Designing Together?: Group Dynamics in Participatory Digital Badge Design with Teens

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ABSTRACT

Balancing the dynamics between industry, academia, and stakeholders in a participatory design (PD) project can be challenging, particularly with teens as design partners. In this reflective case study of digital badge design, we attempt to untangle complex PD work that incorporates several groups, each with their own vocabulary, area of expertise, and position in a perceived project structure hierarchy. Using participant interviews that reflect on the design process, triangulated with video, field notes, and design artifacts, we determined that the adolescent stakeholders, science center staff, researchers, and industry professionals viewed the design process through distinct lenses based on their *communities of practice,* which affected how they perceived the project. Our findings contribute new insight into how youth stakeholders perceive their involvement and role in participatory design practices within a complex design project.

Author Keywords

Participatory design; co-design; reflection-on-action; digital badges; case study; power dynamics.

ACM Classification Keywords

H.5.2. User Interfaces (D.2.2, H.1.2, I.3.6): *Prototyping, User-centered design*; K.3.1. Computer Uses in Education: *Collaborative learning*.
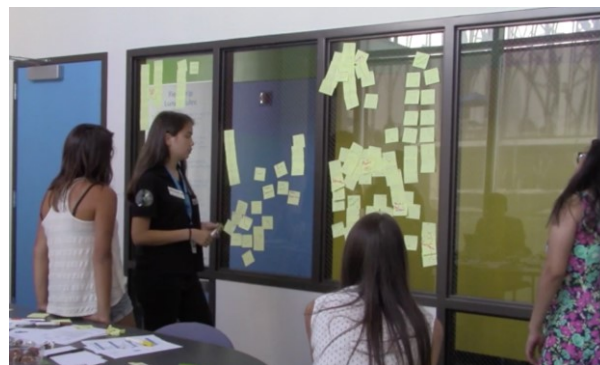
INTRODUCTION

Participatory design (PD), at its roots, attempts to address power imbalances inherent in the typical design process, allowing the users of the technology to have agency in its development [3,15]. In more recent years, the principles of PD have been extended to younger groups of stakeholders, involving children in the design of technologies [8,9,13].

Figure 1. Youth participants of the digital badge design team organize brainstormed stickies about their science learning into overarching themes in the first design session.

The addition of youth creates a new dynamic, as the relationship between children and adults introduces another level of complexity to the power differences already found in various PD projects [17].

Some researchers have begun to explore how adult-child design relationships function; however, less is known about how youth view their participation and the participation of others. Such insight is essential when forming constructive, long-term relationships, as one might in a PD project lasting several years [14,15,17,30,31]. If PD is one component of a larger design project, understanding these relationships can be key to overall success. *Reflection-on-action*, described by Schön, can be a useful tool when working in such design contexts [24]. The current study uses this reflective lens to probe the underlying dynamics and relationships that exist within an ongoing design project involving a complex ecology of stakeholder groups.

In 2015, we embarked on a multi-year PD project with a local science center, recruiting teens from the center's structured science interpretation program to join a design team that would develop a digital badge system for their work. This system was intended to represent the learning pathways of the program and recognize the accomplishments of participating high school students, documented in Bell and Davis [2]. We hoped to gain insight into how digital badges could be used in different educational and career-related contexts and whether or not such a system would be sustainable. During the first year of badge design and development, teens involved in the design process showed clear signs of learning together, using the

design process to develop their thinking about the program and their participation in it (Figure 1) [2]. More generally, digital badges are still an emerging area of research, and thus far many implementations and designs have focused on proof-of-concept and top-down approaches, rather than building, testing, using, and evaluating badges from start to finish through a PD process [1,4,12,23].

In this study, we examine the first year of the design research project: exploring how the different groups experienced the project process, contributed their respective expertise, and developed an understanding of participatory design as well as the design of digital badge systems overall. We conducted in-depth interviews with the different groups of stakeholders involved, reflecting on their participation in the project and triangulating their thoughts with other data such as video and field notes. This study provides insight into the complex workings of such a project and discusses the benefits, limitations, and possible improvements of this type of PD process involving teens as one of multiple groups of stakeholders.

In this work, we address the following research questions: **1)** How do teens and other stakeholders perceive the power dynamics in PD? **2)** How do different stakeholders conceptualize their position in and contribution to the design process?

We found that though the stakeholders viewed the PD process as enjoyable and beneficial to themselves and the broader program, there were distinct imbalances in power and expertise among the different groups. The teens in particular were acutely aware of the fact that all of the adults in the project had more knowledge in areas of domain expertise. This work explores the complexity of a long-term PD project involving multiple stakeholders, focusing in particular on how including teens as design partners affects the overall dynamics. We hope that other researchers will be able to use our insights as a starting point to help address any points of conflict and power imbalance they encounter in their own design research.

RELATED WORK

Participatory Design with Youth
Participatory design with children and teens has risen in prevalence over the past two decades as researchers have explored how best to incorporate young stakeholders into the ever-evolving PD landscape [8–10,13,28–31]. Different perspectives exist on how best to incorporate children in the design process [13,20]. Druin and colleagues are well-known for their *KidsTeam* work that focuses on in-depth design work with a small group of children. Other projects have used similar group sizes over an extended time period [8,9,17,29]. Read's work with children focuses more on a larger sample size, often working with classrooms of students to provide feedback on designs [21,22].

In recent years, advances in PD with children have led to a debate regarding the proper role of youth in the design of technologies intended for their use and the ethics of having children involved in research [17,21,22,26]. McNally, Guha, Mauriello, and Druin explored children's perspectives on their involvement in KidsTeam and found that the participants generally held positive views of their experience as co-designers but that these participants were keenly aware of the role of the adult facilitators [17]. Additionally, overuse of jargon and position can create pressure on participants not to question or criticize, which runs counter to the goals of PD and can hamper the development of conceptual convergence, the building of strong inter-group bonds, and free discussion of ideas, which is something we explore in this study [5,11,27].

Digital Badges
The PD work discussed in this paper focused on the design of a digital badge system intended to support the learning trajectories of the young science interpreters at the science center. Digital badges are web-based icons that represent components of learning trajectories and can be used to provide information about a learner's skills, achievements, and experiences [19,23]. As previously stated, we have embarked on a long-term PD project focusing on the design, implementation, and evaluation of a badge system for a particular science interpretation program in a large science center [2,7,19]. This paper focuses on year one of the project that involved participatory design workshops; development and testing of a badge system for the science center; and evaluation of the success of the program. Thus, this study is an opportunity to examine and reflect on the first year of the larger digital badge design project from the perspectives of our core design team members.

CASE STUDY
Taking a reflective perspective on the first year of a badge system design, we obtained the opinions and reflections of participants through semi-structured interviews supported by additional data from the design process. The interviews were structured to elicit participants' reflections on their participation in the project, their views of design, and their interactions with other group members. This approach was influenced by Schön's *reflection-on-action* as well as Stake's stance on case study research, examining a particular case in-depth to see what emerges [24,25].

Setting and Participants
This research is takes place at a youth science interpretation program at a science center in the Pacific Northwest, conducting PD research with students and staff to develop a digital badge system design to support student learning in the program. Nine monthly design sessions occurred during year one of the project, starting with brainstorming and moving on to more detailed badge development, as well as weekly meetings with the supervisors and the badge developers to discuss progress on the badge system. We interviewed most of the main participants in the design process, listed in Table 1.

Procedure

The interview protocol was developed by the first author and refined by the second author. The interviews were conducted in person or by phone during the late summer and early fall of 2016. Participants were asked to reflect on project meetings, the power dynamics they perceived, and how their perceptions of the project changed over time. They were also invited to reflect on the challenges and points of conflict or confusion that arose during the course of the year, as well as positive moments and experiences they felt were beneficial.

Interview data were triangulated using previously collected data from meetings and design sessions. Design sessions were videotaped and documented using analytical memos written from field notes after each session [2]. While video and sound recordings were not taken during other meetings, agendas and notes were used to verify events and timelines from the interviews.

Analysis

Themes that emerged during the interview process were checked against each subsequent interview revisiting whether or not they were reinforced across participants [24]. In order to triangulate the data, the analytical memos from the design sessions were reviewed, as were any relevant video clips from the design sessions [18]. The interviews were then coded for major themes using an open coding approach [6]. The first author reviewed the interviews and developed a list of possible themes for initial coding, then re-examined the interviews and further refined the thematic analysis. The first author then discussed initial findings and emerging themes with the second author and an external researcher in order to check the reasonableness of the initial conclusions.

FINDINGS

Across all stakeholder groups, participants discussed how the *perceived power structure* of the project affected their *agency and identity as co-designers*, both of which tied into the *vocabulary and practice* of the different communities. This interconnected system of stakeholders provided opportunities for *learning through participation*, where each group was able to learn from and teach the others. These themes are further explored below.

Perceived Power Structure

Participants were asked to describe a diagram of how they might depict the power hierarchy of the entire project in an attempt to understand how each of them viewed the multiple groups of stakeholders. Most participants viewed the researchers as the connective bridge between the science center and the badge developers, if somewhat higher in the project overall. Some of the teen designers placed their supervisors above them, while others considered them to be on a more equal level in this particular context of PD.

Pseudonym	Role	Gender
Claire[T]	Teen designer still in program	Female
Naomi[T]	Teen designer now in college	Female
Felicia[T]	Teen designer now in college	Female
Lily[T]	Teen designer now in college	Female
Sandra[P]	Program coordinator	Female
Tom[P]	Program supervisor	Male
Becca[P]	Program supervisor	Female
Anya[R]	Principal Investigator	Female
Matt[R]	Research Assistant	Male
Julie[R]	Research Assistant	Female
George[D]	Badge system developer	Male

Table 1. Pseudonyms, roles, and genders of participants, superscripts: T = teen, R = researcher, P = program staff, D = developer

Felicia[T] described the following overarching project structure and ecology, visualized in Figure 2, "I guess [Anya[R]] and [Matt[R]] would be the central and then they would flow out to [Tom[P]] and [Becca[P]] as a source of information who referenced them to the [teen] group that was us. And then they took that information and went to the developers…"
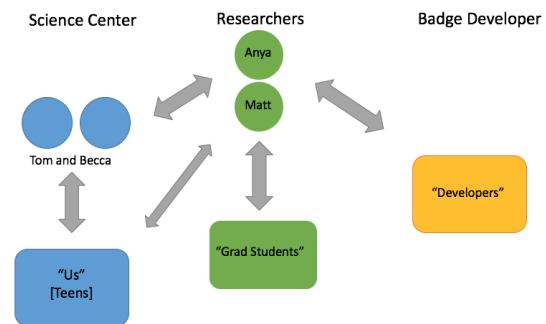
Figure 2. Felicia's[T] description of the digital badge project team hierarchy.

Both the researchers and the program supervisors did mention that they sometimes held back their input in the design sessions and stressed the ideas of the student designers over their own. As Felicia[T] put it "[Tom[P]] kinda tends to stay out of things like that, so there was no problem there. [Matt[R]] was fairly quiet. [Anya[R]] mostly just asked questions to clarify things…" The badge developer did not attend the design sessions, but George[D] expressed that he generally viewed the relationship as an attempt to meet the client's needs versus an equal partnership.

Agency and Identity as Co-Designers

Each teen participant developed a somewhat different perspective on their role as co-designers. Claire[T] described her role within the project as "it would be more to narrow down ideas and like a sounding board." A more senior

student, Naomi[T], stated that "we really worked with [the researchers] to develop [the badge system], and I feel that it was mostly our group that came up with the ideas." Felicia[T] mentioned that she would have liked to attend the meetings with the badge developer, as she felt rather detached from the technical side of the system, which made her feel less of a sense of ownership overall.

While most of the teens felt fairly incorporated as co-designers, the science center staff tended to remain more on the periphery. Both Becca[P] and Sandra[P] attended weekly meetings with the badge developer, but they were not as involved in the participatory design process with teens. Though Tom[P] was the main staff member to attend the design sessions, he often had other duties during parts of the session and usually restrained himself to allow the students a greater voice in the sessions.

The main contact from the badge system developer, George[D], viewed the company's role as that of a contractor providing a service than as a co-design partner, which produced a different dynamic. The other participants in the project also noticed this perspective, Sandra[P] particularly mentioning that she felt more like a client than a collaborator with the badge developer. Overall, the teens were the main stakeholders who expressed that they identified as co-designers, even though some of them did express doubts about their level of involvement.

Vocabulary and Practice
One major theme that arose throughout the interviews was the domain-specific language and practices used in the different *communities of practice* of the participants [16]. The researchers used terms and practices from the academic fields of education and human-computer interaction that were unfamiliar to the participants, though any confusion was quickly clarified. The site-specific terminology and *situated knowledge* of the science center was also something that the researchers and badge developers had to learn quickly in order to translate the program elements into digital learning pathways for the badge system [16]. Both the science center and the research team are based in educational domains, and thus they had a certain amount of shared vocabulary. By contrast, the badge system developers came from industry. George[D], the main contact for the developers, was somewhat acquainted with an educational perspective, but the science center staff and the researchers were not as familiar with the industry terminology, creating points of confusion.

Learning through Participation
Participants across the groups expressed that they had learned from the other stakeholder groups and evolved their understanding of digital badges since beginning the project. The science center stakeholders stated that they had become more confident in their ability to discuss and share their knowledge of badges. These stakeholders also gained insight into the PD process and how it could be beneficial. The researchers, meanwhile, developed a deep understanding of the structure and function of the science interpretation program [2].

Although the badge developers were not present for the design sessions, George[D] also mentioned that this project was a significant learning experience for his team, as this was their first large-scale custom badge project for this type of application. Generally, all parties involved moved towards a shared understanding of digital badging. The teens especially bonded as a team and gained a deeper knowledge of the learning pathways and opportunities in their science interpretation program.

DISCUSSION
Our findings provide new insight into the complexities associated with involving youth in a long-term participatory design project involving multiple groups of stakeholders, each with their distinct sets of expertise, language, and perspectives. This study lays the groundwork for deeper inquiry into how the different parties involved in a PD process interact with, learn from, and perceive each other, which is vital to those who wish to form strong relationships within and among *communities of practice* in their design research[16].

Our interviews also revealed room for improvement with respect to clarity and communication among the different stakeholders participating in the digital badge design project. The miscommunications and misunderstandings that can arise when multiple groups with different sets of vocabulary and practices come together is something all design researchers should consider. These insights can be valuable in almost any PD project, particularly those with sensitive dynamics.

We found that not all participants, even those that we specifically involved in PD activities, identified fully as co-designers. Two of our teens specifically expressed that they did not feel a complete sense of ownership of the badge system design process, contrary to some of the goals of PD [2,3,9] . Although we strove to promote a sense of ownership among all participants, particularly the teens, it is evident that reaching this level of personal engagement can be difficult to achieve.

Thus, we conclude this paper with input from our stakeholders on how the PD process can be improved in such a way that promotes the development of participants' co-design identities. Most of the feedback was around communication and involvement, with stakeholders requesting more interaction with each other and more detailed and explicit explanations of the research process and the rationale behind the activities. This feedback suggests that while researchers attempt to avoid information overload, they must also be aware that sometimes participants want to spend more time and effort, not less.

LIMITATIONS
We acknowledge that case studies in general have limited explanatory power to a broader population [25]. We also

are very aware that there are many potential ethical considerations involved in interviewing youth, and all youth participation was approved by our university's Institutional Review Board, with assent continuously obtained and re-verified throughout the research process. Another limitation is that this study involved interviewing fellow research team members and contracted developers, which touches on some of the group dynamics issues we explore in this study. We are cognizant of the possible biases that come with studying one's own research team and playing dual roles as participants and researchers, but feel that a reflective stance is important for improvement of the design process.

CONCLUSION

In this case study, we have detailed the experiences of our youth and adult co-designers during the first year of a long-term PD project to develop a digital badge system. From participants' reflections and insights, we identified both successes and challenges associated with this long-term PD project involving multiple stakeholder groups. Participants learned about the perspectives of the other stakeholders on the project, and were able to work with them to increase their understanding of digital badges and the process of design and implementation. At the same time, our participants articulated that they were keenly aware of hierarchies in the project. Particularly among the youth participants, this awareness affected their sense of agency and identity in the design process. Thus we can clearly see that while PD attempts to democratize design and incorporate user viewpoints, power dynamics within a project are still clearly visible and cannot be ignored, particularly when working with children and teens.

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