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## HOW PARTICIPATORY DESIGN HAS INFLUENCED THE LEARNING SCIENCES

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This book demonstrates in an important way the linkages between two different perspectives, held by two different communities. In many ways, the dual perspective of these two communities helps contrast two major stances toward learning—the perspective of science, and the perspective of design. Education, more than many other arenas of intellectual inquiry, has spent the 20th century in a dance between these two perspectives. This has been both a core challenge and, increasingly, a core strength. I don't think it's a coincidence that Herbert Simon, author of *The Sciences of the Artificial* (Simon, 1969) and who explored what it means to have a 'design science,' is still the only person one might identify as a member of the learning sciences to have won a Nobel prize. Simon, John Dewey, Jerome Bruner, Seymour Papert: many of the people who have significantly influenced the learning sciences share this quality of attempting to foster a deep and empirically based understanding of how people learn, and yet have maintained a deeply interventionist stance toward what it means to create an environment that fosters learning, whether in a lab school or a computer lab. And perhaps not coincidentally, as much as each of these scholars is identifiably part of the heritage that led to the learning sciences, each also had a wide-ranging background that makes their discipline hard to pin down—was Dewey an educational scientist, or a philosopher? Bruner is lauded as a psychologist, but spent most of his life as a law professor. Simon's Nobel in economics belies his role as one of the cofounders of artificial intelligence. And Papert's history in AI and computer science (itself a new field) doesn't capture his role in education or media.

As John Dewey stated, every design can be an act of scientific inquiry: "The conjunction of problematic and determinate characters in nature renders every existence, as well as every idea and human act, an experiment in fact, even though

not in design. To be intelligently experimental is but to be conscious of this intersection of natural conditions so as to profit by it instead of being at its mercy” (Dewey, 1925, p. 163). While I wholeheartedly agree with this stance, it contrasts mightily with those who see changing the world as informed by, but not concomitant, with scientific research on how the world works. We might think back to the types of natural science that were conducted in Ben Franklin’s time, when scientific research didn’t necessarily imply collecting your data in a laboratory, and when data was not as distinct from observation, and when science was seen as ‘natural philosophy,’ implying strongly that data without a probing, rational mind was not actually scientific.

On the flip side, science, especially science related to the human sphere, suffers when it is cleaved from its roots of mastering the world. “The contingency of artificial phenomena has always created doubts as to whether they fall properly within the compass of science. Sometimes these doubts are directed at the . . . difficulty of disentangling prescription from description. This seems to me not to be the real difficulty. The genuine problem is to show how empirical propositions can be made at all about systems that, given different circumstances, might be quite other than they are” (Simon, 1969, p. x). And in learning research, this dilemma: how to change the world, based on an empirically derived knowledge of how people learn, when all of the scientific findings on education, “given different circumstance, might be quite other than they are” this dilemma in the 20th century has led to several interesting outcomes. One is the fetishization of ‘objective’ science in learning research. The emergence of research on learning in the 20th century can be seen as a struggle between the faction exemplified by Dewey, aiming for a holistic, grounded, interventionist discipline made rigorous through a balance of empiricism and groundedness, in particular contexts tied together by clear philosophical inquiry, and the faction exemplified by Thorndike and Skinner, aiming for objectivity through a brutal extermination of agendas, irreproducible results, and introspection, with a clear firewall between interpretation and uncontroversial data. This perspective is not limited to the early 20th century, and in many ways aligns with the US National Academy of Science report titled “Scientific Research in Education” (National Research Council, 2002). Still, in the United States at least, most academic education departments remain a valuable, if eclectic, bazaar of approaches ranging from social theory, interpretivism and activism, and humanistic study to the more standoffish approaches of experimental psychology, sophisticated statistical analysis, and psychometrics. Tucked away on a side street in this bazaar are often designers: instructional designers, curriculum designers, designers of educational communications and technology.

The learning sciences community has been a cluster of scholars who, like some of the boundary-crossers described above, tend less toward questions of policy, or the pragmatics of training the education workforce, and more toward the dual attempt to understand and to change learning in context, or in other words, toward science and design (e.g., Collins, 1992). My own history with this

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community is as an American scholar, trained in cognitive science and computer science, and studying in northern California just as the technological revolution was spawning the learning sciences, but also as an advocate for deepening the international nature of the learning sciences community through organizations such as the International Society for the Learning Sciences. I've written about this community and its history elsewhere (Hoadley, 2004, 2005; Hoadley & Van Haneghan, 2011; Kirby, Hoadley, & Carr-Chellman, 2005), but I would reiterate that several characteristics help define it as a place that was perhaps uniquely well suited, among all the learning research communities, to think about design. First, there was a strong tradition of straddling this boundary between science and action in practice. Second, the learning sciences has, like cognitive science before it, struggled with the role of social context, including all the challenges it poses to reproducibility, but also with all the opportunities provided by treating learning research as informing a profession, in the sense of Argyris and Schön (1991). Argyris and Schön argued that professional knowledge, unlike other forms of knowledge, is contingent on context, and on judgment. They argue this is why an architect is not merely a technician applying known solutions to problems, and they echo some of Simon's way of treating design as a way of thinking that can't be reduced to closed-form problem solving. Learning scientists tend to take this 'your mileage may vary' stance, treating learning research as often a 'local science' in diSessa's terminology (diSessa, 1991). And thirdly, perhaps most importantly, the learning sciences as a field is inextricably linked to the emergence of research in and on and with technology. In the 1980s and 1990s, computers were the purview of either computer scientists (an emerging discipline even then) or of science and math experts who had access to the resources for computing. But there was also this incredible moment of opportunity in which cognitive science was providing opportunities for collaborations across psychology, anthropology, linguistics, and neuroscience, with computer scientists at the table (Gardner, 1985; Molnar, 1997). One can argue that the mind-as-computer or mind-as-symbol-system metaphor drove cognitive science for years, and this community included lots of computer folks who were, by inclination or necessity, builders, makers, and designers. They were improvisers and implementers. And in some places, especially Silicon Valley and the Boston area, there was a deep confluence of people who were studying and building our shared future with technology as they went.

As described in Ehn's chapter (this volume), there were important confluences forged in the crucible of technology invention. Xerox PARC hosted not only numerous early human-computer interaction designers and researchers, but also the Institute for Research on Learning. Many of the early groups of learning scientists had strong educational technology emphasis, including those at UC Berkeley's Education in Math, Science and Technology; Northwestern University's Institute for the Learning Sciences; the Cognition and Technology Group at Vanderbilt (CGTV); and MIT's Media Lab. The first learning sciences conference and journal emerged at Northwestern University as an outgrowth

of the Artificial Intelligence in Education community. Participatory design and its long tradition, especially in Northern Europe, had some intersection with these groups, which at the time were as likely to send papers to the Computer Human Interaction conferences as to the mainstream education conferences. And researchers like Michael Cole, Jean Lave, Etienne Wenger, and Jim Greeno helped link the learning sciences community to those studying and fostering technology using a sociocultural framing—this supported ties to the cultural historical activity theory being used in Scandinavia. Those ties persisted, especially in the area of computer-supported collaborative learning, such that scholars from the United States and from Scandinavian centers like INTERMEDIA in Norway again provided critical human capital for ideas from participatory design to be visible to those in the learning sciences.

When I first encountered participatory design in the 1990s, it was through the technology design community: one of the participatory design conferences had several education colleagues in attendance, and participatory design methods and its sibling, informant design methods, were being talked about and cited in the human-computer interaction literature (Muller & Kuhn, 1993; Scaife, Rogers, Aldrich, & Davies, 1997). The metaphor of “user centered design,” at that time still a newish contribution in human-computer interaction (HCI) (Norman & Draper, 1986), was complemented by the concept of “learner centered design” by Elliot Soloway in the *Communications of the ACM*, perhaps the most widely read journal in computer science (Soloway, Guzdial, & Hay, 1994). These connections between learning research and HCI left a door open for ideas from participatory design to come into the learning sciences. Interestingly, the learning sciences was reinventing some wheels here, in that instructional design also had models for learning design that were participatory: for example, “user-design” (Carr, 1997), which closely resembled participatory design, was proposed in the instructional design community but not widely noticed in the learning sciences. In the late 1990s into the early 2000s, the notion of design-based research was evolving and incorporated some of the ideas of participatory design in the notion of design and research as a partnership-based activity involving stakeholders (although often the stakeholders were teachers, but not necessarily learners) (Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003; Design-Based Research Collective, 2003). Later points of connection included what learning scientists would call “co-design” (Penuel, Roschelle, & Shechtman, 2007) and the idea of “research-practice partnerships,” which forms part of the basis for what is now called design-based implementation research (e.g., William R. Penuel, Allen, Farrell, & Coburn, 2015). All of these are framings of design that place a value on empowering (whether in an explicitly political way or not) some of the people whom educational designs would influence, and thereby (one hopes) making the findings of the work more useful, usable, disseminable, and valid.

When I reflect on the ways in which the learning sciences have become more connected to the traditions behind participatory design, I think now is a critical

moment in the history of both communities. On the one hand, the prominence of framings such as design-based implementation research takes some of the core questions of educational research, like ‘How do we understand how people learn in a way that helps us influence it at scale?’ and places them squarely under a design framing where valuing participation and mutual respect are key assumptions. On the other hand, the learning sciences community has a bit of a blind spot when it comes to the inherently political nature of this framing, and has historically done less well at empowering learners (as opposed to educators) in the process. Other educational research traditions, such as participatory action research, are much more explicit about and embracing toward the political nature of research that draws on design that is participatory. At the International Conference of the Learning Sciences in 2014, the theme of ‘learning and becoming in practice’ heralded not only a theoretical stance toward culture and identity as core aspects of learning, but also had an unprecedented number of sessions in which the political aspects of learning design were considered, including one symposium on participatory design in the learning sciences (from which this book draws.) For the learning sciences to advance, and to truly draw on the natural affinities between it and the participatory design community, there needs to be an increasing consideration of how design is inherently (if not deliberately) a political act, and that, rather than being a weakness in an objectivist model of rigor, is a strength in a framing where both the science and the design of learning are aimed at producing usable knowledge (Lagemann, 2002; Lindblom & Cohen, 1979). Committing to the production of usable knowledge means committing to the contingency of context, to ‘local sciences’, to knowledge that fits the Argyris and Schön sense of knowledge-needing-judgment, and to a version of cumulativity very different from that held in today’s natural sciences. By doing so, it may be that we can create a reciprocal benefit to participatory design—one in which, as Dewey says, we can profit from the contingencies and intersectionalities of designing and implementing learning environments, rather than being at their mercy, by generating insights that endure about how people learn, and what to do about it.

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## Author Queries

AU:1 OK? (This or another predicate verb for the subject “emergence” is needed.)

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