Decolonizing and Participatory Research with Youth in Library Makerspaces

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In its *National Research Agenda on Libraries, Learning, and Teens 2017*, the Young Adult Library Services Association emphasizes the importance of research investigating “how informal and formal learning environments have an impact on adolescent development, college and career readiness, and acquisition of literacies” in order to determine “how library staff must serve teens in the 21st century” (Young Adult Library Services Association (YALSA), 2017, p. 3). One type of learning environment libraries are embracing to serve youth is the library makerspace (American Library Association, 2014), a space “usually equipped with tools and technologies for people to get together to work on projects and learn practical skills from each other” (Wang, Wang, Wilson, & Ahmed, 2016).

A rapidly growing body of research explores makerspaces both in and out of libraries. Litts (2015) proposes an activity-identity-community framework for analyzing makerspaces as learning environments. “Making” is the activity, “maker” the identity, and “makerspace” the community. She operationalizes the activity-identity-community framework with the following questions:

Activity: What happens there? What processes and products are supported (through people, tools, & materials) in the space?

Identity: What identities are taken up and supported?

Community: Who is involved both directly and indirectly? What is the community context and structure? (p. 56)

Most of the literature surrounding makerspaces fits within Litts’s framework, but it is designed by researchers in isolation or in partnership with adults working in makerspaces and centers adult voices, even when focusing on spaces and programs designed to serve youth.

Rarely does this literature position youth as collaborators or co-researchers in investigating makerspaces. Sometimes the literature includes youth as participants. As Moeller, Pattee, and Leeper (2011) argue,

Those of us who are granted the privilege by young adults to use their voices in our research know that their voices give our work depth, interest, and relevance. Those who further engage their young adult participants in the process of member-checking more soundly validate their research and the young adult's experience. To produce robust, informative research, we as scholars need to talk *to* young adults, not just about them.

(para. 6, emphasis original)

Researchers of youth participation in makerspaces have the opportunity, however, to go one step further than Moeller, Pattee, and Leeper (2011) suggest, working with youth as collaborators and co-researchers rather than just as participants.

Including youth not just as participants, but as collaborators and co-researchers, not only improves the trustworthiness of our research (Schwandt, Lincoln, & Guba, 2007). It also enables us to help youth “see their own knowledge, strength, and leadership in constructing models for social change” (Parker, Ocegüera, & Sanchez, 2011, p. 226). This process helps us represent youth truthfully while simultaneously supporting the development of their own power to enact change. Enacting decolonizing and participatory research practices in pursuit of this goal is important, as youth are marginalized through the process of adultism, “the oppression experienced by children and young people at the hands of adults and adult-produced/adult-tailored systems” (LeFrançois, 2014, p. 47). These research practices can provide a remedy for youths’ sense that adults do not listen to them (A. Marshall & Arvay, 1999).

This marginalization intersects with other sources of marginalization, including race, poverty, gender, gender identity, sexuality, ethnicity, immigration status, and ability (Ross, 2006). Given the multiple marginalizations many youth face, it is critical that researchers design their research and collaborate with library and makerspace professionals to design library makerspace and research experiences that are decolonizing and participatory. This work must be taken up consciously and intentionally, as both libraries and makerspaces have histories of prioritizing dominant white, middle-class, Western values and practices (Honma, 2005; Vossoughi, Hooper, & Escudé, 2016).

Researching Makerspaces in Libraries and Elsewhere

Since the establishment of the first library makerspace in 2011 (Britton, 2012), research on makerspaces in libraries and elsewhere has proliferated at a breakneck pace. This research tends to take the form of either surveys or ethnographic case studies. Researchers use surveys to solicit descriptions of makerspaces, whether situated exclusively in libraries (Burke, 2013) or in libraries as well as other environments (Peppler, Maltese, Keune, Chang, & Regalla, 2015a, 2015b, 2015c). They also use surveys to determine what types of competencies and training are needed for professionals in makerspaces (Koh & Abbas, 2016). In both cases, survey participants are adult professionals working in makerspaces. Surveys have also been used with youth participants to assess changes in their learning and engagement over the course of their participation in a makerspace (Dorph & Cannady, 2014) and to describe their information practices in a makerspace (Li & Todd, 2016).

Ethnographic case studies of makerspaces use a variety of data collection methods, including participant observation, audio-video analysis, documentation of artifacts and writings, interviews, focus groups, and examination of artifacts created in the makerspace (Abbas & Koh,

2015; Bevan, Gutwill, Petrich, & Wilkinson, 2015; Bowler & Champagne, 2016; Brahms, 2014; Buchholz, Shively, Peppler, & Wohlwend, 2014; Dixon & Martin, 2017; Kafai, Fields, & Searle, 2014; Koh, 2015; Koh & Abbas, 2015; Litts, 2015; Martin & Dixon, 2013; Moorefield-Lang, 2014, 2015b, 2015c, 2015a, Norris, 2014a, 2014b; Sheridan et al., 2014; Slatter & Howard, 2013; Somanath, Oehlberg, Hughes, Sharlin, & Sousa, 2017; Vossoughi, Escudé, Kong, & Hooper, 2014). There is some overlap in the questions investigated using ethnographic methods and survey methods; in addition to survey methods, ethnographic methods are also used to obtain descriptions of makerspaces and their role in libraries (Crawford Barniskis, 2016a, 2016b, Moorefield-Lang, 2014, 2015b, 2015c, 2015a), information about the competencies needed for working in them (Abbas & Koh, 2015; Koh & Abbas, 2015), methods of evaluating library makerspace outcomes (Gahagan, 2016), tips for starting them (Slatter & Howard, 2013), and youth information practices in library makerspaces (Li & Todd, 2016). These methods are also used to examine makerspaces as learning environments (Bevan et al., 2015; Brahms, 2014; Koh, 2015; Litts, 2015; T. Marshall, 2016; Sheridan et al., 2014) and to analyze the discourse surrounding public library makerspaces (Willett, 2016). As with survey methods, ethnographic methods are most often used in these cases with adult participants, usually professionals working in makerspaces such as librarians, program directors, and maker educators.

Ethnographic methods are used with youth participants more often than survey methods are. With these methods and these participants, researchers investigate issues such as youth and educator conceptions of making and the maker movement (Lacy, 2016; Martin & Dixon, 2013), the use of question prompts to promote reflexivity and reflection on meaningful making (Bowler & Champagne, 2016), how people talk about their making work and the practice of exhibiting this work at a Maker Faire (Dixon & Martin, 2017), how youth react to makerspace activities in

environments constrained by limited socio-technical resources (Somanath et al., 2017), and teens' experiences as mentors for younger children participating in making programs (Bar-El, Zuckerman, & Shlomi, 2016).

Researchers use ethnographic methods to engage critically with the Maker Movement's history as a space dominated by middle-class, white men and the ways in which it has been exclusionary while simultaneously investigating its potential for promoting equity and expanding the accessibility of STEM (Science, Technology, Engineering, and Mathematics) fields (Barton, Tan, & Shin, 2016; Buchholz et al., 2014; Davis & Mason, 2016; Kafai et al., 2014; Norris, 2014a, 2014b; Ryoo, Bulalacao, Kekelis, McLeod, & Henriquez, 2015; Ryoo, Kali, & Bevan, 2016; Shin, 2016; Vossoughi et al., 2014, 2016). This equity-oriented research questions is a natural fit for decolonizing and participatory methods.

"Positioning youth as equal participatory partners" in library makerspace research decolonizes knowledge production, making space for youth to draw on their own knowledge, draw attention to narratives that might otherwise be silenced, and "claim empowering spaces for themselves...to bring to the open the particular injustices in which they and their community suffer" (Tan, Barton, Shin, & Turner, 2016, p. 7). While some research in libraries and makerspaces has positioned youth as equal participatory partners, this is but one end of a spectrum of participatory possibilities for research with youth. The spectrum proceeds from youth participation in researcher-designed activities, such as surveys, interviews, and focus groups, to youth participation in the entire research process, from conception to dissemination of results, via methods such as Youth Participatory Action Research. Not all of the studies cited in this literature review provide detailed information about their research methods and where they fall along this spectrum; many simply name the type of method they used and describe their

sample and setting. The rest of the literature review will examine those that provide more detail and consider the extent to which these methods are decolonizing and participatory.

Youth as Participants

While much of the literature addressing makerspaces, in and out of libraries, focuses on adults' perspectives, even in youth-oriented spaces, some researchers are including youth as participants in their studies. These researchers go beyond participant observation and describing youth interactions as the researchers themselves perceive them, to include youth voices in their work. They do this primarily through surveys, semi-structured interviews, and focus groups.

Surveys

“A survey, simply, is a set of items, formulated as statements or questions, used to generate a response to each stated item” (Wildemuth, 2009, p. 257). Surveys may measure simple descriptive statistics and direct assessments of variables. They may also include scalar inventories that measure cognitive and affective variables that cannot be directly assessed (Wildemuth, 2009). The questions on a survey may be closed-ended, providing a limited range of possible responses, or open-ended, allowing respondents to compose their own responses. Administering surveys to youth provides them opportunities to share their voices and perspectives.

The software company Cognizant created a program called the Making the Future Initiative in 2013 (Dorph & Cannady, 2014). Through this program, the company invested in 25 maker programs situated in the United States. Participants in these programs varied in age; while the full range extended from young children in preschool to emerging adults, most participants were between the ages of 8 and 18. As part of this program, Cognizant developed the Making the Future Logic Model, which outlines key assumptions, strategies, outputs, outcomes, and impact

goals for the program (see Figure 1). Program participants took a survey as part of an evaluation “focusing on assessing and informing program delivery, improvement and strategy, and capturing selected data purposefully to provide rapid, usable feedback” (Dorph & Cannady, 2014, p. 2). The survey results suggested that the maker programs were contributing to the desired outcomes, with participants experiencing an increase in the “dispositions, skills, and knowledge that enable success in STEM learning and careers” (Dorph & Cannady, 2014, p. 1). While this type of survey enables minimal participation from youth, it does value youth as contributors to knowledge. It surveys the youth themselves, rather than assessing outcomes based on the perceptions of the adults working with the youth.

Figure 1. Making the Future Logic Model. From Dorph, R., & Cannady, M. A. (2014). Making the future: Promising evidence of influence. *The Lawrence Hall of Science*. Retrieved from <http://www.cognizant.com/SiteDocuments/Cognizant-making-the-future.pdf>, p. 1.

Semistructured Interviews

Unlike surveys, which use a predetermined set of questions in a fixed order, semistructured interviews provide researchers some flexibility when obtaining research data with a participant (Wildemuth, 2009). The researcher goes into the interview with a set of predetermined questions, but the researcher has the freedom to rearrange their order, to follow up on interesting answers with probing questions, and to have participants clarify or elaborate on their answers. Semistructured interviews give youth more opportunities to express their own perspectives than surveys do, both because they are less likely to limit possible responses and because the researcher can prompt them for extended responses. Semistructured interviews can range in the extent to which they solicit youths' perspectives depending on the specificity of their interview guides; some questions are narrowly tailored to address the researcher's preconceived ideas about the research area, while others are more open and provide more space for youth to explore and explain their own understandings.

Lacy (2016) undertook a case study of a high school Fab Lab, another name for a makerspace, to investigate the relationship between the Fab Lab and science education, as well as the way the Fab Lab contributed to or departed from social sorting practices already taking place at the high school. She observed the Fab Lab in a public high school in the northern Midwest of the United States over the course of one semester; she also observed a traditional design-based woodworking course as a point of contrast with the Fab Lab. Seven Fab Lab students and one woodworking student agreed to participate in her study. She interviewed students once, using a semi-structured interview protocol, at the end of the semester. Lacy (2016) also interviewed adult instructors in the Fab Lab and woodworking class.

Lacy's (2016) interview protocol for student interviews uses highly focused questions designed to elicit answers closely related to her research questions. Examples of such questions include "What kinds of skills do you feel you developed by participating in this course?" and "How do you think you used science in the Fab Lab? What scientific knowledge do you think you have learned? What kinds of scientific practices did you use? Math? Engineering?" The questions do not leave much room for youth to direct the conversation. While these questions do make space for the youth voice in Lacy's research, the youth's perspective in this study is limited by what Lacy thought would be relevant to her research questions. Lacy coded interview data iteratively throughout the data collection process, using descriptive coding, *in vivo* coding, values coding, and pattern coding. The *in vivo* coding enabled her to use youth's own words in her coding process. She did not, however, use member checking to return to youth participants and have them confirm that her interpretations represented the truth of their experiences in the Fab Lab.

Martin and Dixon (2013) used semi-structured interviews to investigate youth conceptions of making and the Maker Movement. They asked 17 youth participants, 14 boys and 3 girls, between the ages of 12 and 18, questions about their perceptions of themselves as makers. These participants were part of an out-of-school "maker" club in which they created projects of their own design for the purpose of exhibiting them at a large regional exposition where adult makers also exhibited their own projects. Martin and Dixon's (2013) questions were broader than Lacy's (2016):

The first was, "Do you consider yourself to be a maker?" For those who said yes, we followed up with, "What is it about you that makes you a maker?" For those answering no, we asked, "Would you like to be a maker?" and "What would need to happen for you

to be a maker?” For those who gave a qualified yes or no, we asked both follow up questions.

Our second question asked, “What kinds of making do you like to do?” As a follow up question, we asked, “Do you think of any of these as your specialty?” (Martin & Dixon, 2013, p. 2)

Martin and Dixon (2013) conducted a content analysis on youth’s answers to these questions, identifying emerging categories and themes, then returning to the data to look for cases that confirmed or disconfirmed these themes. These themes included (1) the idea of the maker community as an open space where maker identities were constructed via active participation, (2) “making, and being a maker, as distinctive from a normal, everyday, or common way of being” (Martin & Dixon, 2013, p. 2), and (3) making as an activity that is integrated across a variety of contexts.

Drawing on this earlier work (Martin & Dixon, 2013), Dixon and Martin (2017) continued to use semistructured interviews to explore “participants’ paths toward *knowing* and *being* as makers and learners” (p. 104). They conducted brief interviews with 11 youth between ages 11 and 15, three young women and eight young men, who were presenting at a Maker Faire, “a large regional exposition of maker projects” (Dixon & Martin, 2017, p. 104). Dixon and Martin (2017) deliberately designed their interview guides to resemble the types of questions the youth would have received from other Maker Faire attendees, but they note that their interviews were necessarily different from other question-answering interactions because they were recording the interviews. The questions included were:

1. What have you been asked about the most today?
 - a. What do you explain about your project?

2. What was the most complicated part? Or what was the hardest part to figure out?
 - a. How did you figure it out?
3. How did you choose your project?
4. What are you going to do next with it?
5. What do you think you're going to do with what you learned in the process?
6. Have you done anything at the expo before? If so, what did you do?
7. What is the most important part, to you, of working on stuff and being in the expo?

(Dixon & Martin, 2017, p. 108)

Dixon and Martin (2017) conceive of the interview responses as “narratives of making,” trying to tease out, “What activities and processes do these young people describe, and what values or norms are explicitly or implicitly tied up in these descriptions?” (p. 105) They seek not an objective account of the youth’s experiences, but rather an understanding of “the nature of participation in maker communities and the means with which young people situate themselves in a particular space and time” (Dixon & Martin, 2017, p. 106). They analyzed the recorded and transcribed interview data first by taking notes while listening, then using the process of constant comparison to generate codes and categories that remained as close to the original narratives as possible. They checked and recoded the interviews, looking for confirming and refuting cases. The complete final code list included over 50 codes. They began to look for shared aspects across multiple narratives; they noticed that these seemed to differ based on the participants’ levels of experience, so they returned to the data and mapped the relationship between particular levels of experience and specific codes. Dixon and Martin (2017) clustered codes together according to this mapping. They took a final pass at coding and arrived at a set of three clusters which they call *frames of participation*: exploration, exchange, and deliberate engagement.

These tended to align with experience levels, with less experienced makers emphasizing exploration in their narratives, while makers with more experience focused on exchange and those with the most experience emphasized deliberate engagement. Dixon and Martin (2017) emphasize, however, that these frames are not actually a step-by-step progression: “The data show overlaps in practices across frames and we expect that the frames may shift relative to audience, context, and immediate goals, with the practices serving as repertoires that makers draw from to organize social interaction and other aspects of cognition” (p. 113).

The interview guides from these two studies (Dixon & Martin, 2017; Martin & Dixon, 2013), while still targeted like Lacy’s (2016), offer more space for youth to share their experiences and thoughts, especially in the follow-up questions. Rather than leading youth’s answers with specific questions about skills or specific types of scientific practices, they give youth a chance to articulate their own ideas about what happens in making activities. This contrast is partly a result of the difference in the research questions in these two studies; Martin and Dixon’s (Dixon & Martin, 2017; Martin & Dixon, 2013) questions were explicitly concerned with how youth were considering their own experiences, while Lacy’s were concerned with science education and social practices in the Fab Lab. This contrast offers an example of how not just the specific methodology used, but also the research question itself influences the extent of youth participation in a study. It also demonstrates the possibility for variation between two applications of the same research technique.

Focus Groups

In addition to eliciting youth’s perspectives with surveys and semistructured interviews, researchers have also used focus groups with youth participants. A focus group is “a group of individuals selected and assembled by researchers to discuss and comment on, from personal

experience, the topic that is the subject of the research” (Powell & Single, 1996, p. 499). Focus groups afford youth a level of participation that may be greater than a one-on-one interview, as they are able to build on one another’s ideas. The data produced by focus groups “are a set of intertwined voices” (Wildemuth, 2009, p. 242); youth may be more comfortable revealing their thoughts in a group of their peers than one-on-one with an adult.

Bowler and Champagne (2016) explore the role of critical technical practice in youth’s makerspace practices. They define critical technical practice as “the ability to think deeply, critically, mindfully, and with a sense of responsibility, about the technological artifacts that we design, make, and use” (Bowler & Champagne, 2016, p. 117). They examine three youth-oriented makerspaces in Pittsburgh, Pennsylvania, asking what types of questions adult mentors and youth ask themselves as they create technological artifacts in these spaces, what questions the adult mentors ask the youth, and what problematics and self-reflective thinking these questions capture. One of these makerspaces is situated in a public library; the other two are in a museum and a non-profit community space. Their methods included participant observation, focus groups with teens, and semi-structured interviews with adults. Twenty-nine teens participated in four focus groups. One researcher interacted with teens in each focus group, while the other researcher took notes. They used the following verbal prompts with the focus groups:

- What have you made using a computer?
- What kinds of questions do you think you asked yourself when you made it?
- What kinds of questions might help you think better when you make something?
- When you're stuck, what kinds of questions would you ask yourself?
- What kinds of questions would help you think about how the thing you are making affects you?

- What kinds of questions would help you think about how the thing you are making affects other people?
- What kinds of questions should a mentor ask you? What would help you? (Bowler & Champagne, 2016, p. 120)

The focus groups were audio-recorded and transcribed. Bowler and Champagne (2016) conducted an inductive data analysis, adapting techniques from grounded theory in order to capture the language and thinking of the participants themselves. Through an iterative coding process, they generated descriptive codes, an interpretive framework guided by broader themes, and “a set of eight activation questions that reflect both the authentic world of youth makers and the wisdom of mentors, phrased in natural language so as to encourage direct application in maker spaces... [These questions can] serve as a tool kit for scaffolding critical practices in maker spaces for youth” (Bowler & Champagne, 2016, p. 120). The questions are:

- What will make me happy?
- Who is my audience?
- What resources do I have and need?
- What will inspire me to give my time and effort to a project?
- What do I know?
- Can I let myself make a mistake?
- How will my creation affect other people?
- What kind of maker am I? (Bowler & Champagne, 2016, pp. 120–121)

These questions capture youths’ voices to varying degrees. “What will make me happy?” is a question that arose directly from focus group participants’ focus on fun and happiness.

“What resources do I have and need?” grew from both teen and mentor responses related to both

human and material resources available. For teens, “What will inspire me to give my time and effort to a project?” grew out of a desire to undertake projects that would not take “too long,” though Bowler and Champagne (2016) don’t report a specific time commitment that teen participants identified as meeting this requirement. Similarly, when teens addressed “What do I know?” it was because they wanted to use existing knowledge rather than gain new knowledge. “Can I let myself make a mistake?” grew out of a tension between mentors’ insistence that failure is an important part of the making process, and teens’ fear of failure. When researchers asked teens what types of questions they would ask themselves when they got stuck in a project, the answer from one focus group was “What is wrong with me?” (Bowler & Champagne, 2016, p. 122). Teens only addressed the questions “Who is my audience?” and “How will my creation affect other people?” after researchers prompted them to consider questions related to how their made artifacts would affect others. The question “What kind of maker am I?” grew out of adult mentors’ shifting conceptions of themselves as makers, for example, moving from being a meditative maker to being an entrepreneurial maker. Bowler and Champagne’s (2016) method of combining participant observation, teen focus groups, and interviews with adult mentors offers a promising model for capturing youth’s voices while balancing their words and ideas with observations by both researchers and mentors of youth’s actual practices.

Youth as Co-Researchers

While surveys, semistructured interviews, and focus groups provide opportunities for researchers to foreground youths’ voices in their work, cooperative inquiry (Heron & Reason, 1997) provides an opportunity for youth to act as coresearchers. In youth-oriented cooperative inquiry, youth and adults collaborate to “define the questions they wish to explore and the methodology for that exploration” (Heron & Reason, 1997, p. 283) to apply the methodology in

their own areas of practice either separately or together, and to represent their findings. A project that uses this participatory inquiry paradigm is *Making for Change: Becoming Community Engineering Experts through Makerspaces and Youth Ethnography* (Barton, Tan, & Greenberg, 2017; Barton et al., 2016; Shin, 2016; Tan et al., 2016).

In the *Making for Change* (M4C) project, faculty from Michigan State University and the University of North Carolina at Greensboro have partnered with the Boys and Girls Clubs in Lansing, Michigan and Greensboro, North Carolina to create “an informal (out-of-school) STEM learning model to engage middle school youth from underrepresented backgrounds in experiences related to engineering-for-sustainable-communities” (National Science Foundation, n.d.). In this program, youth act as community ethnographers and then use their findings to inform their work in a makerspace (Barton et al., 2017). The program has resulted in the publication of multiple research papers (Barton et al., 2017, 2016; Shin, 2016; Tan et al., 2016).

The overall approach to the M4C project is one of critical ethnography, in which the scholars from Michigan State University and the University of North Carolina at Greensboro collected data “from multiple sources/sites, including participant observations in the two community-based makerspaces (~78 hours/year), conversation groups with youth makers (~36 hours/year/site), and artifact-based interviews” (Tan et al., 2016, p. 3). The adult researchers analyzed this data through multiple stages of coding and generated multiple levels of codes using the constant comparison method (Barton et al., 2017; Tan et al., 2016). As the university researchers were collecting their data on the program, the youth were acting as community ethnographers (Tan et al., 2016). They undertook activities such as designing and administering surveys, interviewing family and community members, and analyzing survey and interview data in partnership with adult mentors. They then used their results to inform and inspire their design

and production of solutions in the M4C makerspaces. Examples of such problems and the related innovations include

“keeping my peers and younger children safe when playing football outdoors in our community” and “helping kids make friends” (Samuel’s light-up football), “helping people in my community feel safe on the streets at night” or if you “need protection from the police” (Samuel’s phantom jacket), “helping kids or our peers play with scooters outdoors in the late afternoon or evening” (Jennifer and Emily’s light-up scooter), and providing peers with “glamour and fashion” and “helping people in our community—including the homeless—live, work, and play outside in winter at night and feel safe and warm” (Jennifer and Emily’s heated jacket). (Tan et al., 2016, p. 4)

Tan, Barton, Shin, and Turner (2016) emphasize that youth participation in the M4C project went beyond simply responding to university researcher prompts. The adult mentors in the program supported youths’ agency in framing their own research and design problems. “Instead of merely responding to parameters laid out by adult mentors, the youth, through community ethnography, framed salient safety issues for themselves to investigate and innovate” (Tan et al., 2016, p. 7). This process was not only participatory, but also decolonizing; as youth drew on their own knowledge as “oppressed insiders,” they brought attention to narratives that are typically silenced and absent from makerspaces, such as rape and bullying.

Youth participants in M4C “complained vehemently at one point that ‘all’ of the makerspaces they ever visited were ‘not kid friendly’” (Barton et al., 2017, p. 8). They were unable to immediately identify the reasons for this sense, and spent part of the M4C program determining what a “youth-centered” makerspace should look like. Inspired by this conversation, Shin (2016) collaborated with youth on a Youth Participatory Action Research (YPAR) project to

design a youth-centered makerspace and propose its realization to the executive board of directors of the afterschool club where M4C took place.

YPAR is both a methodology and an epistemology (Shin, 2016). As part of the broader category of participatory action research (PAR), YPAR challenges dominant narratives about knowledge production; it asserts that knowledge and expertise do not reside exclusively with scholars, but instead are distributed among many individuals (Fine, 2008). YPAR assumes that knowledge and expertise can be found in the experiences and understandings of youth. Throughout the YPAR process, youth are equal co-researchers with the power “to identify problems, to design investigations, to interpret data, and to take action to transform the unjust situations” (Shin, 2016, p. 108).

In the project Shin (2016) describes, 16 youths aged 11 – 16 participated: 13 African-American girls and boys, and three white girls. Most of them had previous involvement with the M4C program before beginning the YPAR project. “The main goal of the project was to design a new youth-centered makerspace in a local afterschool club to challenge the traditional design/notion of makerspaces that may shape the participation of youth from non-dominant communities” (Shin, 2016, p. 110). The youth worked with their adult co-researchers to identify local makerspaces they could visit as research for their design, as well as distant makerspaces that they could tour virtually. The youth identified the type of data they wanted to collect; they co-designed worksheets for data collection with the adults. They collected data on the virtually-toured makerspaces first, then collected data on the local makerspaces in person. They also collected data on the Boys & Girls Club where they hoped the makerspace would be located. Data collection methods included participant observations, group conversations, video diaries,

and reviews of student artifact collections. Shin (2016), one of the adult researchers on the project, performed data analysis using the YPAR framework

to identify and analyze focal events from the data on how the youth frame the importance of a youth-centered and community-based makerspace, as well as its link to their desired identities and practices in making/engineering. (Shin, 2016, p. 117)

Shin organized the data in meaningful chunks using the constant comparison method. First, he considered the focal events chronologically and organized them into categories. Then he used open coding to address the following questions:

why does transforming makerspaces matter to the youth? Which makerspace designs discourage the youth from engaging in making? How does the design of makerspaces influence youth engagement in making? In what ways do the youth design their own makerspaces? How do the youth justify their design of makerspaces? What actions do they take to actualize their new makerspace? (Shin, 2016, p. 118)

Based on this analysis, he created initial codes, which he then developed further into themes “by selecting core categories and relating these to others” (Shin, 2016, p. 118). Shin found that the youth’s engagement in YPAR “empowered them to expose and challenge a set of power dynamics that shape their participation in making and makerspaces” (Shin, 2016, p. 149), a set of dynamics they articulated as existing in the tension between adult-friendly and youth-friendly spaces. The youth also “contested the boundaries of making and makerspaces, re-positioning what it meant to make and be a maker” (Shin, 2016, p. 149).

Conclusion

The literature on makerspaces, in and out of libraries, demonstrates a variety of possibilities for youth participation. Whether youth are articulating their views given a limited

set of response options or participating in research as equal co-researchers from the conception of a project, their voice can be incorporated into research designed to illuminate how these learning environments can impact their development. Of the methods discussed in this literature review, Shin's (2016) use of YPAR makes space for the highest degree of youth agency in the research. New makerspace research might go beyond even Shin's (2016) work, however; youth can act as co-researchers in the data analysis process as well, as Shannon Crawford Barniskis (2012a, 2012b, 2013) demonstrates in her work on collaborating with teens to form a grounded theory of library art programs. They might also act as co-authors, disseminating the results of their research not only in their local environment, but in professional or scholarly literature. To date, youth have not acted as co-researchers in a makerspace embedded within a library setting; this literature review provides a foundation for pursuing this promising combination of methodology and setting.

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