Legitimate Peripheral Participation in a Makerspace for Emancipated Emerging Adults

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Abstract

Following emancipation from foster care, youth often transition into adulthood without the support of family or school. For some emancipated emerging adults (EEAs), alternative support may come from informal educational programs like makerspaces—safe spaces to learn, explore identities, build relationships, and become entrepreneurs. This exploratory study uses Lave and Wenger's concept of legitimate peripheral participation as a lens to for analyzing the diverse relationships of three EEAs (ages 20, 22, and 25) to the maker community of practice, as they live in a transitional housing facility and engage with its on-site makerspace and its affiliated museum.

Keywords

emerging adulthood, legitimate peripheral participation, emancipated, makerspace, communities of practice

Literature Review

Emerging Adults

Between the ages of 18 and 25, youths undergo a period of transition from adolescence to adulthood called "emerging adulthood" that is characterized by the following traits: optimism for the future, feeling between adolescence and adulthood, instability, identity exploration, and self-focus (Arnett, 2000). For many middle-class emerging adults, this transition occurs with the support of family and the resources available through postsecondary education, including clubs and classes to explore identity and career opportunities, as well as pseudo-parental supports such as dining services and campus health and safety (Arnett, 1994). Even with these supports, emerging adulthood can be a risky time for youth, as opportunities and pressures to engage in high-risk behaviors increase, like excess drinking, recreational drug use, and unprotected sexual activity (Chassin, Pitts & Prost, 2002; Pharo, Sim, Graham, Gross, & Hayne, 2011; Stone, Becker, Huber, & Catalano, 2012). Traditionally, youth began to see themselves as adults when they reached important markers of "successful emergence," including marriage, parenthood, and career progression (Arnett, 2000). As youth begin to self-identify as adults, they experience less depression, engage in fewer risky behaviors, and have a better sense of their overall identities, as well as the type of person they want as romantic partners (Barry & Nelson, 2005; Galambos, Barker, & Krahn, 2006).

Foster Youth

Emerging adults who are emancipated from foster care, that is, "age out," often lose government and foster-family supports between ages 18 and 21 (Avery & Freundlich, 2009), long before the transition to adulthood has ended. Like their counterparts, emancipated emerging adults (EEAs) demonstrate the five traits characteristic of emerging adulthood (Hokanson, 2014). Unlike their counterparts, however, a disproportionate number of EEAs come from marginalized groups; many are lesbian, gay, bisexual, transgender, or queer (LGBTQ) (Wilson, Cooper, Kastanis, & Nezhad, 2014), and nearly half of youth in foster care are either Latino/Hispanic or African American (https://www.childwelfare.gov/pubPDFs/foster.pdf). In addition to the high-risk behavior characteristic of other emerging adults, EEAs are vulnerable to other risks like homelessness, incarceration, and early parenthood (Fowler, Toro, & Miles, 2009; Jones, 2011). For such EEAs, the transition to adulthood may be cut short, limiting developmental opportunities (Berzin, Singer, & Hokanson, 2014). In addition, EEAs are

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often reluctant to seek assistance and support, as self-reliance and independence are important to their ability to view themselves as adults (Samuels & Pryce, 2008). Measures of adulthood become even more important for youth for whom traditional options may not apply, such as marriage and parenthood, particularly among LGBTQ youth (Torkelson, 2012).

Traditional sources of support like family and college are limited for EEAs (Courtney et al., 2007). EEAs must seek jobs in an economy where college marks the threshold for entry (Carnevale, Smith, & Strohl, 2013), while facing higher pressure to pay for food and shelter and potentially support dependents (Pecora et al., 2006). Without the means to meet basic needs, EEAs' mental and physical health suffers (Fowler, Toro, & Miles, 2011). Despite high interest in attending college, Davis (2006) found that fostered youth rarely attend college during emerging adulthood. With prohibitive costs of attendance and lack of support during the college application process, many fostered youth struggle to get into college (Wolanin, 2005). For marginalized groups, negative school experiences may also discourage applying to or staying in college; Hefner and Eisenberg (2009) found emerging adults of minority race, ethnicity, or low-socioeconomic status in college often face social isolation and lower mental health. To that end, the maker movement offers promise as an alternative for youth barred from the developmental opportunities available through college experiences and training available through technical schools.

The Maker Movement

Making as an activity stems from the innately human practice of constructing physical and digital products through an iterative process (Halverson & Sheridan, 2014). The "maker movement" went from home garages to diverse makerspaces, hackerspaces, and fab labs as a community grew around the world to support practices for designing, testing, and sharing (Brahms & Crowley, 2016). Making crosses domains like science and engineering to include arts (Sheridan et al., 2014). In the United States, making in paid makerspaces and of the kind featured in popular MAKE magazine tends to represent a White, middle-class, male-dominated practice (Halverson & Sheridan, 2014), but through growing efforts, making is reaching broader audiences to support positive development and learning.

Making is an activity that supports learning and positive development. Those who engage in making learn through constructionism (Harel & Papert, 1991), building knowledge through the act of creating something digital or physical. Martin (2015) argued that the most critical aspects of the maker movement for supporting learning include increased opportunity for fluency with technology and tools; community infrastructure, including access to other makers and mentors through events, magazines, makerspaces, and meetups; the maker mind-set described by Dougherty (2013), comprised of playfulness in experimentation, asset and growth orientation, and failure positivity; and the collaborative sharing of process

and products. Accordingly, studies have found that making can support youth interest in programming (Resnick et al., 2009) and help marginalized youths make connections between their identities and learning (Barton, Tan, & Greenberg, 2016).

Despite the broad range of ways in which makerspaces are anticipated to improve learning and positive development, the educational aims for which makerspaces are designed typically fall within one or more of three categories: science, technology, engineering, and mathematics (STEM) pipeline and workforce development; inquiry-based learning; and entrepreneurship and community creativity (Vossoughi & Bevan, 2014). It is this last aim, in particular, that holds promise for EEAs. The opportunity to work creatively in makerspaces can support well-being, mental health, and provide the means to make to meet one's individual or community needs, for example, building a lower cost alternative to something purchasable (Taylor, Hurley, & Connolly, 2016).

Participation in entrepreneurship, likewise, can support positive youth development through building competence and 21st-century skills (Bowers et al., 2010; Obschonka, 2014; Schmitt-Rodermund, 2007) and, for disadvantaged youth, has been found to support empowerment in the form of increased autonomy and engagement and decreased risk avoidance (Jennings, 2014). Entrepreneurship is the process of devoting resources to creating something of value and assuming the accompanying risks, responsibilities, and financial rewards (Hisrich, & Peters, 1992). Examples of entrepreneurial makerspaces vary; in one case, a makerspace was available for a membership fee, full of expensive equipment, offered difficult classes, and hosted a high concentration of professionals, while in the other, the makerspace had less expensive equipment but was free for community use for learning, entrepreneurship, creativity, and repair (Sheridan et al., 2014). In such makerspaces, access to machinery and materials can lower the cost of prototyping and production, and diverse networks promote creativity and innovative thinking; thus, even activities that start out as hobbies may evolve into accidental entrepreneurship as individuals come to value the economic potential of their work (Van Holm, 2015).

Theoretical Framework

Lave and Wenger (1991) describe learning in terms of legitimate peripheral participation (LPP); learning is a social process where newcomers gain skills and knowledge by participating within a community of practitioners and eventually move toward full participation in the sociocultural practices of the community. Communities of practice are defined not by the physical boundaries of the community but by shared practices, knowledge, customs, relationships, roles, and identities. Communities of practice self-perpetuate by assisting newcomers in LPP, ultimately resulting in more members of the community who can inherit the tradition. In order to achieve LPP, a learner must engage in the following practices on an ongoing basis: (1) engage with the community of practice, (2) acquire skills and knowledge requisite of the practice, and (3) develop an identity

as a fully participating member within the community of practice.

In this study, we use LPP as a lens for analyzing and interpreting learning in a makerspace for EEAs. Prior literature informs our understanding of LPP's three constituent parts in reference to making and makerspaces. Although makerspaces can serve as entry points to different communities of practice, for example, the engineering community, as is often the goal in the case of STEM workforce development, we focus on LPP toward full participation in the broad maker community, as this is often associated with entrepreneurial making and community creativity (Sheridan et al., 2014; Vossoughi & Bevan, 2014).

Maker community engagement. Martin (2015) characterized maker community infrastructure to support engagement as consisting a network of museum and community events, makerspaces, magazines, and online platforms. With present technological advancements, access to a community of practice is not limited to in-person interactions but extends to social media, forums, sharing platforms like Pinterest, and media like Make magazine (see https://makezine.com). Makerspaces represent an opportunity to work side by side with other makers of varying levels of expertise and benefit from their diverse experiences and ways of viewing a problem (Sheridan et al., 2014). Attending fairs where makers sell items and share practices is another way that members of the maker community typically interact, but the maker community of practice extends across so many disciplines that makers might be found in shops, museums, schools, as hobbyists in their own garages, and more (Dougherty, 2012).

Maker skills and knowledge. A vast variety of skills, knowledge, and practices arise from and support the maker movement due to its nature as a multidisciplinary practice. Brahms and Crowley (2016) found that making typically involves seven general practices, including exploring and questioning; tinkering, testing, and iterating; seeking out resources; hacking and repurposing; combining and complexifying; customizing; and sharing. Dougherty (2013) also argued that makers must also possess a "maker mind-set," in other words a can-do, problem-solving, and resourceful attitude compatible with Clapp, Ross, Ryan, and Tishman's (2016) concept of maker empowerment, "a sensitivity to the designed dimension of objects and systems, along with the inclination and capacity to shape one's world through building, tinkering, re/designing, or hacking," as both a desirable outcome of making practices and key quality of makers.

Maker community-member identity. Lave and Wenger conceived of identity as "long-term, living relations between persons and their place and participation in communities of practice." Therefore, although Dougherty, at the forefront of the maker movement, describes everyone as a maker due to the nature of making as an innately human practice, self-identification as part of a community requires more than passive qualification. In the maker community of practice, a relatively new

community of practitioners, skills and roles alike are varied and flexible but involve relationships among hobbyists and professional makers, as well as teaching artists and facilitators, who employ a shared vocabulary and practices (Sheridan et al., 2014). In Davies (2018), makers identified as "hackers" or problem solvers both in and out of the makerspace and felt making was to be pursued for "pleasure, identity formation, and self-actualization." The identities marginalized youth brought to the maker community likewise shaped their maker identity development allowed them to reclaim spaces and practices in a way distinct from middle-class White male makerspaces (Greenberg & Barton, 2017).

In this exploratory study, we use LPP as a means of understanding the relationship between EEAs and the maker community of practice. We present the cases of three EEAs whose ongoing engagement in a makerspace depicted different engagement with the maker community of practice.

Method

We used Stake's (1995) instrumental collective case study method to frame our research, a methodology that uses interviews, observations, and documents to answer general research questions through the study of several related cases. The cases depict the diverse narratives of three emerging adults, Nadia, Clark, and Asa, as they engage with the maker community of practice through access to a makerspace within their place of residence and an affiliated museum with its own makerspace.

The Makerspace

Transitional housing facility (THF) was located in a mid-size, Northeastern United States city that provided up to 2 years of support for up to 24 selected EEAs at risk of homelessness. Many of its residents were African American, LGBTQ, Latino/Hispanic, or disabled. In 2015, THF partnered with a local children's museum to build a makerspace within THF's ground floor community room, free for EEA residents' use both during the THF program and after graduation. In their grant proposal, the museum stated that the makerspace would provide residents with "one-of-a-kind opportunities to discover their skills and future potential, explore their passions, and build confidence and coping tools through making with digital and physical materials" (quoted from grant proposal). To that end, the program would also provide youth with the opportunity to apply for a part-time, paid internship to learn to facilitate at the museum and eventually replace THF's facilitator, if practicable.

With funding from the grant, staff from the museum selected and purchased tools and materials for use in the makerspace, primarily including sewing equipment, various art supplies, woodworking and soldering tools, a few computers, and some notepads and pens for jotting ideas. Two to three times a week, the facilitator the museum had appointed to THF visited THF's budding makerspace to introduce residents to the new space and assist with the development of projects. A social

worker typically moderates the space alongside the facilitator. The social worker was a self-proclaimed maker herself and described her role; thus, she ensured that the residents followed community rules, like referring to nonresident adults as "Mr." or "Ms." and kept the peace between residents, all while occasionally helping residents with projects. On several occasions, other staff joined residents in the makerspace, sometimes participating in making as well, but other times merely socializing with residents.

At the project's inception, the makerspace was nearly vacant most nights, but as the makerspace became more of a fixture in the residents' lives and norms were established, especially regular hours and the provision of food at making sessions, the makerspace saw more frequent attendance. Making sessions typically lasted 2 hrs in the evening on three weekdays or two weekdays and a Saturday, depending on facilitator availability and residents' interest. At all other times, the community room was locked unless used for other purposes such as staff meetings. Residents occasionally trickled down from their housing any time before the makerspace closed to chat with other residents, listen to music, experiment with materials, and eat when snacks were available. Residents were required to sign an attendance sheet upon entry into the makerspace and visit at least once a month, but the rule was loosely enforced and did not require the residents to engage in making.

By 2016, around 3–10 residents were in the makerspace at any given time but often more if dinner were available or a special event were taking place. These special events included themed nights, like a make-your-own-presents Christmas party and a cake-decorating night. On these occasions, other facilitators from the children's museum or local artists visited THF makerspace to demonstrate new techniques and activities. Residents also had infrequent but nonetheless popular opportunities to visit the museum's makerspace, either for special events to sell things they had made during fairs or to attend 21+ nights. On such occasions, the museum typically provided a bus to support residents' travel.

Data Collection and Sampling

In late 2015, the researcher spent several sessions familiarizing herself with the space and building relationships with staff and residents before selecting residents to interview and observe. Selection criteria included residents' voluntary participation in the study, their expressed intent to visit the makerspace frequently for the duration of the study, and evidence of some engagement in making during previous making sessions. Of the five EEAs initially selected, only four remained at THF for the duration of the study, and of the remaining four, data from three were chosen for analysis on a basis of data quality and contrasting narratives. In 2016, the researcher interviewed the three focal residents approximately monthly, for a total of six interviews each. Interviews were semistructured, conducted in the makerspace or other office space at THF, and included topics like how the EEAs defined themselves in relation to making,

the extent of their engagement with the broader making community, what their interests in making were, what their career goals and other responsibilities consisted of, what their experience within the makerspace was like, and how resources within the space supported their process. Staff were asked about their roles, experience, expertise, and about the makerspace engagement of the residents being interviewed to supplement our understanding of the three residents' engagement with the makerspace.

In addition to conducting interviews, the researcher acted as a participant-observer, primarily taking photos and field notes in the space but also working on projects alongside the staff and emerging adults; like the residents, she occasionally engaged in a teaching role if others became interested in the kinds of projects she worked on or helped out when a facilitator was not immediately available. The researcher's role in relation to the emerging adults, although announced to staff and residents during the study, was ambiguous in the sense that while staff required the residents to address them with "Mr." or "Ms.," she did not, and additionally, she was closer in age to the residents than some staff, of mixed race/ethnicity (presenting as White, but identifying as Latina), and had interests in common with a number of the youth. This facilitated trust and conversation with the interviewees, some of whom eventually opened up about difficult topics, such as the treatment of transgendered youth or struggles with responsibility toward their families while still minors. After one interview, one resident in particular remarked that it was gratifying to talk to the researcher and feel heard.

Coding and Analysis

Our analysis relies primarily on data from transcribed interviews conducted in a makerspace with three emerging adults, six each. Interviews collected with two other residents were not included in this study due to attrition and data quality. One facilitator interview, one social worker interview, field notes on observations of the site, and photos of projects supplemented the analysis, all of which the researcher collected during makerspace sessions at least once monthly during the first half of 2016. All names used are pseudonyms.

Following Stake (1995), we applied a direct interpretation to our data by events and narrative threads. Coding was an iterative process, using both codes derived from the data and a priori coding schemes based on emergent themes. Initially, we looked for emergent themes related to learning and identity. Themes emerged, such as residents' definitions and valuing of "making" and the unfolding narratives of their engagement and interactions with the practices and community of the maker movement. The most prevalent themes suggested LPP as an appropriate lens for analyzing learning and development during the emerging adults' participation in THF's makerspace, and we organized these themes within the three parts of our framework (Table 1).

Table 1. Codes for Themes.

Framework	Thematic Code	Description	Example
Community			
	Engaging	*Engaging with the community of practice, in a social, productive, or educational capacity.*	Asa attended special events at the museum by invitation, enabling her to meet adults within the maker community.
Skills and knowledge			
	Prior experience	*Prior experience with community or its practices.*	Clark had previously taken studio-based classes for movie special effects (e.g., makeup, latex monster costumes).
	Participating	*Participating to learn practices, skills, and knowledge of the practice.*	Clark experiments with a spray that allows ink to transfer from one surface to another.
Identity			
	Defining	*Defining the practice.*	Nadia: Does baking count [as making]?
	Relating	*Relating to the community of practice.*	Asa: . . . let's say we going to [a maker fair] or something; I get to step outside of business, boring American 401k plans, and get to genuinely be myself . . .
	Valuing	*Valuing the practice/community.*	Asa: Let's say we going to [a maker fair] or something; I get to step outside of business, boring American 401k plans, and get to genuinely be myself . . .

Results

During the 6 months of the study, the three EEAs Nadia, Clark, and Asa evidenced LPP within the maker community of practice. Despite similar characteristics such as prior experience relating to making or crafting, being interested in but not presently attending postsecondary education, and living in transitional housing while working to become self-sufficient adults, their relationship to the maker community varied greatly, in turn shaping what benefits they reaped from their engagement.

Case 1: Nadia—22, Female, Latina/Hispanic

Nadia's narrative depicts how a strong interest in making and a positive mind-set for learning can support LPP in the maker community, particularly when supported by opportunities to grow, network, and be a part of the community. Her story also demonstrates, however, how EEAs have difficult and practical choices to make when faced with adult responsibilities and limited supports. A recent addition to THF after living in a women's shelter, Nadia's professional interests were not in making:

> Cooking has always been there in my life. It's something I've always done. I've worked in restaurants constantly, whereas bioengineering . . . I had a love for biology through high school, through middle school . . . . Genetics just interests me so much. I actually went to college for genetic engineering for a year, and I did pretty well. (Nadia, Int. 4)

As was the case with all residents, Nadia had goals to accomplish while at THF, with the support of a social worker; hers included getting a driver's license, paying off her debt from school before taking more genetic engineering classes, and

taking the time to focus on her personal needs and well-being after a childhood spent caring for her family. Her plans to return to school fluctuated during the course of the study, moving from summer (Int. 1), to fall (Int. 3), and finally to spring of the following year (Int. 5), after she started a full-time job working in hospital kitchens.

Maker community engagement. From the start, Nadia's enthusiasm for making sparked deep engagement with the maker community, first through THF's makerspace and then the museum. In her first week at THF, she attended the maker session and promptly applied for the paid, part-time museum facilitator internship. "As soon as I saw the flyer I was like, 'I have to sign up!'" (Int. 3). Thereafter, Nadia attended making sessions at THF as often as possible, befriending other residents, and working on a variety of practical or experimental projects. The internship took her participation in the maker community from THF's makerspace to the museum, where she learned from museum facilitators with different areas of expertise:

> Since I'm an intern, I help everyone else with their own project. But everyone has such a vast variety of projects, and everyone is so talented. Honestly a lot of people don't need help. It's the newer tenants . . . who still see [the makerspace] as a shiny new area; they're the people who really need to be led through the process still. (Nadia, Int. 3)

As the study progressed, however, other opportunities that Nadia felt better addressed her goals and responsibilities competed for her time and, ultimately, won. After befriending a fellow resident in the makerspace, she learned of a higher paid, full-time, and entry-level work opportunity in the kitchens of a hospital. Nadia took the job, initially saying that she would

juggle the internship, work, and school but shortly quit the museum internship and cutback on visits to the makerspace and museum. With this job, she believed she would be able to pay off her previous debt completely and become self-sufficient, allowing her to pursue restaurant management or return to school.

Maker skills and knowledge. Nadia's engagement in making practices and skills began long before the start of the study and expanded through her time spent making to meet personal needs and training to facilitate making for others.

> My grandmother . . . taught me how to cook, she taught me how to speak Spanish, she taught me how to crochet . . . . Unfortunately, we don't have a good relationship anymore, but . . . . She can't take away what I've learned from her. (Int. 1)

THF makerspace represented a renewed opportunity for her to pursue her interests in making-related domains: "I've always had an interest to make things, but I never had the opportunity to be able to make things. I never had the time. I never set aside the time for myself" (Int. 1). Throughout her time at THF, she relied on support from museum facilitators, THF staff, peers, other guest maker community "old-timers," and a can-do attitude to move her learning along.

> It's all something I've never tried before. So I try not to hold myself to any standard. I don't have any preconceived notion of how it's going to turn out . . . . [My silk-screened T-shirt] turned out really great. I also did marbling with this dinosaur pattern. So it's the first time [the facilitator] tried marbling, first time I tried marbling and screen printing, and it turned out marvelously. (Nadia, Int. 3)

She started with crochet, a familiar skill, working with the researcher's help to construct a padded bed for her cat that ultimately proved too time consuming to be of immediate, practical use. She had a therapy cat coming to live with her and had just moved into THF housing but had limited resources and saw the makerspace as a means of fulfilling needs (see Figure 1):

> I'd love to make a cat tower, a cat scratching post, some little kitty toys, honestly everything for my cat . . . . I'd love to learn how to make a blanket, I'd love to learn to make an apron here . . . . Whatever projects they have here. (Int. 1)

The crocheted bed proved complicated, and while she later finished it, in the meantime she constructed one with the facilitator's help by sewing a pillow and assembling a wooden frame (see Figure 2).

The wooden bed was the first of many practical projects Nadia made over the course of several months. She also experimented with mini-projects on offer at THF makerspace and learned new skills through her internship. As an intern, her skills and knowledge broadened rapidly as she learned to use and facilitate others' use of materials and tools available at both the museum and THF. After she quit the
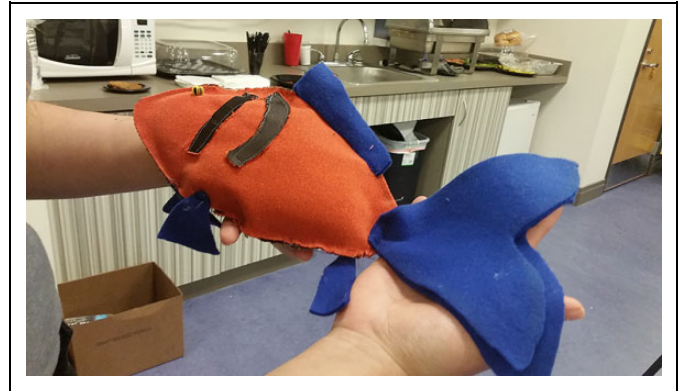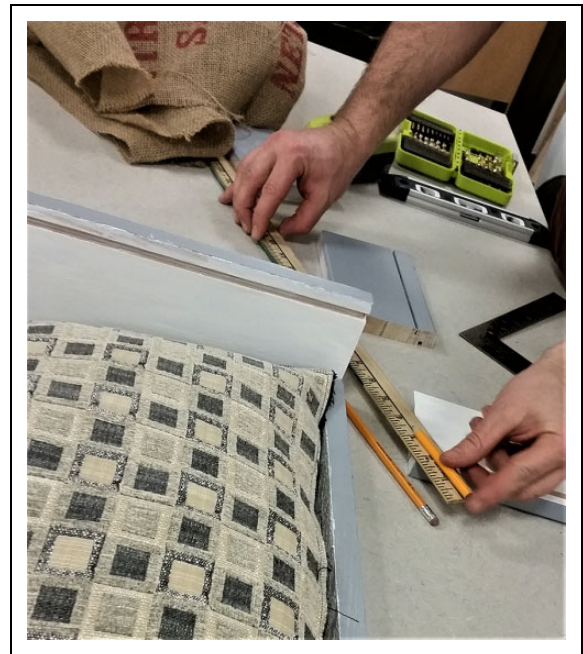

Figure 1. Nadia's catnip fish toy.

Figure 2. The facilitator helps Nadia work on her cat bed.

internship, she continued to practice and experiment on rare days off from her job, but as a result considerably slowed her progress.

Maker community-member identity. Nadia's view of the maker community reflected the belief that it was an innately human practice; throughout the study, she used inclusive language to suggest that she was a maker because all people are makers. "Making [is about creating] something by hand, to be able to create something of your own knowledge with raw material" (Int. 1). "I think almost everyone's a maker. We make things, I think, as a society, every day, whether it be a photo, whether it be food, whether it be a piece of clothing . . . " (Int. 3). She expressed uncertainty about the boundaries of making practices; however, when asked what she had made in the makerspace, she first excluded a cake she had baked from scratch and decorated on a cake-decorating guest maker night at THF

makerspace, but then asked, "Does [baking] count? . . . . Then I'm always making food upstairs, always" (Int. 5). When asked who defines what making is, she said "[The facilitator], 'cause he just pulls all these ideas out of nowhere and creates the most wonderful items" (Int. 5). While she had the museum internship, she viewed herself as having a role within the maker community, locally, but despite referring to her responsibilities at THF and the museum, and believing that residents of THF would say she was a maker "because I would help them [with making]" (Int. 3), she never referred to a maker community beyond the sites.

Nadia's inclusive view of making as a practice did nothing to diminish her view of making as a valuable practice for her and for others. She believed making was helpful in meeting her goals and needs outside of making, including support for her well-being,

> I think [the makerspace] really calms me down . . . . Which lets me be more successful in my life . . . . Just because with stress, I just feel . . . bogged down and so limited. (Int. 1)

She also felt it was a means of learning important skills for her and others:

> It'll show me how to do different skills which I could learn in the future, and teach my kids in the future . . . . Especially in our generation, those skills are dying out, so I think it's really essential for us to learn right now, to keep those skills going. (Int. 1)

This belief which persisted to the end of the study: "I really think [making] effects our day-to-day life, because we all have to make things . . . . I think everyone uses a making skill every day of their lives" (Int. 5). To that end, Nadia was grateful for access to the makerspace: "I think [the makerspace is here] to help us learn and grow our talents, because honestly a lot of people here haven't gotten that chance, so this is almost like a second chance that we never had . . ." (Int. 4).

Case 2: Clark—25, Transgender Male, African American

Clark's story depicts the tension between having a fully formed but unsupported identity and trying to form a new identity as he made the involuntary shift from attending college to become a professional special effects makeup and costume artist to exploring how a makerspace could support his interests and needs and, potentially, help him find new goals. Already at THF for about a year prior to the start of the study, Clark worked as a security officer for a bank and as a mentor for lesbian, gay, bisexual, and transgender (LGBT) youth.

> I am trying to find a job that pays me to travel and talk to youth in foster care and LGBTQ . . . . Right now I just want to find a house that's forever, and maybe move to Philly, and sculpt. That's my personal goals as of right now. (Int. 1)

He had gone to art school for entertainment design and special effects makeup but dropped out when his funding depleted, prior to the start of the study. He dreamt of working in and on movies.

> Creatively, I really want to make a full-body [latex monster suit] . . . . I would love [to do the costumes and makeup for movies] . . . . And also to be a creature in one of those [movies] . . . . If I could ever do that, just once in my life, I'd be so happy . . . . I could die happy! (Clark, Int. 2)

Clark's plans to move to Philadelphia solidified as the study wore on: "Philly has a better trans community and everybody's more open" (Int. 3). Initially, he made plans to move there during the summer, but after being fired from his job near the end of the study, he had to postpone them. He still expressed optimism: "That's okay, things happen for a reason. I always believe that" (Int. 6). In the next year, he expected he would have to leave THF and the makerspace "because, you know, two years, so I'll probably be out of [the makerspace]" (Int. 6). Clark still planned to move to Philadelphia when he could, to start a business sculpting accessories for transgendered men.

Maker community engagement. Clark's on-again, off-again relationship with the maker community was a testament to his innate need for a creative outlet but frustration when comparing the makerspace to art school. His experience with making-related practices and communities started in his childhood; he sculpted on his own, shared his projects on social media, and eventually studied special effects costuming and makeup in college. Clark's involvement with the maker community (e.g., in spaces specifically referred to as "makerspaces" and where practices were referred to as "making") began with THF makerspace, which failed to meet his expectations:

> . . . . I go there, and I have all these ideas and I'm like, "I'm going to settle on just this one idea," and then we don't have the materials for it. And then I'm like, "Well, I'm going to do *this*," and they're like, "Well, we don't have [tools] for that either." So I just give up. (Int. 5)

Despite his frustration, he still came when he remembered:

> [I come] every so often, because I keep forgetting that it's on a Wednesday . . . . It's my day off so I usually sleep all day, be a grandpa. And then I'm like, "Wow, so that was today . . ." (Int. 2)

Clark's participation in the makerspace typically consisted of coming late, eating, and socializing briefly with other residents, but he was popular and well received, sometimes stopping by with his dog. On occasion, however, Clark did come early enough and stay to work on making things or show his work to others in the makerspace. Staff recognized Clark as a valuable and talented member of the THF makerspace community, sometimes inviting him to special events at the museum, including making items to sell at a maker fair. As long as the makerspace was available to him, Clark repeated a pattern of occasional social appearances and engagement in making
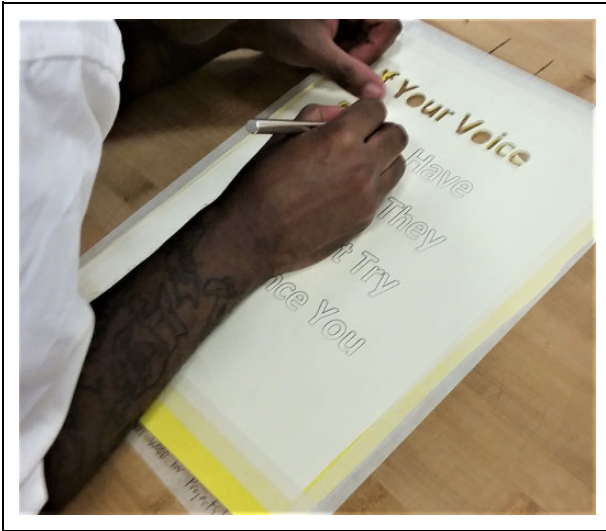
Figure 3. Clark's silk-screening stencil.

projects. After Nadia resigned from the makerspace internship in April, Clark expressed interest in taking it but did not apply because he said he would not be able to earn enough income doing it. He continued making outside of the makerspace and sharing his sculptures through social media.

Maker skills and knowledge. Clark's learning in the makerspace took place sporadically over tumultuous journeys that often ended when Clark abandoned his work partway. He had grown up loving to sculpt, inspired by mythical monsters and special effects in film, and had already taken college-level courses in pursuit of his well-defined interests. As a result, he frequently came to the makerspace with an idea in mind and no materials to support his plans: sculpting, in particular, required expensive materials that staff could order, but Clark said his request had been turned down:

> I'm a sculptor, and they don't have anything that I need. What you need for sculpting is supplies that's expensive . . . . If they're going to spend a lot of the money on it, more than one person needs to want it. And I'm the only one that's a sculptor. (Int. 4)

Clark's exploration and interest was not restricted to sculpting; however, he said he was "always the person that liked to take things apart and figure out how it works and put it back together" (Int. 1) and had helped his foster mom put up a pool and build an attic. In the makerspace, he helped assemble shelves and tackled other practical projects to serve his individual needs, most notably silk-screening a series of hand-stenciled T-shirts in bulk so that he might sell them (Figure 3).

> This [design] that I came up with . . . . I'm silk-screening it on shirts and putting a picture on the front, and then I'm going to be selling them at my organization that I work for. So that money will potentially be going back to the organization. (Clark, Int. 3)
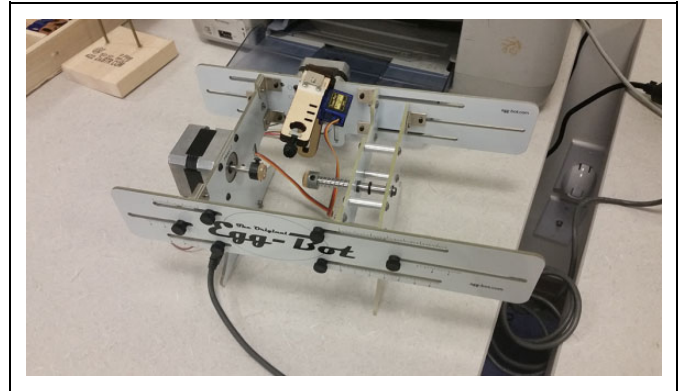

Figure 4. The egg bot.

The project took patience and diligence to design the stencils, painstakingly remove the inked areas, and silk screen T-shirts, something Clark had grown fond of at THF. It presented difficulties, however, and by the end, Clark had learned how to improve the process in the future:

> I have the two logos [done] . . . . My fingers started hurting and I gave up on [the others]. I'm going to still finish it . . . . I'm very mad though because there's another way of doing it that involves no cutting, you're just printing and then ironing it on. I'm so mad." (Int. 5)

The makerspace also provided Clark with the opportunity to use materials and tools he would not have thought to experiment with, such as an "egg bot" (see Figure 4) designed to draw on spherical surfaces and a spray that allowed him to transfer ink from a printout onto a surface like wood. "[Ink transfer is] really witchcraft! It's amazing" (Int. 2).

Clark's biggest hurdle to learning in the makerspace, however, was a tendency to start complex projects and stop before he could complete them:

> I'm just kind of a perfectionist with that stuff. I think I'm scared how it might come out. Because when I first started, everything was perfect, and then when I get on the sewing machine, it [messes up], and I'm like, "Whelp! Time for something else." (Int. 2)

At such times, staff attempted to encourage him to persist, with inconsistent results. In the case of the silk-screened T-shirts, Clark refused to give up despite challenges and sore fingers, insistent on meeting the practical goal he had in mind.

Maker community-member identity. Clark's identity as an artist was entangled with his sense of being a maker, but he expressed no distinct attachment to the maker community of practice. Making was, to him, about making something and being creative. "Everybody's creative in their own little way . . . . [In the makerspace] you can make jewelry or clothes—or [someone] made a chair . . . . Whatever you want to do" (Int. 4). He did not place clear boundaries between makers and nonmakers or identify a community to which makers

belonged; instead, he believed anyone qualified as a maker. "Well because if you think about it, like, everybody has made something, it doesn't matter what it is" (Int. 5). Clark's identity as a maker seemed to be a repackaging of his artist/sculptor identity rather than as a product of feeling that he was becoming part of a maker community of practice that included sculptors. When not prompted to talk specifically in terms of making, he described himself as a sculptor and was proud of his accomplishments as a sculptor:

> All of my sculptures I am very proud of, and I have an attachment with them, so when somebody's like, "Yeah, would you like to sell that? Pick a number." I'm like, "Oh, that would be amazing! But no." (Int. 1)

When questions were framed in terms of making, he said that being a sculptor made him a maker, he said, "Because you're making art" (Int. 2), and that, "Everybody who knows me personally and everybody who doesn't know me [would describe me as a maker], because I put a lot of stuff on my Instagram and Facebook and stuff like that" (Int. 5).

To Clark, the community and makerspace were important as a means of socializing, meeting individual needs, and having a creative outlet.

> I think [making is] important because it's a way for me to be creative.... This is reality, and I make stuff that's not a reality, so I make all these monsters and stuff and...it's just like, I'm going to make *this* and it's going to be *awesome*, and I'm going to need to make *this* with it so it can be awesome *with* it, but then I need to make *all of this*! (Int. 5)

For Clark, the makerspace's greatest asset was the "Sense of community; instead of everybody all crammed in their room and going about their day-to-day lives, there's actually something we can all do in there" (Int. 3). He assumed that he would lose access after finishing his 2 years with THF, however, since he intended to move out of the city. Resources available at the museum had caught Clark's imagination, however:

> I really want to build on a 3D printer.... If they had classes on how to work with that software on a 3D printer, you know how much stuff we could make? Let me tell you, I'd be on that thing every day. They're going to have to tell me, you know, that I'd have to start paying, because I'd be on it. I would. (Clark, Int. 6)

He hoped that in the future, guest makers might show him more about special effects makeup, how to make miniatures, and how to build ball-jointed dolls, a special kind of doll with joints that move more naturally than traditionally jointed dolls.

> [THF makerspace] is more open to...hearing what we want to do now. Before it was just like sewing and jewelry making, now it's sewing and jewelry making, crocheting, painting.... Next week I'm going to be making a house out of Popsicle sticks. (Int. 6)

Clark valued his practical projects, such as T-shirts to earn money for himself or his LGBT organization or a pallet bed for his dog, and enjoyed pride in his accomplishments: "I felt good, like I've achieved something that's going to make me money because I'm going to make a lot of [shirts] and then sell them" (Int. 5).

Case 3: Asa—20, Female, African American

Asa's narrative highlights a harmonious alignment between her interests, identities, goals, and opportunities through engagement with THF's makerspace. She was the most veteran in the makerspace, having been there since its inception almost a year prior to the start of the study. She was ambitious, had diverse interests, and was unafraid of hard work. At the start of the study, she worked at a security desk at a hospital and was not in school, but trying to get into school with the ultimate goal of going to an Ivy League school for sports medicine. She planned on becoming an orthopedic surgeon, as she was fascinated with the human body from an early age and loved sports.

> I had to wean myself off of doing a sport all day, every day, to become an adult.... I can't have a practice for three hours, I have homework and bills and stuff now.... [And] I'm actually a nerd. I don't admit it very often but it's true.... [So] I was like, "What profession is there that I can combine science and sports that's not overly analytical?" Because when you tend to analyze everything, it's overkill, and it's not as fun. And I really love interaction with people, understanding things, more than I do analyzing them...(Asa, Int. 4)

Asa also dreamed of becoming a professional performer:

> I would like to become the fat version of Beyoncé.... I feel we are just misrepresented. There's a lot of talent [in] the plus-size community, but we just get passed over because we're big and we don't conform to [society's standards]. (Int. 2)

She hoped being a successful performer would enable her to pay for medical school easier. She had been performing for 10 years in churches and showcases, and during the study, she increased her focus on recording music and taking hip-hop classes. She later got a second job working at a custard shop and planned on going to school in the fall. By the end of the study, her 2 years at THF were almost up and she was ready to move out. She planned on "getting an overnight job somewhere, hopefully, so that when I start school in August, I don't drive myself bat-crap crazy with trying to study and work and support myself at the same time" (Int. 6).

Maker community engagement. Asa's engagement with the maker community was one of steadily increasing and expanding involvement and connections. Known to be fond of arts and crafts practices among THF staff, Asa was one of the first residents that staff invited to the makerspace, participating frequently either socially or tackling projects of varying complexity.

Figure 5. Cake night and Asa's finished cake.

My makeshop journey began when [staff] approached me and said, "Hey we have this brand new idea, and it's called [a makerspace], and it's going to be here in the building a couple nights a week. I think it's something that you'd be interested in, because you are very interested in arts and crafts." So I was like, "Okay, that sounds so fun!" So, I decided to come . . . . I've actually been coming here since the program started. (Asa, Int. 2)

She quickly became a fixture in the makerspace, both as a maker and the center of attention, joking around with residents at a crowded table. Over time, staff recognized her, like Clark, as a valuable, talented, and responsible member of the makerspace. As a result, she was repeatedly invited to special events, like a museum showcase, sell her work at a fair, and talk about the importance of the makerspace to her in a video to be displayed at a museum gala. Through this experience, Asa was also able to network for her future plans in orthopedic surgery.

I actually had a chance to sit down and talk with the executive director of the [museum], and she's like, "Yeah, so I heard you want to be a surgeon. I think that's cool. So, basically, my neighbor is the second head in charge through [a university's] medical school. She's a surgeon, and . . . . I want her to be your mentor." And I was like, "When are we doing this?! When is this happening? I'm so excited!" (Asa, Int. 6)

Asa had fewer opportunities than some residents to benefit from the museum resources, specifically because of her age and a conflict with her schedule, "If there's [an adults-only event], I'm at work. And then for a while when I wasn't at work, I wasn't 21" (Int. 6). Nevertheless, when guest makers were invited to THF's makerspace, Asa took advantage of the opportunity to learn something new:

[Guest maker nights] make it just that much more fun, because sometimes I do have artistic block and they're like, "Oh but you can decorate a cake," and I'm like "Bro! I can decorate my cake and eat it, too." (Int. 6, see Figure 5)

She continued to return to the makerspace even after successfully transitioning out of THF.

Maker skills and knowledge. Asa drew readily on the inspiration, support, and knowledge of others to learn in THF's makerspace.

[Since the makerspace opened] it went from just a big boring community room to . . . . I think when we started there was probably me and maybe one or two other people that came consistently . . . . Now I would say probably sixty-five percent of the people, if they're not working . . . come, they enjoy it. It's like I can go in there, just look around, and get inspired by little dumb stuff. (Asa, Int. 4)

Like many other EEAs in the makerspace, she had come to THF with some experience with arts and crafts knowledge from family members and K–12 schooling but had found an interest in making from a young age:

I started at a young age. My grandmother, she used to have an old-school sewing machine, so I used to try and operate it at the age of four and poke myself with the needle . . . . I've always been pretty hands-on . . . . And I took a lot of art classes in high school and outside of school. (Asa, Int. 1)

In the makerspace, Asa experimented gleefully on guest maker days, took advantage of the space's practical use for making items she needed, and at other times, just took inspiration from the materials available or others' projects. Her projects varied from painting on a canvas she had built and stretched herself, to cake decorating, to making a dress for a performance. One project took the majority of the study to complete, a round Batman-logo pillow (Figure 6), and through a series of trial and error and the support of staff proved a valuable learning experience for Asa.

Figure 6. Asa's batman pillow.

It [was] my first time making a round pillow. Tracing [the logo], cutting it, and stitching it by hand was the easy part, but . . . it ended up [oval] because I don't know how to use a pattern . . . . I just sort of guesstimated. (Int. 3)

At times, she felt like giving up because the quality was not what she expected. "[The stuffing] didn't fit and it was really frustrating, and it was disheveled, and I was like, 'It looks like a fourth grader would have done this'" (Int. 3). She explained that staff supported her through her challenges: "From the beginning [the facilitator] was just like, 'You need to work on it.' And he was like, 'Do you need help tracing it? Let's trace it.' And he's just been very supportive" (Int. 3). In the end, she was proud of her accomplishments:

I can be a bit of a perfectionist, so when I had originally planned it . . . . I wanted it to look like I went to a furniture store and I found this diamond-in-the-rough Batman pillow . . . . That's how I initially thought it was going to come out . . . . I'm very happy with the end result, because . . . it was definitely a challenge and I didn't give up on it, and . . . it's still pretty presentable. (Asa, Int. 5)

Asa was particularly proud of a painting of a mother and child she called "Roots." To her, it was evidence of growth as a maker and artist and opened up possibilities of turning her interest into a means of making money:

The more I was looking at it, and I thought about it, I was like, "Yo, this is dope! I can't believe I just did this!" . . . . You can feel what the artist is portraying and I feel like for me, artistically speaking, it was a big step . . . . To be able to take what was in my brain and actually throw it on a canvas and actually have it turn out how I wanted it to . . . . I was going sell it but I was like, "I can't, it's the first one!" (Asa, Int. 5)

Maker community-member identity. Relationships and exposure to the maker community of practice were critical to Asa's development of an identity as a member of the maker community of practice. In addition to the affirmation of being invited

to speak at the museum gala through a video, staff encouraged Asa to consider selling things she made and viewed her as artistic. She was among the first residents to be told about the makerspace, as staff felt she would particularly enjoy it. Like Clark, Asa's definition of making focused on arts and crafts, but she felt it was open to interpretation.

At makeshop we make stuff. Arts, crafts, drawing painting . . . . You can make anything. It doesn't even depend on what you're making . . . . You don't even have to know what you're going to make to make something. (Int. 1)

She viewed herself as a maker: "I feel like my maker style reflects my personality, so it can be very rambunctious, it can be goofy and sporadic" (Int. 3).

Of the three EEAs, Asa was the only one to use language suggesting that that there was, in fact, a maker community somehow distinct from the outside world. Like Clark and Nadia, Asa believed that "everyone qualifies as a maker . . . . One person can be good at drawing or painting, another one can be good at sewing or coloring" (Int. 5). But she also acknowledged that "maker" was not a term in common use: "I feel like [people] wouldn't necessarily use the term 'maker' because I feel like the general public is not familiar with the term maker or what if vaguely describes what a maker is" (Int. 5). To her, being a part of the larger maker community was also integral both to learning more about making and to being herself.

You're an adult, but then let's say we going to [a maker faire] or something; I get to step outside of business, boring American 401k plans, and get to genuinely be myself and be around people who appreciate things the way I do . . . . You can resonate with people better. (Int. 5)

She described making as a community activity rather than a solitary one, despite infrequently collaborating on projects: "Just to be able to be a part of a group of people that come together and have separate ideas . . . then all come together collectively . . . is amazing" (Int. 2).

Asa believed engagement in making was valuable and important to her well-being and growth. She chatted in the makerspace about selling things she made online or in a shop and contemplated taking business classes when she returned to school. She valued any opportunity for self-expression, something she mentioned repeatedly throughout the months of the study, and from her first interview defined making as an opportunity for self-expression. "Making [is] being hands-on and free and expressing yourself" (Int. 1). In addition to supporting her self-expression and progression as an artist, she valued making for the opportunity to hone dexterity: " . . . Being a doctor, [you're] working with your hands, and when you're a doctor the body's your craft . . . " (Int. 2). She described how making as a practice supported her ability to persist as well:

I definitely learned patience because if you force things like [the batman pillow], you're going to get frustrated and you're not going

to want to finish it. I've learned that it is okay that when things seem overwhelming . . . to take a step back and . . . just get it done when you can, not when other people feel like it should be done. (Asa, Int. 3)

Asa also identified the maker community and its infrastructure as critical to her growth as a maker.

I want to go to [an adult making event] soon and be around adult makers, be like 'Oh so this is what the adult making world looks like' . . . . It just unlocks another level of making. (Int. 6)

The makerspace, in particular, provided her with valuable opportunities "[to] unlock your creativity, and to learn new things and try different things that you probably usually wouldn't be able to do or afford, because I know I can't afford a wood [burner] and that sort of stuff" (Int. 4). After successfully transitioning out of THF in the summer, Asa continued to visit the makerspace to socialize with friends and work on projects.

Discussion

EEAs face barriers to access and continued participation in college (Courtney et al., 2007), but the three cases of LPP (Lave & Wenger, 1991) presented in this study illustrate how access to a makerspace could provide alternative support. Despite similarities in their artistic interests and limited awareness of making, each engaged differently with the maker community, obtained different skills, and formed different kinds of identities. Only Nadia participated in the proffered internship, learning much in a short time, and then resigned when the possibility of self-sufficiency conflicted with her creative interests. Clark engaged more in creative pursuits outside the museum and THF making community than within it, believing the makerspace frustrating and ill-suited to supporting his interests in sculpting, but ultimately broadened his experiences with making through the space and had practical opportunities to develop as an entrepreneur. Asa's dreams expanded to include entrepreneurial aims after positive experiences with the maker community, while networking opportunities through the community bolstered her nonmaker goals. Through a comparison of their narratives, implications emerge for those seeking to study and support the development of EEAs through makerspaces, community organizations, and entrepreneurial experiences.

LPP

Maker community engagement. Community engagement is a critical component of learning through LPP, but connecting pathways between organizations can be a challenge for those seeking to support EEAs' engagement with a broader community of practice (Akiva, Kehoe, & Schunn, 2017). The design of this program supported the three EEAs' connections between the THF makerspace, museum, and other practitioners within the local maker community. Nadia, Clark, and Asa were all at a point in their life of directing their own learning pathways

without support from parents and teachers. They received alternative forms of support in that social workers who knew their interests encouraged them to attend museum events. Familiarity with the breadth of the community of practice meant that some, like Asa, recognized the need and opportunity to identify and participate in makerspaces outside of THF in the future. Means of navigating the community while THF were similarly valuable; without resources provided through THF like a free museum shuttle or bus pass, the cost of transporting themselves to other events may have prohibited participation. Additionally, barriers like age restrictions and work scheduling conflicts at times prevented all three from participating.

Maker skills and knowledge. Perhaps because of the variability within the maker community itself, participation in the skills and knowledge of the maker community of practice can look and be paced different for everyone without invalidating individual growth and experiences (Sheridan et al., 2014). Through training to become a teaching artist and an eagerness to try everything, Nadia experienced the breadth of making available at both THF and the museum, the latter of which mainly consisted of short-term projects that could be done with children. Clark had a different attitude toward exploration and came in with a different level of expertise but still found new interests through moments of newness and surprise and explored entrepreneurship with his intricate silk-screened T-shirt designs. Asa's breadth of exploration sat between the two, but she completed projects of varying levels of difficulty and duration, enabling her to develop different skills and competencies. Despite this variety of participation, each took away what they needed from their experiences while still progressing toward a new level of expertise.

Maker community-member identity. Engagement with the maker community of practice and learning the skills and knowledge of makers supports the development of a maker identity (Davies, 2018; Greenberg & Barton, 2017). The nature of participation and identities with which these EEAs entered the community, however, helped shape their unique maker identities. Through experiences at THF and the museum, the EEAs began to form understandings of the language and concepts around making, developed a sense of how they valued it and what it was for, and who existed "within" rather than "without" the maker community. Nadia, Clark, and Asa all talked about making as something "everyone" does, which is a core tenet of the maker community, as it is discussed in popular sources like Make Magazine. Nadia's exposure to making was primarily focused on teaching young children at the museum that anyone can be a maker. Clark's preexisting sculptor identity tied him more closely to the art community. Only Asa suggested that makers have a conscious, identifiable distinction from nonmakers when she described wanting to go to making events where she could be with like-minded people and be more "herself."

Other Key Findings

Although youth organizations often focus on developing interests and intrinsic motivation in children, supporting the learning of EEAs requires more attention to extrinsic motivators and the costs of their participation (see also Akiva, Cortina, & Smith, 2014; Wigfield 1994). In this study, the EEAs often had little free time to come to making sessions, might have to wait weeks for the materials they needed to arrive whether they could be ordered at all, and were less likely to complete projects without practical value. Fortunately, each also found opportunities for the makerspace to help them meet individual needs or goals, and all experimented with tools and materials they had never seen before, experiencing moments of triggered interest, the first phase in developing deeper interests in domains (Hidi & Renninger, 2006). Becoming self-sufficient is likewise of utmost importance to EEAs, and thus practicality and competing responsibilities are a constant factor in their ongoing engagement. For some, making presented an opportunity for addressing responsibilities and needs, such as Asa's plan to sell handmade items or Clark's plan to sell accessories for transgendered men. But for Nadia, there was not time or enough stability through the internship; therefore, despite strong intrinsic motivation, she was unable to maintain high levels of participation.

Learning research in makerspaces for youth often focuses on STEM educational makerspaces, emphasizing the importance of digital tools, competences, and technological interest (e.g., Bevan, 2017). But making is more than STEM; many makerspaces also value entrepreneurship, aesthetics, and creative work. Like youth in Sheridan and colleagues' (2014) comparison of three makerspaces, the EEAs in our study capitalized on opportunities to repair and make items that they needed or could support entrepreneurial aims. Asa, for example, indicated that opportunities for self-expression motivated her making, as they supported her needs and artistic development. Clark, though disappointed with the available materials, nevertheless returned to the makerspace frequently because it had the potential to address his needs to be creative and artistic.

Limitations and Future Directions

Our findings suggest that the impact and value of a maker program for vulnerable EEAs requires understanding of the needs and motivations of EEAs, and that, even with seemingly few resources, a makerspace can have a meaningful impact for this population. This study only captured a glimpse of EEAs' experiences in such an experience, however, raising questions like: What would have happened without social workers in the space? How would a program more closely targeted toward entrepreneurship or workforce development have benefitted them differently? What is the longitudinal impact of participation in a program like this for EEAs? What other developmental and psychological benefits are there for emerging adults with trauma or high levels of responsibility to participating in makerspaces? Such questions were beyond the scope of this exploration but merit future study.

This study bears practical implications for organizations seeking to support EEAs as well. Staff may find that supporting EEAs' learning is to be challenging when participation is voluntary and drop-in, resources are limited, and staff expertise does not capture the diverse range of learners' interests, challenges not unlike those other youth program leaders face (Larson & Walker, 2010). These were all challenges in this study, but the EEAs each developed positively through their experiences regardless of the program constraints. Work schedules and expenses of transportation can also diminish EEAs' abilities to partake in a program, particularly if the housing they must leave from and return to is in a high-crime and poor infrastructure area. Programs can take means of access into consideration. Finally, organizations seeking to support EEAs' development should consider EEAs' perception of the practical value of engagement in offered activities. Ultimately, EEAs are burgeoning adults with more responsibilities and pressures and fewer supports than other emerging adults but who, in this case, dreamed big and can accomplish much with a little support.

Author Contribution

R. Bonnette contributed to conception, design, and acquisition; drafted the manuscript; critically revised the manuscript; gave final approval; and agreed to be accountable for all aspects of work ensuring integrity and accuracy. K. Crowley contributed to conception, design, and interpretation; selected item; critically revised the manuscript; gave final approval; and agreed to be accountable for all aspects of work ensuring integrity and accuracy.

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