

Designing for Democracy in Education: Participatory Design and the Learning Sciences

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Abstract: Within the learning sciences the concept of design is important in developing learning environments and conducting research. We propose the field of learning sciences seek better understandings of design from the field of design. In this paper we focus on Participatory Design (PD), where goals for real world impact and democratic process resonate with goals of the learning science. Our reflection on applying PD in the learning sciences suggest a more democratic and effective methods for objectives such as: defining research and learning goals, practices that consider multiple participants in design, practices for establishing participatory living labs for design research, developing infrastructure for sustainable participation, and using PD as a way to seek transferable rather than generalizable outcomes. Finally, we reflect on how PD might help us answer some of the issues with interest driven learning that motivated our work.

The effort of the last two-thirds of a century has been successful in building up the machinery of a democracy of mind. It has provided the ways and means for housing and equipping intelligence. What remains is that the thought-activity of the individual, whether teacher or student, be permitted and encouraged to take working possession of this machinery: to substitute its rightful lordship for an inherited servility. (Dewey, 1903, p 193-194)

Introduction

The goal of the learning sciences is to not only understand the phenomena of learning, but also to impact current practices to enable more effective learning. Part of this includes building things, putting them in the world, testing them, refining them and iterating. We propose that the learning sciences would benefit by reflecting on this process by exploring the discipline of design and design research. One method within the discipline of design, participatory design (PD), offers particular promise for the learning sciences because of aligned goals for engaging in in the real world applications and shared democratic values.

Although the quote that started this paper is from 1903, we still, persistently, struggle to focus education on the learner, their self-motivation, identity, interest, and what they find personally meaningful, rather than simply meeting criteria of content acquisition. PD offers opportunities to uncover self-motivations, identities, and interests and to construct meaningful engagements by working together with participants to co-creating learning environments that meet the needs of the whole community that is engaged in the learning practice.

In this paper we will particularly reflect on challenges with interest driven learning that may be ameliorated with PD. While this is not the only area of the learning sciences that can benefit from PD it offers a number of concrete problems where PD methods may prove useful. Beyond interest based learning will explore some other current uses of PD in the learning sciences. Then we will introduce participatory design, as it is understood in the field of design. And finally we will reflect on some concrete contributions that PD may offer the learning sciences and how it could impact interest driven learning.

Challenges in Designing Interest Driven Learning

Currently many learning activities work to build upon the *content interest* of the youth such as leveraging young people's interest in games (Y. B. Kafai, 2006), new media (Forte & Guzdial, 2004) or focus on maker culture (Yasmin B Kafai et al., 2013). A constructionist perspective suggests that learning is most effective when the learner is constructing a *personally meaningful* product (Papert, 1993). By creating learning experiences around content interest or personal interest designers seek to increase motivation and persistence with learning (Schiefel, 1991). However designing and

implementing effective interest driven learning activities poses many challenges, including: What is interesting or personally meaningful to young people?; How do we balance learning and interest in design?; and How can we create persistence with interest driven learning?

What is interesting or personally meaningful to young people?

Identifying what content is interesting or what activities are personally meaningful young people can be more difficult than we assume. In some theories of interest it is suggested that interest is content-specific, and it is directive to how a student is motivated to learn. This type of content interest can be short lived or enduring (Schiefele, 1991). In contrast, use of the phrase *personally meaningful* is frequently used in constructionist theory to speak to interest that are more value driven. The ways that personally meaningful is used suggests interest that are not necessarily content specific, but have a value to young people as individuals, rather than simply as cultural signifiers. Some ways that are suggested to create more personally meaningful experiences are to offer learners a chance to present their work in a public or authentic manor (Shaffer & Resnick, 1999), to have learners engage in narrative (Bruckman & Resnick, 1995), or to imagine future use of learning (Luckner & Nadler, 1997). These notions of creating motivation based upon the individual's interest, whether content interest or personally meaningful, are more complex than simply looking at what is popular in youth culture and require an ability for learning scientist to discover with youth what content or values motivate learning.

How do we balance learning and interest in design?

Even after we uncover the interest of youth it may be difficult to leverage that into a learning experience. Many have lamented the *edutainment* (Resnick, 2004) or gamification (Bogost, 2011) of learning that take popular or “fun” activities like current media or games and use them to candy coat learning. Edelson and Joseph (2004) outline a number of challenges in the logistics of basing learning responsive to individuals' interest:

First, it requires rare levels of internal motivation on the part of children. Second, it provides no mechanism for promoting learning objectives even marginally outside of learners' interest. Finally, it requires impractical levels of resources and flexibility in serving the divergent interest of individuals. (Edelson & Joseph, 2004, p 168)

How can we create persistence with interest driven learning?

While there are many promising interest driven learning experiences, it is challenging to engage in persistence with learning based upon interest alone. Dewey suggest, in his book *Interest and Effort in Education*, that external attempts may catch someone's interest, but holding it and engaging learners in persistent effort and identification with a topic area are much more difficult (Dewey, 1913). Edelson and Joeseph have addressed this in their Interest-Driven Learning Design Framework (IDLDF) by focusing on what the learner will perceive of having a future usefulness outlining five methods for sources of usefulness for designers to use in generating interest; Pleasure, Concern, Identity formation, Life goals, and Curiosity (Edelson & Joseph, 2004). However, this framework assumes that the designer or researcher can identify what is pleasurable or of concern to a learner, what activities do they attach to identity or life goals, or simply what makes a young learner curious.

Design and Participation in the Learning Sciences

The learning sciences use the word *design* to describe many of the methods used to plan, develop, test, and iterate learning programs. In addition, there has recently been an emphasis on *participatory* culture in scholarship related to youth culture (Jenkins, 2009). While the use of these two terms has little direct relationship to participatory design (PD) as it is defined in the field of design, PD still closely aligns with a number of efforts in the learning sciences.

The Learning Sciences' emphasis on approaches such as Learner Centered Design (LCD), Design-based Research (DbR) and Community Based Design Research suggest that the field is receptive to thinking about design critically. In LCD the learner is considered as central to the design process in terms of consideration rather than the teacher or facilitator (Soloway, Guzdial, & Hay, 1994). In DbR the emphasis is on using design to test and building theories in the ever changing and confusing real world rather than a lab setting. To do so it is imperative to engage participants in real world settings and to gather their input in the process (Barab & Squire, 2004). In both of these approaches engage in aspects of prototyping, testing and iterating with participants makes them participatory by nature however neither would be engage in PD as it is understood in the field of design.

Community based design research as it has been realized by Bang and colleagues with indigenous communities grows from a tradition of Participatory Action Research (PAR) (Bang, Medin, Washinawatok, & Chapman, 2010). PAR and PD share a commitment to working with communities to articulate issues of concern and develop plans of action toward those concerns. But whereas PAR is grounded in inquiry, PD is grounded in design itself. Community based design research could be seen as a bridge between these traditions and practices, but this line of thinking has yet to be developed in the learning sciences.

There are few examples of participatory design in learning, for instance, Druin has lead a number of efforts the focus on PD in research on and development of human computer interaction for young people (Druin, 2013). While the development of new technology in her work is not explicitly focused on learning, because the participants are youth, frequently learning is a goal of the design process (Druin, 2002). Spikol, Milrad, Maldonado and Pea brought a strong Scandinavian influenced co-design approach to the development of mobile science collaborations (Spikol, Milrad, Maldonado, & Pea, 2009). DiSalvo has included elements of participatory design methods in learning science research (B. DiSalvo, 2012) and in collaborative work with the Carnegie Mellon School of Design on the Click! Urban Adventure (B. DiSalvo, Parikh, & Crowley, 2006; Hughes, 2007).

Background of Participatory Design

The origins of participatory design can be traced to Scandinavia in the 1970 and 80s (Ehn 1993, Simonson and Roberston 2012). Early participatory design projects focused on the workplace and were often conducted in conjunction with unions. Participatory design was seen as an approach to ensure democratic agendas in labor, particularly as information technology and automation was introduced into work environments (Simonson and Roberston 2012). From the earliest days, then, participatory design has been at one and the same time a set of methods, a practice of engagement, and a commitment to a particular set of political values—all enacted through design.

Though still niche within design, over the past several decades participatory design has developed into a rich domain of research and practice, extending far beyond its origins in Scandinavia. Workplace environments are still central to participatory design, and in addition to the factory floor there are substantial case studies across fields of work, most notably in healthcare Sjöberg, C., & Timpka, T. (1998) and in government (Anthopoulos, L. G., Siozos, P., & Tsoukalas, I. A. (2007). But as information and communication technologies have changed and expanded beyond the workplace, the field sites of participatory design have likewise changed and expanded. Increasingly there are examples of community-based participatory design (C. DiSalvo, Clement, and Pipek, 2012) that continue with the methods, practices, and commitments of participatory design but in new contexts, with new actors, and new purposes.

For example, the in the city of Malmö, Sweden there are a series of “Living Labs” that have become sites for a new mode of participatory design that engages residents in the open exploration of inventive creative uses of information and communication technologies (Ehn 2008; Björgvinsson, E., Ehn, P., & Hillgren, P. A. 2010). Notably, many of the residents that participate in these Living Lab programs are immigrants to Sweden. What these programs provide are opportunities to conceptualize and construct systems that function as experiments in cultural expression, for example, sharing food practices or enabling DIY music production. Other examples of community-based participatory design explore engagement in technical practices such as environmental sensing and monitoring. Neighborhood Networks was one such project that brought together designers and neighborhood residents to explore the practices of environmental monitoring and prototype civic interventions and alternate forms of expressing environmental data (C. DiSalvo, et al, 2008). What the Neighborhood Networks project demonstrates is an approach to participatory design that seeks to directly engage the public in the activities of design, not simply for instrumental ends, but as a kind of co-operative study of the potential of information and communication technologies.

Pelle Ehn, one of the early practitioners of participatory design, has articulated these changes in participatory design through a series of papers that explore what he refers to as “participation in design things.” (Ehn 2008) These so-called design things are the instantiation of contemporary controversies, such as citizenship or pollution (to draw from the examples above). To participate in design things is to collaborate in both an investigation of the conditions of these controversies (who counts as a citizen? what counts as pollution?) and also to explore how we might respond to these conditions—all through design.

These new practices of participatory design are challenging to the participatory design community, and to the practices of professional design and design research more generally, because their purpose is often seen to be obscure. Certainly, it is more nebulous that the early work of the field in which the relationship between the design of technical systems and the agency of workers was (or at

was seen to be) direct and an unambiguous democratic concern. Still, for Ehn, and many others this mode of participatory design is an extension of the foundational methods, practice of engagement, and commitment to democratic values. What is different is that experiences and events take the place of the technical systems. That is, rather than the end goal being the design of an operational system, the end goal is an experience or event that develops the agency of participants. This may involve a technical system, but more as a prop or process. The activities of participatory design become activities of *infrastructuring*, that is providing the resources necessary to prompt, support, and sustain, this collective and collaborative inquiry through design (Ehn 2008; C. DiSalvo, Clement, and Pipek, 2012)).

Arguably, learning is an implicit aspect of many of these new participatory design endeavors. Oftentimes there is an aspect of the projects that involves the development of technological literacy or fluency. In some cases, that is an explicit aspect of the project, in others, a by-product of the design activities. For example, in the Neighborhood Networks project participants learned about using simple sensors for monitoring various aspects of air quality and sound levels. In addition to learning the operation of devices, they also encountered the limitations of those devices in use. And too, they had to consider, and ultimately construct, methods of communicating that data in a public forum to their neighbors and other interested parties. To achieve this, the designers designed a series of activities and formats — the infrastructure of the project. Likewise with the projects of the Malmö Living Labs — *infrastructuring* becomes central to these new modes of participatory design.

Reflection on What PD Offers the Learning Sciences

There are a number of ways that the methods, practices for engagement and democratic goals of PD can provide a useful framework for the use of design with in the learning sciences. In the following section we reflect upon the use of PD in the learning sciences and envision five ways that PD methods, practices and goals can enhance the research and output of the learning sciences. These ways include, democratic practices for defining research and learning goals, practices that consider multiple participants in design, practices for establishing participatory living labs for design research, developing infrastructure for sustainable participation, and using PD as a way to seek transferable rather than generalizable outcomes. Finally, we will reflect on how PD might help us answer some of the issues with interest driven learning that motivated our work.

Democratic Research and Learning Goals

Frequently in the learning sciences previous findings, policy, administrative directives, or the passions and interest of the researcher drive our goals for research or learning outcomes. PD proposes a different approach to setting research and learning goals. In PD it is the community or the participants one is working with that establish the goals of design. In practice much of the work of PD is in providing the tools and establishing a dialogue with the participants so they can set the agenda for new design.

This work is often playful or provocative activities that help participants feel empowered to share their perspective no matter their level of expertise. Examples of activities are games that involve juxtaposition of images, mapping conceptual ideas on geographic maps, or getting participants to create reflective art or craft projects. At times the outcomes reinforce our understanding or inspire new lines of inquiry, but at other times they can be difficult to interpret. It is important to note that interpretation of such activities frequently is secondary to establishing a dialogue and vocabulary between the designer and the participants. We see this work of PD to be beneficial to researchers because it helps break down knowledge, language and power barriers that limit the ability of participants to share in setting goals and design directions.

Considering Multiple Participants

Many of the DbR classroom studies are designed with input from teachers; many constructionist programs are designed to give young people choices so they can direct their own learning. Both of these are reflective of PD practices, yet traditional PD methods call for designers to identify all of the participants and those impacted by the design. For example, in classroom environments teachers, students, and administrators would all be considered important participant in the design process, but other participants may also be included in the design process such as parents or policy makers. In informal learning environments, such as in designing museum exhibits the exhibit designers often consider the visitors from various backgrounds, such as experts, parents, youth, or the elderly. However there are other participants that may be overlooked in design, such as the museum educators, guards, and maintenance staff. We have outlined a few participants that may be overlooked in the design process or whom have roles that can be reconsidered with the use of PD approaches.

Teachers

Teachers are frequently already included in the design of classroom interventions because of their expertise, but also because they are necessary implementers – if teachers do not feel ownership and believe in an experimental project they will not implement it well. However, in other environments such as educational software, afterschool programs, or museums teachers are not frequently considered participants in the design process. If teachers are invited into early speculative design process about more informal learning environments they may provide new incites into connections and breakdowns in relationships to classroom learn.

Youth

Inviting youth into defining their own interest would seem like a necessary first step in designing interest driven learning, but they are often not part of the design process for learning scientist in the formative stages of design. The use of more playful or provocative PD activities may give youth the self-efficacy, skills and vocabulary to contribute to the design of interest driven learning. The structure outlined by the IDLDF identifies one way to structure a learning environment for direction of seeking relevance from the learner rather than selecting relevant topics based upon the designer or the teachers perspective (Edelson & Joseph, 2004). We suggest that methods and practices from PD will help learners contribute in more effective ways to the design process

Administrators, Policy Makers and Maintainers

With in a PD model administrators, policy makers, and those maintaining learning environments would be included in the design process. While these participants may not be considered users or learners in a LCD design approach their successful engagement with a learning activity or environment is as necessary as other participants. By inviting them in, and giving them tools to dialogue with teachers, youth, and other community members we can create a better understand between all participants and designs to bridge different goals.

Parents

Among youth one of the most influential factors in their life and their learning is parents, yet we frequently do not have their participation in the design of learning environments. Parents are resource providers, brokers and partners in learning (Barron, Martin, Takeuchi, & Fithian, 2009) and also strongly influence value systems for young people that impact their learning (B. DiSalvo, Bruckman, Guzdial, & Mcklin, in press).

Living Lab

Research with some participant who are resistant to learning or who resent changes imposed from outsider can be difficult. There is a distrust of outsiders, seeking to do “good” with in a community by imposing their own values (Freire, 1970; Illich, 1971). Successful community based research requires a long-term commitment, with goal setting and co-designing with communities (Stoecker, 2005). One approach to developing a long-term relationship with participants in education is the laboratory school model, where practice and research on learning theories have meet (University of Chicago 2013). Other models in learning sciences, while not necessarily build for this intention, have served as informal learning laboratory spaces such as the Computer Clubhouses (M. Resnick & Rusk, 1999). Existing living labs, such as a the Malmö Living Labs, suggest they allow for a more democratic approach to research with diverse audiences, allowing goals and innovations to emerge from bottom-up, rather than imposed from on high (Bjrgvinsson, Ehn, & Hillgren, 2010).

Infrastructuring

With a similar goal to living labs, infrastructuring is developing tools, such as Wikipedia, where the infrastructure is designed for participation in shaping the knowledge output and the ongoing design of the environment (Ehn, 2008). Within the field of learning sciences one can see that the online Scratch 2.0 programming community as infrastructure to encourage ongoing participation and, while perhaps not at formalized participatory infrastructure as Wikipedia, it does have strong participatory elements in the way the program is shaped (Resnick et al., 2009). We would encourage further reflection on infrastructure for participatory methods in the learning sciences as a way to design more sustainable participation in the design of the learning experience and therefore retaining the interest of learners.

Transferability rather than generalizability

A concern with DbR is the generalizability of findings because research is conducted outside of the laboratory in the highly variable classrooms or informal learning environments. By focusing on

developing design methods or principles, rather than research interventions, the learning sciences gains an approach to offers transferable design findings that can be used new contexts. For example, the issues of designing participatory learning infrastructures addressed with a DbR approach could yield new theory and findings that can transfer to the design of other participatory learning infrastructures.

PD and Designing Interest Driven Learning

The interest driven learning approach is often about creating a “hook” that will get kids interested in an activity where learning is embedded. Frequently these efforts result in candy coated stale and not valued learning activities that might get immediate attention, but with little persistence. We outlined three questions in designing interest driven learning that addressed this challenge and will wrap up our reflection with exploring how PD can help us answer these questions.

What is interesting or personally meaningful to young people?

We see PD as a way of identifying what is an interesting context to the participants, but also as a way to uncover values of the whole community involved in learning. The engagement of the whole community involved with young peoples learning will help in shaping fundamental goals for the environment, the research and the learning that will move a project beyond what is “cool” or “fun” and address issues of value to the learners and the people that matter to them.

How do we balance learning and interest in design?

By inviting all of the participants to the design table we can engage in design that helps bridge conflicting goals. This means not only talking youth about what is interesting to them but also engaging them in design activities about what is not interesting and what they resist. By allowing the young people and the others in their learning community to better understand motives we can design better interventions and address issues of content coverage that call into question what content needs to be covered and why.

How can we create persistence with interest driven learning?

By designing for participatory infrastructure learners and other community members will be engaged in ongoing design, with potential for learning environments that are flexible, democratic, and remain interesting.

Conclusion

The learning science relies heavily on the concept of design in establishing methods and practices. It is time that the field looks outside of the common use of design terms to understand the methods and practices of the field of design. In this paper we found that reflection on the methods, practices and goals of participatory design was fruitful in addressing issues in interest driven learning and in constructing new ways of looking at design in the learning science. In future work the use of PD can be leveraged to develop design processes for interest driven design, moving past what is “cool” and making learning valuable to learners and their community.

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