

Understanding Goals, Pedagogical Frameworks, and Relationships in Community-based Participatory Design

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Abstract: The extant literature suggests that human-centered approaches to design such as Participatory Design (PD) lend to more reusable and relevant design outputs, but often assumes this progression as an inevitable outcome of PD work. To investigate the factors contributing to this assumption, we document a comparative case analysis of the design processes of three studies centered on learning in communal spaces. All three studies shared the overarching objective of designing signage to promote playful learning opportunities in grocery stores, providing a rare opportunity to analyze different approaches to PD work in a controlled design area. We compare how three components interact throughout each design process: 1) researchers' goals 2) researchers' pedagogical frameworks and 3) community roles. We propose that future researchers consider the interplay of these three components as points of deliberation to formulate innovative and intentional PD practices. We offer a set of guidelines incorporating these components that researchers can reference when structuring their PD process.

Introduction

Within the learning sciences, human-centered methods such as Participatory Design (PD) have received increased attention to create more culturally-relevant and reusable learning artifacts *for, with, and by* those who will use them (DiSalvo, Clement, & Pipek, 2012). PD opens up opportunities to integrate input from users to design outputs centered around users' values and contexts (Ahn, Campos, Hays, & Digiaco, 2019). Nonetheless, to optimize this process, researchers must interrogate their goals, assumptions of how learning occurs and how that relates to the outputs they develop, and the way they incorporate community participation in tandem (Ahn & Clegg, 2018).

Researchers' goals largely stem from their assumptions about learning. The pedagogical frameworks that researchers bring to the design process influence their conceptualization of how learning happens during interaction with design outputs (Ahn & Clegg, 2018). For the purposes of this paper, we conceptualize the three following high-level pedagogical schools of thought. Cognition and learning can be conceptualized as occurring individually (cognitive), situated in interactions with others (social), or extrinsically being linked to interactions within a cultural-historical context (sociocultural) (Greeno, 2011; Nasir & Hand, 2006). These pedagogical frameworks undergird how researchers approach and structure PD; therefore it is important to name and reflect on how their pedagogical frameworks influence their facilitation.

Within PD, community members can shape the design outputs by taking on different roles —*users* of artifacts, *testers* who provide feedback, *informants* who contribute insight at multiple stages of the design process, and *design partners* who are equal stakeholders throughout the design process (Druin, 2002). As such, it is important to consider the types of contributions researchers seek from community members—and the corresponding relationships and capacities to best incorporate them. In this paper, we demonstrate how the structure of PD projects leads to different design pathways, and contribute a framework for researchers to characterize and structure PD in education. We provide a unique case study that examines the design processes of three community-based research projects that aim to design grocery signage that promote learning. These three studies are variations of a study conducted by Ridge et al. (2015) that found an increase in parent-child conversations when signage was installed in grocery stores. We posed the following research question: **How do researcher goals, researchers' pedagogical frameworks and community participant roles influence PD processes and outputs?** We propose a set of guidelines based on our findings to highlight elements researchers should consider when structuring future PD work.

Methods

To reveal the different trajectories research teams took to design signage that facilitates learning in grocery spaces, we analyzed the design process and outputs of three projects building on the work by Ridge et al. (2015). Projects 1 and 2 already completed initial stages of their research and Project 3 is an ongoing PD project conducted by our research team. We provide more contextual details of each study in our findings.

We conducted and transcribed interviews with five researchers from Projects 1 and 2 to learn about their goals, design process, and experiences working with community partners. We also transcribed Project 3's co-

design sessions and collected researchers' written reflections following the sessions and subsequent signage development meetings. The final data corpus included 61 pages of interview transcripts, 56 pages of co-design session transcripts, and 17 pages of reflections/field notes of co-design sessions.

We used an emergent thematic analysis in two phases to understand the design process of the different projects. In an open-coding phase, the research team examined sample interviews and co-design sessions to develop an initial codebook. The research team met to discuss codes, refine code definitions, and combine and reorganize codes that had overlapping conceptual definitions. Then we assigned codes across our research team so that each one was double coded for intercoder reliability. The research team wrote analytic memos to capture the structural components of the design process that surfaced across the three projects (Weston et al., 2001).

Findings

In this section, we use vignettes to illustrate the varying interplay between the goals, pedagogical frameworks, and relationship configurations in each design narrative. We emboldened sections of each vignette to demonstrate how these components are apparent in the structures of each research project.

Project 1: Signs promoting math talk in supermarkets

Project 1 researchers designed signs based on predetermined theoretical content and food groups, and examined their effectiveness in promoting increased children's math talk in supermarkets (Hanner, Braham, Elliott, & Libertus, 2019). Grounding their design in cognitive and social learning frameworks, researchers used directive language tailored to different developmental levels in their signs. One researcher recalled, "*We decided to have one question that was low level targeted at the younger kids in our age range and then one that would be slightly more advanced that would require some arithmetic operation or more complex reasoning process to engage the slightly older kids.*" For example, one sign asked, "How many eggs are in a carton?" to encourage younger children to count; another prompted slightly older children to subtract by asking, "If we each ate an egg, how many would be left?"

Project 1 researchers were firm on the content and purposes of their signs, and positioned their partners as *users* and *testers*. To gain permission for implementation, researchers discussed with the local grocery store managers to gain *tester* feedback on specific design elements that are allowed for the signs (e.g. dimensions, content), and *user* feedback on where to institute them. A researcher reflected "*[Some stores required] that they would have to create the signs. And that kind of ruins the whole point of the study. So we couldn't do it with them. [...] I couldn't make [the signs] super wide because [the grocery store staff] wanted everyone to be able to walk down the aisle easily...and they also didn't want something that would promote a specific product.*"

Researchers were ultimately able to accomplish their goals, but initiating permission-based relationships with partners to use predetermined signs seemed to set constraints on initiating and facilitating more substantial engagement with community partners. One researcher recalled, "*It seemed like we couldn't convince grocery stores that this would be a meaningful engagement with the community or [...] making a more meaningful shopping experience for the families.*" The signs were highly usable in the space to study math talk. However, researchers' firm stances on design and the corresponding roles their partners took may have resulted in less alignment with community values.

Project 2: Signs promoting elaborative talk in a food pantry

Project 2 researchers relied on social and cognitive theories to develop signage to examine whether guided prompts elicited more elaborative dialogue between caregivers and children compared to signs with learning pronouncements (i.e. "learning can happen anywhere!"). Researchers collaborated with a food pantry in a low-SES neighborhood and talked to patrons and staff to inform their signage development and placement.

Researchers had defined the theoretical content of their signs but still looked to learn about how to best situate them in topics relevant to their context. A researcher described their considerations when drafting signage prompts: "*[We wanted] sort of open-ended, what, why, the W questions... So it was very easy for the parents to elaborate on the guided play kind of questions [in the signs].*" To create signs relevant to their context, researchers incorporated community partners (food pantry staff and patrons) as *users* and *informants* to learn about the culture, routines, and layout of the food pantry. A researcher reflected: "*We went in [the food pantry] once just to start to volunteer [...] So we spent a bit of time in there [...] getting to know the culture of the place. We talked to the people in charge to see what items they typically got, what sort of products always came in, no matter what...things like that. And based on the layout of the food pantry was how we decided where we'd be putting the signs up.*"

Researchers used this information to situate their signs in relevant foods and context to food pantry patrons and study the signs' influence on elaborative talk. Nonetheless, a logistically-based relationship resulted in constraints on facilitating value-informed participation with community partners. A researcher reflected, "[Our partner organization] **really wanted an evaluator, not a scientist or researcher, so it was sort of one of those fundamental bad fit situations.**" Incorporating community partners' insight helped researchers optimize the signs' relevance and usability in the space, but ultimately did not abate several misalignments between researcher and community partner goals in the PD process.

Project 3: Signs promoting culturally situated STEM learning

In Project 3, we used cognitive, social, and cultural pedagogical frameworks to produce grocery store signage prompting conversations around STEM learning situated in local values and supermarket experiences. We conducted two co-design sessions with 20 participants—researchers, partners from a local health organization, and caregivers from a low-income predominantly Latinx community. In each session, participants recounted their grocery store experiences.

A researcher reflected on the goals of the project: "*This project looks for any underlying factors [...] within the family or in these participants' communities. It is important for us to find these factors so that we can **create posters relevant to this community's needs.***" As such, we situated community partners as cultural informants with expertise in local cultural and lived experiences. Some of the values we heard were: familial connection, emotion, routines, and cross-cultural comparisons. For example, some parents (as immigrants to the United States) expressed frustration around changing from metric to imperial measurement systems: "***The children [...] they already know about pounds. But us as adults, in the butcher shop, [deciding between] a kilo and a pound [...] we're thinking it's a kilo, we get a pound.***" We drew upon cognitive skills involved in STEM learning that we heard in community members' stories—such as measurement unit conversion—to develop signs promoting interactions situated in local experiences, needs, and culture.

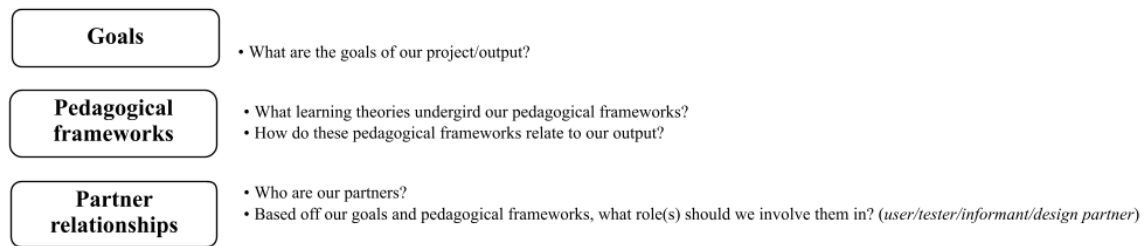
We defined content for our signs by conducting a thematic analysis on the data from our sessions. To translate the themes into signage ideas, we posed questions with the stem "How might we" coupled with the themes we saw arise in the data to try and prompt STEM learning interactions. One example question we posed was, "*How might we promote activities to convert different quantities, measurement systems or cultural ways that we measure?*" From this question, we developed a conversion table that families could use to convert between metric and imperial systems at the deli. However, at the current stage of our project we have not yet included community partners as *users* and *testers*, so we do not know whether families would engage with design output as desired.

Conclusion, limitations, and implications

This case study presents a unique opportunity to look across similar projects and examine how researchers' choices in each stage of the design process lead to different design directions. Our analyses shed light on the interplay of three critical components—researcher goals, pedagogical frameworks, and community roles—in PD processes. We found that researchers' pedagogical frameworks and goals across each project influenced how they structured the design process and conceptualized community roles.

Based on how community members are situated in partnerships, the constant incorporation and negotiation of researcher and participant input into design can result in a process of mutual learning (Yip et al., 2016). However, we acknowledge as a core limitation that none of the teams referenced in this paper has yet developed mutual learning opportunities in their PD. Work involving communities is inherently more complex due to the increased number of constituents; executing PD to its full potential therefore demands heightened intentionality and reflection in how to best incorporate these constituents. To support this process, we propose a set of **Goals, Pedagogical frameworks, Partner relationships (GPP) Guidelines** (Figure 1) future researchers can use to highlight considerations around three key components when structuring their PD. By reflecting on these guidelines in the planning phase, researchers can harness PD approaches more effectively in complex community-based work and abate any foreseeable misalignments. Future researchers who aspire to maximize PD can use these guidelines to yield more usable design artifacts and sustainable interventions that incorporate community voices and promote mutual learning.

Figure 1. GPP Guidelines for Structuring Community Participatory Design



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