

Liberatory Methodologies: Participatory Action Research Strategies for Discovering Inclusive Maker Space Practices

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Abstract—In this Research Work in Progress paper, we describe the methods chosen for a project exploring best practices of inclusion in maker spaces serving diverse populations. Maker spaces provide communities access to innovation tools in startup settings that are shaped by the participating members. In our study, these include not only hacker spaces that involve computing, electronic activities, and three-dimensional printing capabilities, but also sites focusing on traditional arts and crafts. Sites selected represent sustainable examples of the values embedded in maker space missions: to promote shared space (physical or virtual, temporary or permanent), materials, and knowledge for the purpose of putting production back in the hands of the people. To study the dynamics through which a community and its space come together, we have employed methods including content analysis, ethnographically-informed participant-observations, and an open space technology workshop/Unconference combined with participatory action research (PAR). We position PAR as both a method and as a methodology, providing a justification for our flexible approach and adaptable strategies. We will describe the process of data collection leading up to the Unconference, how various perspectives are combined at the Unconference, and how the PAR component is threaded throughout the entire project. Finally, we explain our use of the theoretical framework and analytical tool of Critical Discourse Analysis (CDA), which guides our interpretations of interactions in both the maker spaces and our participatory action research process.

Keywords—*maker spaces; participatory action research (PAR); liberatory; Critical Discourse Analysis (CDA); diversity and inclusion*

I. INTRODUCTION

The first U.S. “maker spaces” were community spaces opened in New York and DC circa 2007 [1]. Since then, maker spaces have opened in rural and urban communities, K-12 schools, libraries and universities. The maker movement championed the ideas of putting design/making/production back into the hands of the people, as opposed to commercial manufacturers, and proclaimed that “everyone is a maker” [2].

The maker movement is wide-ranging at different levels, consisting of old and new technologies (e.g. blacksmithing and 3D printing), an array of settings (e.g. urban, rural, educational, community), and it involves people from different identity groups (e.g. class, race, gender, etc.). Considering this diversity, the movement was well poised to advocate for the people most likely not to be included in making—those who are historically and systematically underrepresented in science, technology, engineering and math (STEM). Unfortunately, as maker spaces have developed, many have replicated engineering demographics catering more to white, male, cisgender, heterosexual, middle-class, able-bodied hobbyists [3]. The goals of our project are to identify: (1) characteristics and practices of maker spaces achieving diverse participation and (2) practices that may inform design and operation of campus and community maker spaces to ensure those spaces are diverse, inclusive, and liberatory.

In this paper, we describe our adaptable, unique methodological approach to studying maker spaces and reflect on data collection completed to date; analysis has not yet been completed. This research involves the exploration and study of “messy” phenomena involving physical settings. At a surface level, sometimes maker spaces are quite literally messy, while in others the participants are meeting in a borrowed “clean” space; but how do such variations affect social relations? If the maker movement is concerned with “local access to tools” [4, p. 5], then exploration of how this occurs in intentionally inclusive maker spaces is crucial. Hence, we considered it important to not only observe the ways in which the tools, artifacts, and buildings were being used, but to also explore what Langdon Winner characterized as the “politics of artifacts”—the ways that technologies “can embody specific forms of power and authority” [5, p. 121]. While often less visible and less noticed, artifacts in an activity system (“defined as a group of people who share a common object and motive over time, as well as the wide range of tools they use together to act on that object and realize that motive” [6, p. 275]) influence social relations [7]–[9]. Thus, our methods include careful observation of the role artifacts play in relation to other components of maker spaces, such as subjects,

objects, rules, community and division of labor. In this work of exploring these “messy” interactions, we use a combination of content analysis, ethnographically-informed participant observations, and an open space technology workshop combined with participatory action research (PAR), all informed by Critical Discourse Analysis (CDA). CDA—a theoretical framework and analysis method that “focuses on how language as a cultural tool mediates relationships of power and privilege in social interactions, institutions, and bodies of knowledge” [10, p. 367]—is an appropriate frame to use as we seek to understand the role of power and how these communities strive to design spaces that are not only diverse and inclusionary but also liberatory—in essence, how they may disrupt traditional power relations [11] in STEM and society at large.

To begin, we make the distinction between method and methodology in our work. Methods are the tools used to conduct research, whereas methodology provides the rationale for choosing certain methods [12]. In this study, participatory action research (PAR) [13], [14] provides both a set of tools and a mode of analysis that includes the subjects of the research as researchers themselves in an effort to be more accurate and aligned. So, as method and methodology, features of PAR are woven through the project.

II. METHODOLOGICAL CHOICES

A. Introduction to Participatory Action Research (PAR)

In our work, representatives of partner sites are not simply research subjects, but also collaborators because participatory action research (PAR) “is a practice of participation, engaging those who might otherwise be subjects of research... as inquiring co-researchers. Action research does not start from a desire of changing others ‘out there’, although it may eventually have that result, rather it starts from an orientation of change *with* others” [15, p. 1].

B. Content Analysis

In our first stage of data collection, we used content analysis methods to learn more about each of our partner sites, their membership, activities and practices. Further, we used content analysis to identify practices of inclusion in maker spaces that serve/engage people traditionally underrepresented in engineering. Put simply, “content analysis is a research method that uses a set of procedures to make valid inferences from text” [16, p. 9]. In alignment with our research goals, we designed a standard protocol addressing topics such as: planning and policies; organization history; space/setting; tools/equipment; staff; staff and member training; practices of welcome; artifacts and activities; leadership; and finances.

We identified each organization’s web resources by starting from known websites, following page links and using google; web resources available varied by organization, including Wikis, Facebook, Twitter, MeetUp, YouTube, and Instagram. We sifted through the information available on these publicly accessible web resources to find answers to questions on our standardized protocol; some partner sites had

a large web presence while others did not so availability of information varied significantly from site to site.

One theme that emerged in the data was attention to accessibility concerns. Questions of access varied across maker spaces depending on the physical environment and the tools used at each site. For example, in a rural center, the website advises guests, “if special accommodations are required please contact Center personnel and allow at least two weeks to coordinate appropriate, reasonable accommodations.” Whereas in an urban center, the maker space’s website made it clear physical accessibility was critically considered; their website specifically stated: “Accessibility: The front door doesn’t have a push-button opening and the loft isn’t for public use. Otherwise the site (including restroom) is wheelchair accessible. There is usually free street parking. We use fragrance-free cleaning products.” This access statement demonstrates consideration and availability of mobility access (wheelchair accessible routes), financial access (parking), and sensitivity/allergy-friendly environments. Another urban organization addressed accessibility on an event-by-event basis because they didn’t have a single home location; they hosted events in spaces offered by local companies. This organization listed whether event sites had elevators and restrooms that were accessible for people with disabilities and/or gender non-binary folks in their event invitations. Providing an up-front, candid summary of accessibility (or lack thereof) is regarded as a best practice by our research team because it allows participants to prepare accordingly.

One limitation to this stage of our project was that we only had one researcher who could act as a reviewer, presenting risk of bias or data misinterpretation. However, this limitation was outweighed by the benefits of the content analysis. Findings from the content analysis allowed us to gain valuable knowledge about each partner site; acquiring this knowledge prior to visiting the organizations in person was crucial to our ethnography. The researcher who acted as the content reviewer also acted as the main ethnographer so they arrived at each maker space with some existing knowledge. We gained insight into organization’s governance documents, finances/funding, types of projects, and connection to other local community organizations. Entering our partner sites’ spaces with an existing knowledge base helped us establish rapport, gain trust and jump into data collection.

C. Ethnographically-Informed Participant Observation

The second stage of our research involved spending over 80 hours in diverse maker spaces in a participant-observer capacity. Tedlock [17] points out that the “oxymoron participant observation implies simultaneous emotional involvement and objective detachment.” She continues, “ethnographers attempt to be both engaged participants and coolly dispassionate observers of the lives of others” [17, p. 180]. Using a PAR approach to ethnography allows us to balance our researcher-participant role with authentic participants’ contributions to the research. “Like ethnography, PAR is committed to local knowledge. It involves different

stakeholders in a group research process, yielding rich ethnographic knowledge about lives and sense-making processes. It is deeply aware of power, designed to uncover the structural causes of problems through collective discussion and interaction. It is reflexive, insofar as it forces one to confront the self that observes" [18].

In our study, we visited seven maker spaces, ranging from a 4-hour visit over a period of 2 days to a 22-hour visit over the course of 11 weeks. Through these prolonged, immersive visits, we worked to build trust with participants, learn their culture, recognize the impact our presence had on the community [19] and ultimately obtain a "native view of reality" [19, p. 212]. In total, we engaged with 68 participants during on-site ethnographic visits. We participated in the operations of each site as a community member, conversed with directors and members, and documented examples of conversations, written materials, artifacts and creative products.

Ethnography offers the advantages of enabling researchers to gain insights beyond their own pre-study protocols, and to be cognizant and intentionally reflective about the influence of their presence on the participants [19]. While our ethnography protocol was aligned with our research goals, it was also open-ended; researchers took note of the following items:

- Setting (i.e.: furniture, restroom access, accessibility)
- Safety procedures / precautions
- Reoccurring language / "power words"
- Interactions between people and people
- Interactions between people and artifacts
- Practices of welcome
- How are opinions / critiques shared?
- How is assistance given and/or received?
- Availability of training, materials, tools
- What impression do we get? What informs that impression?
- Process or product?
- Is this fun? Discovery? Work?

Researchers also sketched setting and/or occurrences in the maker space. As allowed, researchers would photograph, video and/or audio record occurrences, interactions, artifacts, settings, etc.

As is true in most ethnographic studies, gatekeepers commonly present access issues for researchers [19]. Because community maker spaces are a relatively new territory for engineering education researchers, there was no precedent for gaining access and most sites were not accustomed to participating in academic research studies. We made contact with facilitators at each site to explain our project goals, methods and consent process, including confidentiality practices, before we obtained invitations to the site events.

In multiple instances, we found that the invite was not the last stage of gatekeeping, even when participation was pre-negotiated through support letters from the organizations in our funding proposal. Upon arrival to one site, the facilitators

asked us to introduce ourselves and our project to the group present. After a short summary, the facilitators asked the researchers to leave the room so the group could discuss their willingness to participate in the study. The group eventually called us back to the room saying, "you're in," but it was clearly important to this maker space that all members have a voice in decision-making.

At another site, prior to giving consent, participants were critical of the research; they thoroughly questioned the researchers about the project framework, the guiding paradigm, how realistic the goals were, how information would be disseminated and who would be credited. During this conversation, we learned that this maker space has been identified as a site of interest by as many as seven other research teams in the U.S. Their feminist organization is unique considering the maker space landscape is full of LGBTQ-exclusionary, white-led spaces. They informed our research team that the only difference between others' research requests and our research request was that we had (in line with the PAR approach) offered them full funding to attend a conference and offered to co-publish with them. In other instances, researchers have looked to this group as a subject site, collected data regarding their organizational practices, and then published the findings without crediting the organization. Their experience is not dissimilar from the experience of underrepresented minorities (URM) in academia who are subject to the "minority tax" where the burden of education about minoritized groups is placed on the URM themselves [20]. This finding underscores the importance of participatory action research: community partners are experts in their own experiences and should be offered opportunities to collaborate at all stages of research formulation, data collection, analysis, and reporting, and credited as such.

Fetterman [21] argues that "working with people day in and day out, for long periods of time, is what gives ethnographic research its validity and vitality" [21, p. 46]. To further ensure research quality, our research team practiced peer debriefing after each visit; Creswell [19] calls debriefing "an external check of the research process... much in the same spirit as interrater reliability in quantitative research" [19, p. 202]. In debriefing sessions, researchers explained methods used and decisions made during field visits as well as interpretation of observations and emerging themes in the data; notes were taken on the debrief sessions [19].

D. Critical Discourse Analysis (CDA)

In our work, we focus on the liberatory nature of maker spaces that have specifically been formed to provide opportunities for members to move beyond traditional role expectations and economic constraints. We use CDA because it supports our goal of identifying liberative practices in maker spaces, explaining how and why they work, and proposing ways to implement these practices in academic and community spaces. In analyzing discourse, we look at different aspects such as artifacts, gestures, and speech acts (remarks that have performative function) [22].

For example, in one maker space, we observed a meeting between makers, a representative of the county government, and a veteran of the city council who was leading his own participatory action research project as a part of his graduate education. The project utilized photovoice, “a process in which people—usually those with limited power due to poverty, language barriers, race, class, ethnicity, gender, culture, or other circumstances—use video and/or photo images to capture aspects of their environment and experiences and share them with others” [23]. Through this project, the makers, who were residents of the rural city, were presented with the opportunity to document their lived experiences through photographs and narratives, and then share their stories with local and state-level government officials. In this maker space, as is demonstrated by the makers’ involvement in the photovoice project, those with power were intentional about elevating the voices of those with limited power.

E. Open Space Technology (OST)

In addition to visiting each of our partner sites, we invited and funded representatives from each site to attend an open space technology workshop called the ‘Unconference on Making Liberatory Spaces’ in June 2018. Open space technology workshops, also known as “unconferences,” emphasize the value each attendee brings by empowering attendees to define the agenda and influence the types of activities and conversations that take place [24]. Participants spearheaded discussions on topics such as white privilege, making in rural environments, mental health, and innovation. Our research team continued our ethnographic observations at the Unconference, using critical discourse analysis as a guide.

The event was attended by 50 people total including 10 people from our partner sites and 4 members of our research team. This meeting gave us the opportunity to further our relationships with our partner site representatives who, again, serve as participants as well as co-researchers according to our PAR approach. Their involvement in our work, especially in the analysis, is/will be crucial to the study’s credibility.

The Unconference was held the day prior to the Nation of Makers Inaugural Conference (NOMCON) so that our participants were able to attend both events. Attendees of our Unconference were also featured presenters in two dedicated sessions at NOMCON, where they shared their expertise and the learnings from the Unconference with the Nation of Makers community.

E. Impact of the Researcher

In all interactions with participants and partners, we have sought to be a positive force and to minimize interference with activities and behaviors, but considering the Hawthorne/Observer Effect—that people act differently under observation—it was unavoidable that our presence alone would impact our results [25]. The inevitable impact of the researcher required us to be intentional in our methodological choices and adaptable in our methods.

When acting as participant-observer, there are observer effects that cannot be avoided, but participation brings numerous benefits. As a participant, the researcher themselves is being observed by the maker space members. Through interactions, conversations, and this observation, the research subjects become familiar with the researcher and the researcher has the opportunity to develop trust and rapport.

Researchers are often advised not to share personal details about themselves with study participants but because we are working with minoritized communities, we have found that disclosing aspects of the researcher’s identity helps to build rapport with participants. For example, one author is queer and transgender; by coming out to participants at maker spaces populated with LGBTQ+ people, this researcher was able to communicate understanding of relevant issues, putting participants at ease. In those spaces, this researcher could quickly build connections with participants and was less likely to be perceived as an outsider.

III. FUTURE WORK AND IMPACT

This project is ongoing; as stated, our goals in this project are to identify: (1) characteristics and practices of maker spaces achieving diverse participation and (2) practices that may inform design and operation of campus and community maker spaces to ensure those spaces are diverse, inclusive, and liberatory.

Having recently completed data collection, our next step is to formally begin the data analysis phase. Our learnings to date illustrate how the idea of ‘best practices’ of inclusion is not realistic or necessarily possible to characterize. Instead, practices that support inclusion, diversity, and liberation are context-dependent and must be community driven.

Our study and findings have numerous broader impacts. This work creates impact by bringing awareness to researchers of the influence of their presence in a space that is not their own, especially when minoritized identities are involved. This work creates impact by connecting like-minded communities at the Unconference. This work creates impact by bringing in and amplifying different voices into national, global and local maker conversations. And finally, this work creates impact by promoting healthy skepticism among maker space leaders considering the new understanding that there is no one ‘best’ way to design a maker space that will always be relevant.

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