Participatory Design With Students for Technology Integration: Shifting Power and Organizational Practices in an Urban School

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Abstract: This paper examines how *infrastructuring* through participatory design (Le Dantec & DiSalvo, 2013) for school technology practices with students reorganized traditional power relations between students and adults, and how such shifts in power relations in turn surfaced new organizational technology practices. Two researchers collaborated with a group of high school students with a shared goal of designing school technology practices that were meaningful to the students. Informed by theories of infrastructuring forms of participatory design (Le Dantec & DiSalvo, 2013), the collaboration explicitly sought to re-mediate the social relations of designing the school's organizational practices with technology. This study analyzes the development and implementation of a student-designed school technology practice as a case study to examine how infrastructuring forms of participatory design mediated shifts in power relations and organizational practices at the school site. Results indicate that forms of participatory design which seeks to address social relations in the process and outcomes of design can contribute to shifts in student roles within the school and facilitate boundary crossing (Akkerman & Bakker, 2011) in which student goals were reflected in new organizational technology practices.

Equity as a priority for technology integration in schools

Literatures on sociotechnical systems identify the processes in which technologies enter local contexts are mediated by the broader contexts of culture, history, organizational structures, and interactions (e.g. Nardi, 1996). In varying educational contexts, digital technologies have been observed supporting student participation in social, political, educational and economic activities (Ito et al., 2013), while also reproducing barriers to such participation for traditionally marginalized students (e.g. Watkins, 2011). For example, Ito and colleagues, through research related to "connected learning" practices, have highlighted the affordances of emerging technologies to bridge student epistemologies and goals for participation and agency in broader civic, economic, and educational activities (Ito et al., 2013). Such practices are predicated on boundary-crossing processes in which new forms of educational practices are conceptualized through stakeholder knowledge and needs to make participation in capital-producing activities more accessible (e.g. Schwartz, 2015). On the other hand, many have documented ways in which access to technology-mediated activities can reproduce existing inequities based on race, gender, class, and other demographic factors (Warschauer & Matuchniak, 2010). What is often referred to as the "digital divide" can be viewed as a direct consequence of existing educational barriers that traditionally marginalized students experience. What both of these literatures suggest is that inequity is a consistent concern for technology integration in schools, and that equitable approaches to technology integration in schools must respond to the situated elements of such a process, such as organizational practices, stakeholder priorities, and power relations. This study aims to examine the affordances of particular forms of participatory design in designing localized approaches to school technology integration, and in particular, how such design methods may shift power relations in productive ways to develop school organizational practices.

Power as mediator of school technology practices

Schools are sites in which broader social inequities can be alleviated and reproduced in a number of ways (Collins, 2009). This is no different for technology integration in schools, where factors such as access, identity, and pedagogy can mediate the extent to which students benefit from the supposed affordances of emerging technologies (Warschauer & Matuchniak, 2010). As such, school organizational practices have been recognized as a key factor in successful technology integration in schools (e.g. Fishman and Pinkard, 2001). This study views the relational power between stakeholders and consequent ability to participate in the design of school technology practices as a primary constraint to the development of equitable technology practices in schools.

While power, particularly in the context of designing school technology practices is under-examined, fro ma sociotechnical perspective that assumes the social embeddedness of technological practices (e.g. Nardi, 1996), it undoubtedly plays a role in mediating the possibilities of technology integration in schools. Ladson-Billings (2006) argues that there are historical educational debts that are owed to marginalized students as a result of their continued exclusion from productive educational domains, and therefore, a purely access-based

response to technology integration is unlikely to fundamentally transform the deep roots of inequity in education. One expression of such a debt is the power dynamics within schools that exclude marginalized students from shaping their own educational pathways. Nondominant students, in the context of their schools, tend to be excluded from roles that allow them to meaningfully shape the educational practices that serve them (Delpit, 2006). It is particularly problematic that students are excluded from such processes because student knowledge developed in various ecologies can become important resources for the design of technology practices as well as learning processes more broadly (Barron, 2006; Yosso, 2005). In other words, educational interventions aimed at equity in technology integration in schools should not be limited to providing access to particular tools or pedagogy to students, but should also consider how the power relations in designing school technology practices may be remediated to offer more opportunities for knowledge-sharing across stakeholders and agentic action for non dominant students. This analysis will examine the relationship between shifts in power and organizational practices in relation to student participation in the remediation of school technology design processes.

Participatory design and infrastructuring

Infrastructuring in participatory design (Le Dantec & DiSalvo, 2013), the iterative refinement of the social relations in participatory design processes, provides a useful methodological framework towards removing barriers for traditionally marginalized stakeholders to participate in design activities. Such a process reflects the original conceptualization of participatory design as an approach to workplace design in Scandinavia, which focused on the redesign of social relations between workers and management to develop more equitable work practices by leveraging insights for design that would otherwise be marginalized. As such, equity in this instance is conceptualized as both shifts in power relations for design that include the needs and epistemologies of traditionally marginalized stakeholders, and the access to practices that express the needs and epistemologies of stakeholders. Applying this approach to technology integration in schools, *the study sought to examine the affordances of participatory design infrastructuring in developing equitable school technology practices.* While engaging youth in research and design is not a unique endeavor (e.g. Kirshner et al., 2005; Druin, 2002), more needs to be understood about how student participation shifts power relations and design outcomes in schools.

Research questions

With the need to better understand how student participation in school technology design might mediate shifts in a school's design and technology practices, this paper asks the following research questions:

1. How did social infrastructures of design shift within a participatory design effort aimed at co-designing school technology practices with students?
2. How did emerging social infrastructures for design shift power dynamics in the development of technology practices in their school?
3. How did the design outcomes and implementation of participatory design with students expand access to school technology practices that reflected student expertise and needs?

Methods: Participatory design research

Study site

The site, with 80% Latino and 14% Asian students, and 55% of students classified as "Limited English Proficient", reflected broader challenges of technology integration across urban schools. It had recently acquired a learning software named Schoology, an online Learning Management System (LMS) as well as hardware such as Chromebooks and Apple computers, gradually transitioning to a 1-to-1 laptop to student ratio. Such investments were met with inconsistent practices and uncreative use due to the lack of training, buy-in, and coordination across the school stakeholders. Students had indicated that these new tools were mostly used for submitting assignments, receiving grades, and taking quizzes.

Participatory design

Responding to the school site's needs, the authors of this manuscript recruited an advisory class of 15 high-schoolers and their advisory teacher to initiate a participatory design research project (Bang & Vossoughi, 2016) during the 2014-2016 school years to address school technology practices. Participatory design efforts in education seek to collaboratively re-mediate educational practices by addressing the sociocultural aspects of a problem space, including political and institutional dimensions of the design work (Bang & Vossoughi, 2016).

We concluded that taking on this collaborative approach to design and research will allow us to directly address issues of power by privileging the voices of nondominant students to shift their roles within the school. The group met once a week to design interventions to make technology use at the school better reflect student needs. In its second year, the program moved to an after school space with an added emphasis on students to engage with their own personal interests. The students gradually transitioned to a new group of 12 students who continued the collaborative design work.

Data sources and analysis

For this analysis, one student-proposed shifts in design processes was examined to understand how the implementation of the interventions addressed shifted the role of students within the school, and how such a shift created opportunities for organizational learning. Therefore, the interventions, and subsequent field notes describing the implementation were qualitatively analyzed for their contribution to each aspect of the equity framework.

Results

Case study: Making the collaborative design effort more passion-driven

Shifts in design infrastructure

At the beginning of the second year of the participatory design work, four students from the original design group met with the first author to discuss potential improvements in the way students engaged with the partnership. The first year had concluded with a professional development (PD) session organized by the students with administrators, teachers, and university researchers as an audience that reflected the first year's design goals that were co-developed by the researchers and students. The design goal of the first year was to develop practices that were meaningful to students using Schoology, a learning management system (LMS) that the school had recently purchased. Consequently, at the PD session, students presented their designs which all utilized the new LMS, such as an ePortfolio system to facilitate more holistic evaluation of students, an archive of "college-going interviews" of seniors to make college-going knowledge more visible, and an introduction to the "calendar" feature on the LMS. However, about five students had lost interest in the design work through the first year, and did not present at the PD session.

At the onset of the second year of the partnership, five students from the original group who had volunteered to offer feedback on the first year's collaboration met with the first author with the goal of articulating ways to improve the design methods. Asked why some students seemed to become disengaged from the previous year's work, the students unanimously agreed that the design goal, to develop "school practices" was too limiting, and that students needed to do work that they felt "passionate" about. As a result, the group decided to ask future participants to initiate their involvement by engaging with an issue or activity they felt passionate about, and use digital tools to more deeply engage with their passions with an eye towards using the outcomes of this work to inform teachers of technology practices that are meaningful to students. With engaging in "passion-driven work" through digital technology as a central thrust of the design group, the collaboration moved to an after school space with a mostly new group of twelve students who each initiated various technology-mediated, passion-driven projects, such as creating an e-sports (gaming) community, continuing the development of an ePortfolio system, and building a financial literacy website.

Power

Students who engaged in passion-driven designs emerged as leaders and experts within their particular interest-driven communities. For example, a group of students who founded an e-sports community hosted several gaming events which they planned, advertised, facilitated, documented, and were attended by dozens of their peers. They continued to expand the scope of their work to consider social issues such as gender disparities in the gaming community, as well as create extramural networks with outside gaming experts such as several university-based gaming communities. Several teachers have commented on how their perception of some of the students have shifted significantly for the better as they have observed the students take on leadership and organizational roles within their new communities. In another example, the ePortfolio system that was developed by one of the students served as a prototype for school-wide implementation, and is currently being tested in several classrooms.

Student expertise and needs

Due to the realignment of the social infrastructure of design, the design outcomes further reflected student expertise and needs, and expanded the understanding of what it means to learn through technology at the school site. As a result of this shift in design focus, the 12 students who joined the group for the second year each engaged in technology-mediated activities related to their personal interests. The design outcomes reflected student knowledge and needs. For example the e-sports community designers leveraged their deep knowledge of current gaming practices outside of school, in particular the rise of e-sports and the tournament formats for such events, to successfully host their own events, while the students developing the financial literacy website utilized their knowledge of their peers to identify a need for financial literacy education resources. These "boundary-crossing" (Akkerman & Bakker, 2011) technology practices were not available in the school environment prior to this proposed intervention.

Conclusion and implications

The findings from this study not only suggests that students should be critical partners in the design of technology-mediated educational practices, but that continued examination of *how* students engage in such partnerships can critically influence the design outcomes. The realignment of social infrastructures for design, and the consequent designs that emerged demonstrate that infrastructuring social relations of design can lead to the design of interventions that remediate traditional power relations in schools to produce more equitable technology practices that reflect student expertise and needs. In particular, student engagement with participatory design seems to lead to the kind of organizational learning characterized as 'boundary crossing' (Akkerman & Bakker, 2011), which views learning as the expansion of the object of activity systems through the hybridization of traditionally isolated activities within an institution. It is important to note that this study only highlighted some of the potential contributions students can make in technology design efforts, and deeper studies that examine the micro-interactions that mediate the kind of positive outcomes described here are needed to consistently produce positive outcomes. Furthermore, there needs to be a more comprehensive understanding of how knowledge embedded in semiotic tools created by students travel across the school ecology, and how they are taken up by other stakeholders. Moving forward, we hope to contribute to understandings in both of these directions.

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