plane , C. Bazerman , F. Rondelli , C. Donahue , A. N. Applebee , C. Bore , P. Carlino , M. Marquillo Larruy , P. Rogers , & D. Russell (Eds.), *Recherches en écritures: Regards pluriels (Writing research from multiple perspectives)* (pp. 211–232). Lorraine, France: Centre de Recherche sur les Médiations.

Krumm, A. E. , et al. (2015). Practical measures of learning behaviors. In *Proceedings of the Second (2015) ACM Conference on Learning@ Scale* (pp. 327–330). Vancouver: ACM.

Lave, J. , & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.

Lieberman, A. , & Wood, D. R. (2002). *Inside the National Writing Project: Connecting Network Learning and Classroom Teaching*. New York: Teachers College Press.

Penuel, W. R. , Bell, P. , Bevan, B. , Buffington, P. , & Falk, J. (2016). Enhancing use of learning sciences research in planning for and supporting educational change: Leveraging and building social networks. *Journal of Educational Change*, 17(2), 251–278.

Polman, J. L. (2012). Trajectories of participation and identification in learning communities involving disciplinary practices. In D. Yun Dai (Ed.), *Design research on learning and thinking in educational settings: Enhancing intellectual growth and functioning* (pp. 225–242). New York: Routledge.

Polman, J. L. , Newman, A. , Farrar, C. , & Saul, E. W. (2012). Science journalism: Students learn lifelong science literacy skills by reporting the news. *The Science Teacher*, 79(1), 44–47.

Polman, J. L. , Newman, A. , Saul, E. W. , & Farrar, C. (2014). Adapting practices of science journalism to foster science literacy. *Science Education*, 98(5), 766–791.

Recker, M. , Walker, A. , Giersch, S. , Mao, X. , Halioris, S. , Palmer, B. , ... Robertshaw, M. B. (2007). A study of teachers' use of online learning resources to design classroom activities. *New Review of Hypermedia and Multimedia*, 13(2), 117–134. <http://doi.org/10.1080/13614560701709846>

Saul, E. W. , Kohnen, A. , Newman, A. , & Pearce, L. (2012). *Front-Page Science: Engaging Teens in Science Literacy*. Arlington, VA: NSTA Press.

Wenger, E. (1998). *Communities of Practice: Learning, Meaning, and Identity*. New York: Cambridge University Press.

Wertsch, J. V. (1998). *Mind as Action*. New York: Oxford University Press.

Whitacre, M. P. (2014). *Teacher transformation: An exploration of science teachers' changing professional identities, knowledge, and classroom practices*. Doctoral dissertation, University of Missouri–St. Louis.

Whitacre, M. P. , & Saul, E. W. (2015). High school girls' interpretations of science graphs: Exploring complex visual and natural language hybrid text. *International Journal of Science and Mathematics Education*, 1-20.

# Co-Designing an HCI Curriculum with College Students and Teaching Them about Participatory Design in the Process

- ACM & IEEE (2013). Computer Science Curricula 2013. Curriculum Guidelines for Undergraduate Degree Programs in Computer Science, December, 20 2013, at [www.acm.org/education/CS2013-final-report.pdf](http://www.acm.org/education/CS2013-final-report.pdf). Last accessed 28/3/2015.
- Bovill, C. , Cook-Sather, A. , & Felten, P. (2011). Students as co-creators of teaching approaches, course design, and curricula: implications for academic developers. *International Journal for Academic Development*, 16(2), 133–145.
- Churchill, E.F. , Bowser, A. , & Preece, J. (2013). Teaching and learning human-computer interaction: past, present, and future. *Interactions*, March and April 2013, 44–53.
- Dell, N. , Vaidyanathan, V. , Medhi, I. , Cutrell, E. , & Thies, W. (2012). Yours is better!: participant response bias in HCI. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, May 2012 (pp. 1321–1330). ACM.
- DiSalvo, B. , & DiSalvo, C. (2014). Designing for democracy in education: participatory design and the learning sciences. In *Learning and Becoming in Practice: The International Conference of the Learning Sciences (ICLS)*, Vol. 2, pp. 793–799.
- Fincher, S. , Cairns, P. , & Blackwell, A.F. (2012). A Contextualized Curriculum for HCI. Workshop summary in the *Proceedings of CHI 2012*, May 5–10, 2012, Austin, TX. pp. 2707–2710.
- Gelderblom, H. , & Van der Merwe, A. (2015). Applying human-computer interaction (HCI) design principles and techniques in HCI course design. In Coleman, E. (ed.), *Renewing ICT Teaching and Learning: Building on the Past to Create New Energies. Proceedings of the 44th Annual Southern African Computer Lecturers Association Conference (SACLA 2015)*, 1–3 July 2015, Johannesburg, South Africa, pp. 7–18.
- Jacobson, I. , Booch, G. , Rumbaugh, J. , Rumbaugh, J. , & Booch, G. (1999). *The Unified Software Development Process* (Vol. 1). Reading, PA: Addison-Wesley.
- Spinuzzi, C. (2005). The methodology of participatory design. *Technical Communication*, 52(2), 163–174.
- Vredenburg, K. , Mao, J.-Y. , Smith, P. W. , & Carey, T. (2002). A survey of user-centered design practice. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 471–478). Minneapolis, MN: ACM.
- Wasserman, A. I. (1996). Toward a discipline of software engineering. *IEEE Software*, 13(6), 23.

## Designing Learning Pathways in a Complex Learning Ecology

- Azevedo, F. S. (2011). Lines of practice: A practice-centered theory of interest relationships. *Cognition and Instruction*, 29(2), 147–184.
- Banks, J. A. , Au, K. H. , Ball, A. F. , Bell, P. , Gordon, E. W. , Gutierrez, K. , Heath, S. B. , Lee, C. D. , Lee, Y. , Mahiri, J. , Nasir, N. S. , Valdes, G. , & Zhou, M. (2007). *Learning in and out of school in diverse environments: Life-Long, Life-Wide, Life-Deep*. Seattle, WA: UW Center for Multicultural Education & The LIFE Center.
- Barron, B. (2006). Interest and self-sustained learning as catalysts of development: A learning ecologies perspective. *Human Development*, 49, 193–224.
- Barron, B. , Gomez, K. , Pinkard, N. , & Martin, C. K. (2014). *The Digital Youth Network: Cultivating Digital Media Citizenship in Urban Communities*. Cambridge, MA: MIT Press.
- Barron, B. , Martin, C. K. , Takeuchi, L. , & Fithian, R. (2009). Parents as learning partners in the development of technological fluency. *International Journal of Learning and Media*, 1(2), 55–77.
- Barron, B. , Wise, S. , & Martin, C. K. (2013). Creating within and across life spaces: The role of a computer clubhouse in a child's learning ecology. In B. Bevan , P. Bell , R. Stevens , & A. Razfar (Eds.), *LOST Opportunities* (pp. 99-118). Dordrecht: Springer.
- Bell, P. , Bricker, L. , Reeve, S. , Zimmerman, H. T. , & Tzou, C. (2013). Discovering and supporting successful learning pathways of youth in and out of school: Accounting for the

development of everyday expertise across settings. In B. Bevan , P. Bell , R. Stevens , & A. Razfar (Eds.), *LOST Opportunities* (pp. 99-118). Dordrecht: Springer.

Bricker, L. A. , & Bell, P. (2014). "What comes to mind when you think of science? The perfumery!": Documenting science-related cultural learning pathways across contexts and timescales. *Journal of Research in Science Teaching*, 51(3), 260–285.

Bronfenbrenner, U. (1979). *The Ecology of Human Development: Experiments by Nature and Design*. Cambridge, MA: Harvard University Press.

Brown, A. L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *Journal of the Learning Sciences*, 2(2), 141–178.

Buchanan, R. (1992). Wicked problems in design thinking. *Design Issues*, 8(2), 5–21.

Chi, M. T. H. (1997). Quantifying qualitative analyses of verbal data: A practical guide. *Journal of the Learning Sciences*, 6(3), 271–315.

Ching, D. , Santo, R. , Hoadley, C. , & Peppler, K. (2015). *On-Ramps, Lane Changes, Detours and Destinations: Building Connected Learning Pathways in Hive NYC through Brokering Future Learning Opportunities*. New York: Hive Research Lab.

Ching, D. , Santo, R. , Hoadley, C. , & Peppler, K. (2016). Not just a blip in someone's life: Integrating brokering practices into out-of-school programming as a means of supporting and expanding youth futures. *On the Horizon*, 24(3), 296–312.

Collins, A. (1992). Toward a design science of education. In E. Scanlon and T. O'Shea (Eds.), *New Directions in Educational Technology* (pp. 15–22). Berlin: Springer-Verlag.

Crowley, K. , Barron, B.J. , Knutson, K. , & Martin, C. (2015). Interest and the development of pathways to science. In K. A. Renninger , M. Nieswandt , and S. Hidi (Eds.), *Interest in Mathematics and Science Learning and Related Activity*. Washington, DC: AERA.

Design-Based Research Collective . (2003). Design-based research: An emerging paradigm for educational inquiry. *Educational Researcher*, 32(1), 5–8.

Dolle, J. R. , Gomez, L. M. , Russell, J. L. , & Bryk, A. S. (2013). More than a network: Building professional communities for educational improvement. *National Society for the Study of Education Yearbook*, 112(2), 443-463.

Ericsson, K. A. , & Simon, H. A. (1998). How to study thinking in everyday life: Contrasting think-aloud protocols with descriptions and explanations of thinking. *Mind, Culture, and Activity*, 5(3), 178-186.

Goffman, E. (1963). *Behavior in Public Places: Notes on the Social Organization of Gatherings*. Glencoe, IL: Free Press.

Hidi, S. , & Renninger, K. A. (2006). The four-phase model of interest development. *Educational Psychologist*, 41(2), 111–127.

Ito, M. , Gutiérrez, K. , Livingstone, S. , Penuel, B. , Rhodes, J. , Salen, K. , Schor, J. , Sefton-Green, J. , & Watkins, S. C. (2013). *Connected learning: An agenda for research and design*. Digital Media and Learning Research Hub. Retrieved from [http://dmlcentral.net/wp-content/uploads/files/connectedlearning\\_report.pdf](http://dmlcentral.net/wp-content/uploads/files/connectedlearning_report.pdf)

Järvelä, S. , & Renninger, K.A. (2014). Designing for learning: Interest, motivation, and engagement. In R. K. Sawyer (Ed.), *The Cambridge Handbook of the Learning Sciences* (pp. 668–685). Cambridge: Cambridge University Press.

Lareau, A. (2003). *Unequal Childhoods: Class, Race, and Family Life*. Berkeley: University of California Press.

Lewin, C. & Luckin, R. (2010) Technology to support parental engagement in elementary education: Lessons learned from the UK. *Computers & Education*, 54, 749–758.

Martin, C. K. , Pinkard, N. , Erete, S. , & Sandherr, J. (2016). Connections at the family level: Supporting parents and caring adults to engage youth in learning about computers and technology. In Y. Rankin & T. Jakita (Eds.), *Moving Students of Color from Consumers to Producers of Technology* (pp. 220–244). Hershey, PA: IGI Global.

Penuel, W.R. , Fishman, B.J. , Cheng, B.H. , & Sabelli, N. (2011). Organizing research and development at the intersection of learning, implementation, and design. *Educational Researcher*, 40(7), 331–337.

Pinkard, N. (2015, June 12). An ecological view of equity: Reframing our understanding of youth access to connected learning opportunities. Presented at the Digital Media and Learning Conference, Los Angeles, CA.

- Putnam, R. D. (2016). *Our Kids: The American Dream in Crisis*. New York: Simon & Schuster.
- Rosenberg, H. , Harris, E. , & Wilkes, S. (2012). Joining forces: Families and out-of-school programs as partners in supporting children's learning and development. *Family Involvement Network of Educators (FINE) Newsletter*, (6)2. Retrieved from [www.hfrp.org/out-of-school-time/publications-resources/joining-forces-families-and-out-of-school-programs-as-partners-in-supporting-children-s-learning-and-development](http://www.hfrp.org/out-of-school-time/publications-resources/joining-forces-families-and-out-of-school-programs-as-partners-in-supporting-children-s-learning-and-development)
- Rosenberg, H. , Wilkes, S. , & Harris, E. (2014). Bringing families into out-of-school time learning. *Journal of Expanded Learning Opportunities*, 1(1), 18–23.
- Russell, J. L. , Kehoe, S. & Crowley, K. (2017). Linking in and out-of-school learning. In K. Peppler (Ed.), *Encyclopedia of Out-of-School Learning*. Thousand Oaks, CA: Sage Publications.
- Russell, J. L. , Knutson, K. , & Crowley, K. (2013). Informal learning organizations as part of an educational ecology: Lessons from collaboration across the formal-informal divide. *Journal of Educational Change*, 14(3), 259–281.
- Santo, R. , Ching, D. , Peppler, K. , & Hoadley, C. (2017). *Participatory knowledge building within research-practice partnerships in education*. SAGE Research Methods Cases. London: SAGE.
- Schwab, J. J. (1971). The practical: Arts of eclectic. *School Review*, 79(4), 493–542.
- Sefton-Green, J. (2016). Can studying learning across contexts change educational research or will it lead to the pedagogization of everyday life? In L. Erstad, Ola , K. Kumpulainen , A. Mäkitalo , K.C. Schrøder , P. Pruulmann-Vengerfeldt , & T. Jóhannsdóttir (Eds.), *Learning Across Contexts in the Knowledge Society*. Rotterdam: Springer.
- Simonsen, J. , & Friberg, K. (2014). Collective analysis of qualitative data. In J. Simonsen , C. Svabo , S. M. Strandvad , K. Samson , M. Hertzum , & O. E. Hansen (Eds.), *Situated Design Methods*. Cambridge: MIT Press.
- Vakil, S. , McKinney de Royston, M. , Suad Nasir, N. I. , & Kirshner, B. (2016). Rethinking race and power in design-based research: Reflections from the field. *Cognition and Instruction*, 34(3), 194–209.
- Weiss, H. B. , & Lopez, M. E. (2015). Engage families for anywhere, anytime learning. *Phi Delta Kappan*, 96(7), 14–19.
- Zimmerman, J. , Forlizzi, J. , & Evenson, S. (2007, April). Research through design as a method for interaction design research in HCI. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 493-502). New York: ACM.

## Participatory Design with Children in the Autism Spectrum

- Alcorn, A. , Pain, H. , Rajendran, G. , Smith, T. , Lemon, O. , Porayska-Pomsta, K. , Foster, M.E. , Avramides, K. , Frauenberger, C. , & Bernardini, S. (2011). Social communication between virtual characters and children with autism. In *Artificial Intelligence in Education* (pp. 7–14). Berlin: Springer.
- Autism Speaks . (n.d.). *DSM-5 Diagnostic Criteria*. Retrieved March 16, 2016, from [www.autismspeaks.org/what-autism/diagnosis/dsm-5-diagnostic-criteria](http://www.autismspeaks.org/what-autism/diagnosis/dsm-5-diagnostic-criteria)
- Bartoli, L. , Corradi, C. , Garzotto, F. , & Valoriani, M. (2013). Motion-based touchless interaction for autistic children's learning. In *Proceedings of the 2013 Conference on Interaction Design and Children, IDC 2013* (pp. 53–62). New York: ACM.
- Bartoli, L. , Garzotto, F. , Gelsomini, M. , Oliveto, L. , & Valoriani, M. (2014). Designing and evaluating touchless playful interaction for ASD children. In *Proceedings of the 2014 Conference on Interaction Design and Children, IDC 2014* (pp. 17–26). New York: ACM.
- Benton, L. , Johnson, H. , Ashwin, E. , Brosnan, M. , & Grawemeyer, B. (2012). Developing IDEAS: supporting children with autism within a participatory design team. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI 2012* (pp. 2599–2608). New York: ACM.
- Benton, L. , Vasalou, A. , Khaled, R. , Johnson, H. , & Gooch, D. (2014). Diversity for design: a framework for involving neurodiverse children in the technology design process. In

Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI 2014 (pp. 3747–3756). New York: ACM.

Billstedt, E. , Gillberg, C. , & Gillberg, C. (2005). Autism after adolescence: population-based 13- to 22-year follow-up study of 120 individuals with autism diagnosed in childhood. *Journal of Autism and Developmental Disorders*, 35(3), 351–360.

Bosseler, A. , & Massaro, D. W. (2003). Development and evaluation of a computer-animated tutor for vocabulary and language learning in children with autism. *Journal of Autism and Developmental Disorders*, 33(6), 653–672.

CDC . (n.d.). CDC, Data & Statistics, Autism Spectrum Disorder (ASD). Retrieved March 16, 2016, from [www.cdc.gov/ncbddd/autism/data.html](http://www.cdc.gov/ncbddd/autism/data.html)

Coleman-Martin, M. B. , Wolff-Heller, K. , Cihak, D. F. , & Irvine, K. L. (2005). Using computer-assisted instruction and the nonverbal reading approach to teach word identification. *Focus on Autism and Other Developmental Disabilities*, 20, 80–90.

Druin, A. (1999). Cooperative inquiry: developing new technologies for children with children. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI '99 (pp. 592–599). New York: ACM.

Eaves, L. C. , & Ho, H. H. (2008). Young adult outcome of autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 38(4), 739–747.

Eikeseth, S. (2009). Outcome of comprehensive psycho-educational interventions for young children with autism. *Research in Developmental Disabilities*, 30(1), 158–178.

Escobedo, L. , Nguyen, D. H. , Boyd, L. , Hirano, S. , Rangel, A. , Garcia-Rosas, D. , ... Hayes, G. (2012). MOSOCO: a mobile assistive tool to support children with autism practicing social skills in real-life situations. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI 2012 (pp. 2589–2598). New York: ACM.

Fails, J. A. , Guha, M. L. , & Druin, A. (2013). Foundations and trends® in human–computer interaction. *Foundations and Trends® in Human–Computer Interaction*, 6(2), 85–166.

Faja, S. , Aylward, E. , Bernier, R. , & Dawson, G. (2007). Becoming a face expert: a computerized face-training program for high-functioning individuals with autism spectrum disorders. *Developmental Neuropsychology*, 33(1), 1–24.

Farr, W. , Yuill, N. , & Raffle, H. (2010). Social benefits of a tangible user interface for children with autistic spectrum conditions. *Autism*, 14(3), 237–252.

Frauenberger, C. , Good, J. , Alcorn, A. , & Pain, H. (2013). Conversing through and about technologies: design critique as an opportunity to engage children with autism and broaden research(er) perspectives. *International Journal of Child-Computer Interaction*, 1(2), 38–49.

Frauenberger, C. , Good, J. , Keay-Bright, W. , & Pain, H. (2012). Interpreting input from children: a designerly approach. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI 2012 (pp. 2377–2386). New York: ACM.

Gal, E. , Bauminger, N. , Goren-Bar, D. , Pianesi, F. , Stock, O. , Zancanaro, M. , & Weiss, P. L. T. (2009). Enhancing social communication of children with high-functioning autism through a co-located interface. *AI & Society*, 24(1), 75–84.

Giusti, L. , Zancanaro, M. , Gal, E. , & Weiss, P. L. T. (2011). Dimensions of collaboration on a tabletop interface for children with autism spectrum disorder. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI 2011 (pp. 3295–3304). New York: ACM.

Guha, M. L. , Druin, A. , & Fails, J. A. (2013). Cooperative inquiry revisited: reflections of the past and guidelines for the future of intergenerational co-design. *International Journal of Child-Computer Interaction*, 1(1), 14–23.

Hailpern, J. , Karahalios, K. , & Halle, J. (2009). Creating a spoken impact: encouraging vocalization through audio visual feedback in children with ASD. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI 2009 (pp. 453–462). New York: ACM.

Hayes, G. R. , Hirano, S. , Marcu, G. , Monibi, M. , Nguyen, D. H. , & Yeganyan, M. (2010). Interactive visual supports for children with autism. *Personal and Ubiquitous Computing*, 14(7), 663–680.

Hirano, S. H. , Yeganyan, M. T. , Marcu, G. , Nguyen, D. H. , Boyd, L. A. , & Hayes, G. R. (2010). vSked: evaluation of a system to support classroom activities for children with autism. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI

2010 (pp. 1633–1642). New York: ACM.

Hourcade, J. P. (2015). *Child-Computer Interaction*. Publisher: Author. [childcomputerinteraction.org](http://childcomputerinteraction.org).

Hourcade, J. P. , Bullock-Rest, N. E. , & Hansen, T. E. (2012). Multi-touch tablet applications and activities to enhance the social skills of children with autism spectrum disorders. *Personal and Ubiquitous Computing*, 16(2), 157–168.

Hourcade, J. P. , Williams, S. R. , Miller, E. A. , Huebner, K. E. , & Liang, L. J. (2013). Evaluation of tablet apps to encourage social interaction in children with autism spectrum disorders. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI 2013* (pp. 3197–3206). New York: ACM.

Howlin, P. , Goode, S. , Hutton, J. , & Rutter, M. (2004). Adult outcome for children with autism. *Journal of Child Psychology and Psychiatry*, 45(2), 212–229.

Johnson, G. M. , Davies, S. , Thomas, S. , & Hilbert, J. (2013, June). iPads and children with special learning needs: a survey of teachers. In *Proceedings of the World Conference on Educational Media & Technology* (pp. 1022–1026).

Malinverni, L. , MoraGuiard, J. , Padillo, V. , Mairena, M. , Hervás, A. , & Pares, N. (2014). Participatory design strategies to enhance the creative contribution of children with special needs. In *Proceedings of the 2014 Conference on Interaction Design and Children, IDC 2014* (pp. 85–94). New York: ACM.

Parés, N. , Carreras, A. , Durany, J. , Ferrer, J. , Freixa, P. , Gómez, D. , Kruglanski, O. , Parés, R. , Ribas, J.I. , Soler, M. , & Sanjurjo, À. . (2005, June). Promotion of creative activity in children with severe autism through visuals in an interactive multisensory environment. In *Proceedings of the 2005 Conference on Interaction Design and Children* (pp. 110–116). New York: ACM.

Tartaro, A. , & Cassell, J. (2008). Playing with virtual peers: bootstrapping contingent discourse in children with autism. In *Proceedings of the International Conference of the Learning Sciences, ICLS 2008*. Utrecht, The Netherlands: International Society of the Learning Sciences (ISLS).

Venkatesh, S. , Phung, D. , Duong, T. , Greenhill, S. , & Adams, B. (2013). TOBY: early intervention in autism through technology. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI 2013* (pp. 3187–3196). New York: ACM.

Weiss, M. J. , Fiske, K. , & Ferraioli, S. (2008). Evidence-based practice for autism spectrum disorders. *Clinical Assessment and Intervention for Autism Spectrum Disorders*, 22–61.

Whalen, C. , Liden, L. , Ingersoll, B. , Dallaire, E. , & Liden, S. (2006). Behavioral improvements associated with computer-assisted instruction for children with developmental disabilities. *The Journal of Speech and Language Pathology–Applied Behavior Analysis*, 1(1), 11.

## **Teachers, Students, and After-School Professionals as Designers of Digital Tools for Learning**

Bielaczyc, K. (2006). Designing social infrastructure: Critical issues in creating learning environments with technology. *Journal of the Learning Sciences*, 15(3), 301–329.

Blumenfeld, P. , Fishman, B. J. , Krajcik, J. , Marx, R. W. , & Soloway, E. (2000). Creating usable innovations in systemic reform: Scaling up technology-embedded project-based science in urban schools. *Educational Psychologist*, 35(3), 149–164.

Bonsignore, E. , Yip, J. C. , Ahn, J. , Clegg, T. , & Guha, M. L. (2013). Designing for learners, with learners: Toward a theory of cooperative inquiry in the design of learning technologies. Presented at J. Rick , M. Horn , & R. Martinez-Maldonado (Orgs.), *Human-Computer Interaction and the Learning Sciences*. Pre-conference workshop at CSCL 2013, Madison, WI.

Cobb, P. , Confrey, J. , Lehrer, R. , & Schauble, L. (2003). Design experiments in educational research. *Educational Researcher*, 32(1), 9–13.

- Druin, A. (2002). The role of children in the design of new technology. *Behaviour and Information Technology*, 21(1), 1–25.
- Fishman, B. J. (2014). Designing usable interventions: Bringing student perspectives to the table. *Instructional Science*, 42(1), 115–121.
- Jackson, S. L. , Stratford, S. J. , Krajcik, J. , & Soloway, E. (1994). Making dynamic modeling accessible to precollege science students. *Interactive Learning Environments*, 4(3), 233–257.
- Könings, K. D. , Brand-Gruwel, S. , & Merriënboer, J. J. (2005). Towards more powerful learning environments through combining the perspectives of designers, teachers, and students. *British Journal of Educational Psychology*, 75(4), 645–660.
- Könings, K. D. , Seidel, T. , & van Merriënboer, J. J. (2014). Participatory design of learning environments: Integrating perspectives of students, teachers, and designers. *Instructional Science*, 42(1), 1–9.
- Papert, S. (1980). *Mindstorms: Children, Computers, and Powerful Ideas*. New York: Basic Books.
- Penuel, W. R. , Coburn, C. E. , & Gallagher, D. J. (2013). Negotiating problems of practice in research–practice design partnerships. *National Society for the Study of Education Yearbook*, 112(2), 237–255.
- Penuel, W. R. , Fishman, B. J. , Cheng, B. H. , & Sabelli, N. (2011). Organizing research and development at the intersection of learning, implementation, and design. *Educational Researcher*, 40(7), 331–337.
- Sandoval, W. (2014). Conjecture mapping: An approach to systematic educational design research. *Journal of the Learning Sciences*, 23(1), 18–36.
- Scaife, M. , & Rogers, Y. (1999). The design of children's technology. In A. Druin (Ed.), *The Design of Children's Technology* (pp. 27–50). San Francisco, CA: Morgan Kaufmann Publishers, Inc.
- Scaife, M. , Rogers, Y. , Aldrich, F. , & Davies, M. (1997). Designing for or designing with? Informant design for interactive learning environments. In *Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems* (pp. 343–350). ACM.
- Schwarz, C. V. , Reiser, B. J. , Davis, E. A. , Kenyon, L. , Achér, A. , Fortus, D. , Shwartz, Y. , Hug, B. , & Krajcik, J. (2009). Developing a learning progression for scientific modeling: Making scientific modeling accessible and meaningful for learners. *Journal for Research in Science Teaching*, 46(6), 632–654.
- Sherin, B. , diSessa, A. A. , & Hammer, D. (1993). Dynaturtle revisited: Learning physics through collaborative design of a computer model. *Interactive Learning Environments*, 3(2), 91–118.
- Shwartz, Y. , Weizman, A. , Fortus, D. , Krajcik, J. , & Reiser, B. (2008). The IQWST experience: Using coherence as a design principle for a middle school science curriculum. *The Elementary School Journal*, 109(2), 199–219.
- Spitulnik, M. W. , Krajcik, J. , & Soloway, E. (1999). Construction of models to promote scientific understanding. In W. Feurzig & N. Roberts (Eds.), *Modeling and Simulation in Science and Mathematics Education* (pp. 70–94). New York: Springer-Verlag.
- Voogt, J. , Laferrière, T. , Breuleux, A. , Itow, R. C. , Hickey, D. T. , & McKenney, S. (2015). Collaborative design as a form of professional development. *Instructional Science*, 43(2), 259–282.
- White, B. Y. , & Frederiksen, J. R. (1998). Inquiry, modeling, and metacognition: Making science accessible to all students. *Cognition and Instruction*, 16(1), 3–118.
- Wilensky, U. , & Reisman, K. (2006). Thinking like a wolf, a sheep, or a firefly: Learning biology through constructing and testing computational theories—an embodied modeling approach. *Cognition & Instruction*, 24(2), 171–209.
- Wilkerson-Jerde, M. H. & Gravel, B. E. (2011). EXP: SiMSAM: Bridging student, scientific, and mathematical models with expressive technologies. Unpublished grant proposal.
- Wilkerson-Jerde, M. H. , Gravel, B. E. , & Macrander, C. A. (2015). Exploring shifts in middle school learners' modeling activity while generating drawings, animations, and computational simulations of molecular diffusion. *Journal of Science Education and Technology*, 24(2–3), 396–415.

## Learner at the Center

- Bonsignore, E. , Ahn, J. , Clegg, T. , Guha, M. L. , Yip, J. , Druin, A. , & Hourcade, J. P. (2013). Embedding participatory design into designs for learning: An untapped interdisciplinary resource. In *Proceedings of the Conference for Computer-Supported Cooperative Learning (CSCL 2013)* (pp. 549–556). Madison, WI: International Society of the Learning Sciences.
- Bonsignore, E. , Koepfler, J. , Guha, M. L. , Ahn, J. , & Kraus, K. (2014). Exploring teen co-design in alternate reality games for learning. CHI 2014 Workshop on understanding teen UX: Building a bridge to the future. [www.chici.org/teenUX/papers/paper7.pdf](http://www.chici.org/teenUX/papers/paper7.pdf).
- Bonsignore, E. , Hansen, D. , Pellicone, A. , Kraus, K. , Ahn, J. , Shumway, S. , Parkin, J. , Cardon, J. , Sheets, J. , Jensen, C. H. , & Koepfler, J. (2016). Traversing transmedia together: Co-designing an education ARG for teens, with teens. To appear in *Proceedings of the 16th International Conference on Interaction Design and Children, IDC 2016*. New York: ACM.
- Danielsson, K. , & Wiberg, C. (2006). Participatory design of learning media: Designing educational computer games with and for teenagers. *Interactive Technology and Smart Education*, 3(4), 275–291.
- Druin, A. (1999, May). Cooperative inquiry: Developing new technologies for children with children. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 592–599). New York: ACM.
- Druin, A. (2002). The role of children in the design of new technology. *Behaviour and Information Technology*, 21(1), 1–25.
- Fails, J. A. , Guha, M. L. , & Druin, A. (2012). Methods and techniques for involving children in the design of new technology for children. *Human–Computer Interaction*, 6(2), 85–166.
- Fullan, M. (2013). *Stratosphere: Integrating Technology, Pedagogy, and Change Knowledge*. Ontario: Pearson Canada.
- Guha, M. L. , Druin, A. , Chipman, G. , Fails, J. A. , Simms, S. , & Farber, A. (2004). Mixing ideas: A new technique for working with young children as design partners. In *Proceedings of the 2004 Conference on Interaction Design and Children, IDC 2004* (pp. 35–42). New York: ACM.
- Guha, M. L. , Druin, A. , & Fails, J. A. (2013). Cooperative Inquiry revisited: Reflections of the past and guidelines for the future of intergenerational co-design. *International Journal of Child-Computer Interaction*, 1(1), 14–23.
- Guha, M. L. , Druin, A. , & Fails, J. A. (2010, June). Investigating the impact of design processes on children. In *Proceedings of the 9th International Conference on Interaction Design and Children* (pp. 198–201). New York: ACM.
- Hoadley, C. P. (2002, January). Creating context: Design-based research in creating and understanding CSCL. In *Proceedings of the Conference on Computer Support for Collaborative Learning: Foundations for a CSCL Community* (pp. 453–462). International Society of the Learning Sciences.
- Isomursu, M. , Isomursu, P. , & Still, K. (2004). Capturing tacit knowledge from young girls. *Interacting with Computers*, 16(3), 431–449.
- Jenkins, H. , Purushotma, R. , Weigel, M. , Clinton, K. , & Robison, A. J. (2009). *Confronting the Challenges of Participatory Culture: Media Education for the 21st Century*. Cambridge, MA: MIT Press.
- Read, J. C. C. , Horton, M. , Iversen, O. , Fitton, D. , & Little, L. (2013). Methods of working with teenagers in interaction design. In *CHI '13 Extended Abstracts on Human Factors in Computing Systems* (pp. 3243–3246). New York: ACM.
- Yip, J. C. , Foss, E. , & Guha, M. L. (2012). Co-designing with adolescents. In *Designing Interactive Technology for Teens Workshop, NordiCHI, Copenhagen, Denmark*. Retrieved from: [www.chici.org/ditt2012/papers.html](http://www.chici.org/ditt2012/papers.html).

## Learning At/With/From the Edges

- Austerlitz, A. (2008) (ed.) *Unspoken Interactions: Exploring the Unspoken Dimension of Learning and Teaching in Creative Subjects*. London: Centre for Teaching and Learning in Art and Design (CTLAD).
- Bannon, L. J. and Ehn, P. (2013) "Design: Design matters in participatory design," in Simonsen, J. and Robertson, T. (eds.), *International Handbook of Participatory Design* (pp. 37–63). London and New York: Routledge.
- Björgvinsson, E. , Ehn, P. and Hillgren, P.-A. (2012) "Agonistic participatory design: Working with marginalised social movements," *CoDesign*, 8(2–3): 127–144.
- Boys, J. (2016) "Finding the spaces in-between: Learning as a social material practice," in Carvalho, L. , Goodyear, P. and de Laat, M. (eds.), *Place-Based Spaces for Networked Learning*. London: Routledge.
- Deleuze, G. (1994) *Difference and Repetition*. London: Continuum.
- Deleuze, G. (2003) "The three kinds of knowledge," *Pli: The Warwick Journal of Philosophy*, 14: 1–20.
- DiSalvo, C. (2012) *Adversarial Design*. Cambridge, MA: MIT Press.
- England, K. V. L. (1994) "Getting personal: Reflexivity, positionality, and feminist research," *Professional Geographer*, 46(1): 80–89.
- Everyday Disruptions (2014) Northumbria University. <https://db.tt/lgeP0Uoc>
- Freire, P. (1993) *Pedagogy of the Oppressed*. London: Penguin.
- Garfinkel, H. (1967) *Studies in Ethnomethodology*. Englewood Cliffs, NJ: Prentice Hall.
- Gaver, W. (2012) "What should we expect from research through design?" *Proceedings of the 2012 ACM Annual Conference on Human Factors in Computing Systems (CHI '12)* (pp. 937–946). <http://dl.acm.org/citation.cfm?id=2208538>
- Latour, B. (2005) *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press.
- Light, A. (2013) *Effectiveness in Action*, Report for the Arts and Humanities Research Council, AHRC.
- Light, A. and Akama, Y. (2014) "Structuring future social relations: The politics of care in participatory practice," in *Proceedings of the ACM Participatory Design Conference (PDC '14)* (pp. 151–160).
- Pignarre, P. and Stengers, I. (2007) *Capitalist Sorcery: Breaking the Spell*. Palgrave MacMillan.
- Polanyi, M. (1966) *The Tacit Dimension*. Chicago: University of Chicago Press.
- Price, M. (forthcoming) "Un/shared space: The dilemma of inclusive architecture," in Boys, J. (ed.), *Disability, Space, Architecture: A Reader*. London: Routledge.
- Ryave, A. L. and Schenkein, J. N. (1974) "Notes on the art of walking," in Turner, R. (ed.), *Ethnomethodology* (pp. 265–274). New York: Penguin.
- Stengers, I. (2005) "The comspolitical proposal," in Latour, B. and Weibel, P. (eds.), *Making Things Public: Atmospheres of Democracy* (pp. 994–1003). Cambridge, MA: MIT Press.
- Titchkosky, T. (2011) *The Question of Access: Disability, Space, Meaning*. Toronto: University of Toronto Press.
- Wenger, E. (1998) *Communities of Practice: Learning, Meaning, and Identity*. Cambridge: Cambridge University Press.

## Participatory Design for Value-Driven Learning

- Anthopoulos, L. G. , Siozos, P. , & Tsoukalas, I. A. (2007). Applying participatory design and collaboration in digital public services for discovering and re-designing e-Government services. *Government Information Quarterly*, 24(2), 353–376.
- Bonsignore, E. , Ahn, J. , Clegg, T. , Guha, M. L. , Yip, J. , Druin, A. , & Hourcade, J. P. (2013). Embedding participatory design into designs for learning: An untapped interdisciplinary resource. In *Proc. CSCL (Vol. 13)*. Retrieved from

[www.researchgate.net/profile/Jason\\_Yip4/publication/265209011\\_Embedding\\_Participatory\\_Design\\_into\\_Designs\\_for\\_Learning\\_An\\_Untapped\\_Interdisciplinary\\_Resource/links/540543c40cf23d9765a6d9cd.pdf](http://www.researchgate.net/profile/Jason_Yip4/publication/265209011_Embedding_Participatory_Design_into_Designs_for_Learning_An_Untapped_Interdisciplinary_Resource/links/540543c40cf23d9765a6d9cd.pdf)

Buechley, L. , Eisenberg, M. , Catchen, J. , & Crockett, A. (2008). The LilyPad Arduino: Using computational textiles to investigate engagement, aesthetics, and diversity in computer science education. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 423–432). New York: ACM. Retrieved from <http://dl.acm.org/citation.cfm?id=1357123>

Chin Jr, G. , Kuchar, O. A. , & Wolf, K. E. (2009). Exploring the analytical processes of intelligence analysts. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 11–20). ACM. Retrieved from <http://dl.acm.org/citation.cfm?id=1518704>

Dewey, J. (1913). *Interest and Effort in Education*. Cambridge, MA: Houghton Mifflin.

DiSalvo, B. , & Bruckman, A. (2009). Questioning video games' influence on CS interest. Presented at The Fourth International Conference on the Foundation of Digital Game. ACM.

DiSalvo, B. , & DiSalvo, C. (2014). Designing for democracy in education: Participatory design and the learning sciences. Presented at the International Conference of the Learning Sciences. Retrieved from <http://betsydisalvo.com/wp-content/uploads/2012/08/ICLS-PD-Paper-Final.pdf>

DiSalvo, B. , Guzdial, M. , Meadows, C. , McKlin, T. , Perry, K. , & Bruckman, A. (2013). Workifying games: Successfully engaging African American gamers with computer science. In *Proceedings of the 44th ACM Technical Symposium on Computer Science Education* (pp. 317–322). New York: ACM. <https://doi.org/10.1145/2445196.2445292>

DiSalvo, C. , Clement, A. , & Pipek, V. (2012). Participatory design for, with, and by communities. In J. Simonsen and T. Robertson (Eds.), *International Handbook of Participatory Design*. Oxford: Routledge.

Edelson, D. C. , & Joseph, D. M. (2004). The interest-driven learning design framework: Motivating learning through usefulness. In *Proceedings of the 6th International Conference on Learning Sciences*, International Society of the Learning Sciences (pp. 166–173). Santa Monica, CA: International Society of the Learning Sciences. Retrieved from <http://dl.acm.org/citation.cfm?id=1149126.1149145>

Eglash, R. , Bennett, A. , O'Donnell, C. , Jennings, S. , & Cintonino, M. (2006). Culturally situated design tools: Ethnocomputing from field site to classroom. *American Anthropologist*, 108(2), 347–362.

Eglash, R. , Gilbert, J. E. , & Foster, E. (2013). Toward culturally responsive computing education. *Communications of the ACM*, 56(7), 33–36.

Ehn, P. (2008). Participation in design things (Vol. 8). In *Proceedings of the Tenth Anniversary Conference on Participatory Design*. ACM.

Fischer, G. (2013). Meta-design: Empowering all stakeholder as co-designers. *Handbook of Design in Educational Computing* (pp. 135–145). London: Routledge.

Fischer, G. , & Giaccardi, E. (2006). Meta-design: A framework for the future of end-user development. In *End User Development* (pp. 427–457). Netherlands: Springer.

Freeman, J. , Magerko, B. , McKlin, T. , Reilly, M. , Pernar, J. , Summers, C. , & Fruchter, E. (2014). Engaging underrepresented groups in high school introductory computing through computational remixing with EarSketch. In *Proceedings of the 45th ACM Technical Symposium on Computer Science Education* (pp. 85–90). ACM. Retrieved from <http://dl.acm.org/citation.cfm?id=2538906>

Giaccardi, E. , & Fischer, G. (2008). Creativity and evolution: A metadesign perspective. *Digital Creativity*, 19(1), 19–32.

Institute for Applied Autonomy . (2001). iSee [Digital]. Retrieved from [www.appliedautonomy.com/isee.html](http://www.appliedautonomy.com/isee.html)

Jeremijenko, N. (2014). Feral Robotic Dogs. Retrieved from [www.nyu.edu/projects/xdesign/feralrobots/](http://www.nyu.edu/projects/xdesign/feralrobots/)

Kafai, Y. B. , & Burke, Q. (2014). Beyond game design for broadening participation: Building new clubhouses of computing for girls. In *Proceedings of Gender and IT Appropriation. Science and Practice on Dialogue-Forum for Interdisciplinary Exchange* (p. 21). European Society for Socially Embedded Technologies. Retrieved from <http://dl.acm.org/>

citation.cfm?id=2670301

- Margolis, J. (2008). *Stuck in the Shallow End: Education, Race, and Computing*. Cambridge, MA: MIT Press.
- Margolis, J. , & Fisher, A. (2002). *Unlocking the Clubhouse: Women in Computing*. Cambridge, MA: MIT Press.
- Margolis, J. , Goode, J. , & Chapman, G. (2015). An equity lens for scaling: A critical juncture for exploring computer science. *ACM Inroads*, 6(3), 58–66.
- NSF . (2008). Broadening Participation in Computing (BPC) Program Solicitation. Retrieved from [www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=13510](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13510)
- Peckham, J. , Harlow, L. L. , Stuart, D. A. , Silver, B. , Mederer, H. , & Stephenson, P. D. (2007). Broadening participation in computing: Issues and challenges. *ACM SIGCSE Bulletin*, 39(3), 9–13.
- Repenning, A. , Webb, D. C. , Koh, K. H. , Nickerson, H. , Miller, S. B. , Brand, C. , Basawapatna, A. , Gluck, F. , Grover, R. , Gutierrez, K. , & Repenning, N. (2015). Scalable game design: A strategy to bring systemic computer science education to schools through game design and simulation creation. *ACM Transactions on Computing Education (TOCE)*, 15(2), 11.
- Robertson, T. , & Simonsen, J. (2012). *Participatory design*. Routledge International Handbook of Participatory Design 1. New York: Routledge.
- Russell, K.K. (1998). Driving while black: Corollary phenomena and collateral consequences. *Boston College Law Review*, 40, 717.
- Sjöberg, C. , & Timpka, T. (1998). Participatory design of information systems in health care. *Journal of the American Medical Informatics Association*, 5(2), 177–183.
- Swidler, A. (1986). Culture in action: Symbols and strategies. *American Sociological Review*, 51(2), 273–286.
- Sy, S.R. , & Romero, J. (2008). Family responsibilities among Latina college students from immigrant families. *Journal of Hispanic Higher Education*, 7(3), 212–227.
- Yip, J. , Clegg, T. , Bonsignore, E. , Gelderblom, H. , Rhodes, E. , & Druin, A. (2013). Brownies or bags-of-stuff?: Domain expertise in cooperative inquiry with children. In *Proceedings of the 12th International Conference on Interaction Design and Children* (pp. 201–210). ACM. Retrieved from <http://dl.acm.org/citation.cfm?id=2485763>

## Establishing Content Expertise in Intergenerational Co-Design Teams

- Beyer, H. and Holtzblatt, K. (1997). *Contextual Design: Defining Customer-Centered Systems*. San Francisco, CA: Morgan Kaufmann.
- Bonsignore, E. , Quin, A. J. , Druin, A. , and Bederson, B. (2013). Sharing stories “in the wild”: A mobile storytelling case study using StoryKit. *ACM Transactions on Computer-Human Interaction*, 20(3): 1–38. doi:10.1145/2491500.2491506
- Druin, A. (1999). Cooperative inquiry: Developing new technologies for children with children. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems: The CHI Is the Limit* (pp. 592–599). New York: ACM.
- Druin, A. (2005). What children can teach us: Developing digital libraries for children, with children. *Library Quarterly*, 75(1): 20–41. doi:10.1086/428691
- Guha, M. L. (2010). Understanding the social and cognitive experiences of children involved in technology design processes. PhD dissertation, University of Maryland.
- Guha, M. L. , Druin, A. , & Fails, J. A. (2013). Cooperative inquiry revisited: Reflections of the past and guidelines for the future of intergenerational co-design. *International Journal of Child-Computer Interaction*, 1(1): 14–23. doi: 10.1016/j.ijcci.2012.08.003
- Norooz, L. , Mauriello, M. L. , Jorgensen, A. , McNally, B. , & Froehlich, J. E. (2015). BodyVis: A new approach to body learning through wearable sensing and visualization. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (pp. 1025–1034). New York: ACM.

- Yip, J. C. , Foss, E. , & Guha, M. L. (2012). Co-designing with adolescents. Proceedings of the Designing Interactive Technology for Teens Workshop at NordiCHI. October, Copenhagen, Denmark. New York: ACM.
- Yip, J. , Clegg, T. , Bonsignore, E. , Gelederbom, H. , Rhodes, E. , & Druin, A. (2013a). Brownies or bags-of-stuff? Domain expertise in cooperative inquiry with children. Proceedings of the 12th International Conference on Interaction Design and Children (pp. 201–210). New York: ACM.
- Yip, J. C. , Foss, E. , Bonsignore, E. , Guha, M. L. , Norooz, L. , Rhodes, E. , McNally, B. , Papadatos, P. , Golub, E. & Druin, A. (2013b). Children initiating and leading cooperative inquiry sessions. In Proceedings of the 12th International Conference on Interaction Design and Children (pp. 293–296). New York: ACM.

## Learning in PD

- Benkler, Y. (2004) "Sharing nicely": On shareable goods and the emergence of sharing as a modality of economic production. *Yale Law Journal*, 114, 273–358.
- Candy, S. (2010) The futures of everyday life: Politics and the design of experiential scenarios. Unpublished doctoral dissertation, Department of Political Science, University of Hawaii at Manoa. <http://scribd.com/doc/68901075/Candy-2010-The-Futures-of-Everyday-Life>
- Candy, S. (2015) Dreaming together: Experiential futures as a platform for public imagination. In Durfee, T. and Zeiger, M. (Eds.), *Made Up: Design's Fictions*. Zurich: JRP Ringier/Art Center Graduate Press.
- DiSalvo, C. (2014) Speculative interventions as inquiry. In *Speculative Interventions: The Research Network for Design Anthropology*, August 14–15, 2014, Copenhagen, DK.
- Dunne, A. and Raby, F. (2013) *Speculative Everything: Design, Fiction and Social Dreaming*. Cambridge, MA: MIT Press.
- Ehn, P. (1988) *Work-oriented Design of Computer Artifacts*. Arbetslivscentrum.
- Hamari, J. , Sjöklint, M. , and Ukkonen, A. (2015) The sharing economy: Why people participate in collaborative consumption. *Journal of the Association for Information Science and Technology*, <http://doi.org/10.1002/asi.23552>
- Irwin, T. , Kossoff, G. , Tonkinwise, C. , and Scupelli, P. (2015) *Transition design: 2015*. White paper from Carnegie Mellon University's School of Design.
- Jenkins, H. , Clinton, K. , Purushotma, R. , Robinson, A. J. , and Weigel, M. (2006) *Confronting the Challenges of Participatory Culture: Media Education for the 21st Century*. Chicago: MacArthur Foundation.
- Johnson, B. D. (2011) *Science Fiction Prototyping: Designing the Future with Science Fiction*. San Rafael, CA: Morgan & Claypool.
- Lavender, S. , Sommerich, C. , Patterson, E. S. , Sanders, E. B. N. , Evans, K. , Park, S. , Umar, R. , and Li, J. (2015) Hospital patient room design: The issues facing 23 occupational groups who work in medical/surgical patient rooms. *Health Environments Research and Design Journal*, 8(4), 98–114.
- Lindley, J. , Sharma, D. , and Potts, R. (2015) Operationalizing design fiction with anticipatory ethnography. *Ethnographic Praxis in Industry Conference Proceedings*, 2015 (pp. 58–71). doi: 10.1111/1559-8918.2015.01040
- Montuori, S. (2010) Beyond postnormal: The future of creativity and the creativity of the future. *Futures*, 41(2), 221–227.
- Packer, M. J. and Maddox, C. (2014) Mapping the territory of the learning sciences. In Sawyer, R. K. (Ed.), *The Cambridge Handbook of Learning Sciences*. New York: Cambridge University Press.
- Sanders, E. B. N. (2006) Design research in 2006. *Design Research Quarterly* 1(1), 1–8.
- Sanders, E. B. N. (2016) Where are we going? An aspirational map. In Joost, G. , Bredies, K. , Christensen, M. , Conradi, F. , and Unteidig, A. (Eds.), *Design as Research: Positions, Arguments, Perspectives (BIRD Series)*. Basel: Birkhäuser Publishers.

Sanders, E. B. N. and Stappers, P. J. (2012) *Convivial Toolbox: Generative Research for the Front End of Design*. Amsterdam: BIS Publishers.

Sanders, L. and Stappers, P. J. (2014) Three slices in time: From designing to co-designing to collective dreaming. *ACM Interactions*, November–December 2014.

<http://dl.acm.org/citation.cfm?id=2670616>