Becoming Facilitators of Creative Computing in Out-of-School Settings

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Abstract: Educators in informal learning environments are often called "facilitators" to highlight the role that they play in guiding youth interests rather than prescribing or directing their activities. This paper presents research on the development of adult facilitators in out-of-school programs that engage youth in creative computing experiences, where youth create, design, and build with technology. Facilitators are typically volunteers recruited from the local community, schools, and companies with varied backgrounds with youth, education, and technology. We examined the experiences of adult facilitators in an intergenerational learning program that supported youth and their parents to learn and create with technology. We describe three case studies of adults who developed multiple practices and roles and discuss what supported their development as facilitators. This study has implications for how informal learning organizations and programs can support facilitators from varied backgrounds to support diverse learners in creative computing.

Introduction

In the last decade, researchers, policymakers, and industry leaders have recognized the importance of supporting youth in learning to code, or creating and designing with computing, to become full and empowered participants in our increasingly digital society. Many efforts have emerged in out-of-school settings, such as after school clubs like CodeClub, international challenges like Technovation, and libraries like Ready to Code.

To support these experiences in informal learning spaces and to engage more diverse groups in computing, adult facilitators can play important roles in developing welcoming spaces that enable youth to learn with computing (Vossoughi, Escude, Kong, & Hooper, 2013). In this paper, we focus on the experiences of adult facilitators in out-of-school settings designed to engage youth in creative computing, or making, designing, and tinkering with computing. Adult facilitators may be students, professionals, or community volunteers. They might help for a few days or remain for a few years. Some might have extensive experience with computing as engineers or technology designers, while others might have limited experience. Some might have backgrounds as educators with experience working with youth, while others might have very little. Facilitators might range in age from teenagers to retirees. These adult facilitators are often recruited and trained by staff from informal learning organizations. With these varying backgrounds and circumstances, staff in informal learning spaces face challenges in supporting facilitators to develop the practices that can meaningfully engage diverse learners.

While many studies have examined the experiences of youth in these programs, relatively fewer studies have examined adult facilitators and what supports they need to facilitate empowering and enriching experiences for learners of many backgrounds, different interests, and vastly different expertise with technology. Past studies have primarily focused on the practices of facilitators, such as surfacing learners' interests, providing encouragement, guiding rather than directing, and deepening their engagement (Gutwill, Hido, and Sindorf, 2015). Other studies of adult caretakers such as parents and mentors highlight the different roles they can play such as teacher, collaborator, and learner (Barron, et al 2009; Nacu et al, 2016; Kafai et al., 2008). The identification of these roles and practices are important to help define what facilitators can do, but how do students, professionals, and volunteers learn to take on these roles?

In this paper, we take an initial step to more closely examine the development of adult facilitators and what supports their development of the practices and roles highlighted by these past studies. We present the experiences of facilitators participating in an intergenerational learning program called Family Creative Learning (Roque, 2016). Within this program, facilitators support kids and parents to create and learn together using creative technologies like the Scratch programming language. Facilitators were recruited from local universities, companies, and from the staff at a community organization hosting the workshops. Facilitators had mixed backgrounds as former classroom teachers, software developers, and community organizers.

Our analysis of facilitators' experiences builds on sociocultural frameworks of learning, where learning is embedded in shared activities and involves taking on a variety of practices and roles that change over time (Lave and Wenger, 1991; Rogoff, 1994). We ask (1) what kinds of roles did facilitators play as they engaged families in creating and learning with technology? (2) what supported facilitators in the development of these roles? We focus our study on facilitators in this family program, using collected ethnographic data to describe

facilitators' development. We argue that for facilitators to develop roles to effectively support learners, they must also engage in the process of learning themselves. The adults in our case studies were continually learning as they encountered challenges, responded to learners' interests and needs, and tried to support families.

Background

Educators in informal learning environments are often called "facilitators" to highlight the role that they play in guiding youth and supporting youth interests rather than prescribing or directing their activities (National Research Council, 2009). Supporting such learning experiences require facilitators to negotiate a variety of practices such as knowing when to step back and observe or when to intervene to provide encouragement and feedback. Studies of facilitators in spaces such as makerspaces and afterschool programs reveal the depth of their practices to spark interest, sustain engagement, and deepen learning trajectories (Gutwill et al., 2015).

> Facilitators must carefully balance offering enough support so that learners can actualize their ideas with maintaining enough distance so that learners truly drive the experience for themselves. Striking the right tenor can be challenging, forcing facilitators to question their own interactions constantly: Should I intervene yet or allow that girl to be frustrated for a few more seconds? (Gutwill et al., 2015, pg. 161)

Additionally, facilitators play critical roles in engaging non-dominant youth and supporting them to access new and emerging opportunities with technology (Barron, Gomez, Martin & Pinkard, 2014). Facilitators help to create an environment of intellectual and emotional safety and build on the "funds of knowledge" and "repertoires of practice" of learners (Vossoughi et al., 2013). Facilitators can play important roles positioning learners as creators, pushing back against narratives of being consumers of technology (Barron et al., 2014).

While facilitators enact important practices to support creative and inclusive learning experiences, facilitators themselves may not necessarily be professional educators with a background in supporting diverse youth to engage with digital opportunities. Staff at informal learning organizations may recruit local STEM professionals, students, and community volunteers with a variety of backgrounds and experiences with technology and education. Some facilitators may engage with an informal space for a few weeks to years.

Such varied backgrounds and participation patterns pose challenges for training and ongoing professional development. In a study of three makerspaces, Litts et al. (2015) described the challenges of makerspaces in equipping facilitators with the necessary skills and training. The disciplinary backgrounds and past experiences of facilitators tended to influence the moves and decisions they made as facilitators. For example, facilitators with a background building bikes might facilitate bike building activities. Those with backgrounds supporting physical making might lean towards supporting activities and trajectories in the physical realm — limiting learning opportunities with digital media.

Researchers of informal spaces emphasize the need to better understand how facilitators develop and what supports their development (McNamara, Akiva, Wardrip, & Brahms, 2016). This paper focuses on these questions in the context of a family learning program.

Facilitators in Family Creative Learning

In this paper, we explore the role of facilitators and what supports them to take on different roles within a community-based program called Family Creative Learning (FCL). FCL invites families to learn together using creative technologies (Roque, 2016). FCL has five workshops and are held in a community center once a week for two hours each. Each workshop is divided into four parts: Eat, Meet, Make, and Share. In Eat, families have a meal from a restaurant, allowing all families and facilitators to eat with each other. In Meet, facilitators check-in separately with parents and children to talk about their experiences in the workshops. In Make, parents and children engage in design activities with the Scratch programming environment and Makey Makey invention kit. In Share, families talk about their projects to other families and receive feedback and questions.

Unlike instructionist learning environments where there is a central instructor and pre-determined activities, the design of FCL draws on constructionist traditions of learning, which argue that people learn best when they are building things that are personally and socially meaningful (Papert, 1980; Kafai, 2006). Constructionism builds upon constructivist traditions that knowledge is not something that is transmitted or acquired, but something that is actively constructed through experience (Piaget, 1976). As people build projects, they build ideas. To be personally meaningful, the design of FCL invites families to build on their diverse "repertoires of practices" and "funds of knowledge" (Gutiérrez & Rogoff, 2003; Moll, Amanti, Nef & Gonzalez, 1992). To be socially meaningful, the design of FCL has also leveraged learning theories that emphasize the

social aspects of learning (Brown, Duguid, & Collins, 1989; Lave & Wenger, 1991). Families are encouraged to work together as well as interact with other families participating in FCL.

Prior to the workshops, facilitators met as a team to become familiar with the tools, activities, and facilitation. Both authors met with facilitators and highlighted the role they play in supporting families to engage in personally and socially meaningful experiences with computing. They shared the Family Creative Learning Facilitator Guide (Roque & Leggett, 2014), particularly the Facilitating Fundamentals, which included practices such as "build relationships and trust", "ask questions rather than giving answers," and "surface their interests." For example, to build relationships and trust, facilitators are encouraged to eat with families and focus on a few families rather than the whole room so that facilitators can form deeper connections with families. Additionally, the authors prepared some facilitation dilemmas for facilitators to discuss such as what to do if someone asks a challenging question or what to do if someone becomes frustrated with the making process.

During the workshops, facilitators supported the workshop implementation and worked with families to help them with their projects. Immediately after a workshop session, facilitators met to debrief for 30 minutes to discuss what went well, what questions they have, or things that could be improved or challenging interactions they witnessed. Between the workshops, the facilitators met again to consider their reflections from the previous workshops and to discuss changes or strategies to implement in the next workshop.

Studying the experiences of facilitators

Participants
In this paper, we focus on facilitators who participated in the design and implementation of FCL workshops conducted in the Spring of 2015 at a public housing community center in an urban community in the northeastern United States. Six facilitators facilitated and six families participated in the workshops (13 family members). Facilitators were recruited through local universities and through volunteers and staff from the participating community center. Two facilitators were graduate students pursuing a one-year, professional masters in education, one facilitator was an engineering undergraduate student, one facilitator was a software developer, and two facilitators were staff from the community center. Students were recruited by emailing students lists at two local universities. Facilitators' backgrounds with computer programming ranged from limited exposure to Scratch programming in a class to using programming as part of their educational and professional background. Facilitators were not paid to participate in the FCL workshops. Roque served as a facilitator during this program, while Jain served as a facilitator in past FCL programs.

Families were recruited from the community, with kids between 7 to 13 years old and parents between 35 to 82 years old. (We use parents loosely to mean any adult caretaker such as grandparents and family friends.) Five of the six parents were women. All parents were immigrants from countries in Latin America. All kids qualified for free/reduced lunch in school. All families created and shared a project at the final showcase.

Data collection and analysis
While the data in this study focuses on facilitators, this data is also part of a larger qualitative study using ethnographic and case study methods to examine the learning experiences of families within the context of computing (Roque, Lin, & Liuzzi, 2016). We used individual interview data to understand child and parent interactions and perceptions of facilitators. To understand the experiences of facilitators, we used multiple methods of data collection. During the workshops, we collected photo, audio, and video documentation of facilitator and family interactions. We audio-recorded, and later transcribed, team reflections after the workshops. Between workshops, facilitators wrote field notes to describe the experience from their perspective. We also documented team meetings, where we discussed plans for the next workshop based on reflections from the prior workshop. Three facilitators (the two staff members and the software developer) were unable to participate in writing field notes and meetings between workshops due to their work schedules. After the program ended, we conducted 60-90 minute semi-structured interviews with the six facilitators. Prior to the interviews, we asked facilitators to reflect on three to five moments that mattered to their experience. In addition to asking questions about these moments, such as why they chose them and what they took away from those moments, we asked them questions to surface their motivations, their facilitation challenges, and the strategies they developed. These multiple methods of data collection before, during, and after the program allowed us to triangulate their experiences as well as capture their development as facilitators over time.

We used grounded theory strategies (Charmaz, 2006) to uncover experiences of development or change by examining what facilitators did, how they interacted with families, and what they said about their experience. In particular, we examined the moments that facilitators identified in their interviews — moments where they learned, where they encountered a dilemma, or where they shifted their thinking. We then used field notes,

facilitation workshop debrief sessions, and audio and video documentation to further examine these particular moments of learning or change. We used roles identified by other studies of adult caretakers, such as teacher, collaborator, learner, and audience roles, and we used the grounded approach to uncover additional roles and practices (Barron et al., 2009; Nacu et al., 2014; Brahms & Crowley, 2016; Kafai et al., 2008). Both authors participated in data collection, transcription, coding, and analysis. We met weekly during a seven-month period to discuss data analysis, making sure that each analysis was approved by both team members.

Of the six facilitators, we focused on three facilitators to develop case studies to highlight the ways that facilitators took on varied roles and what supported them to take on these roles as they supported families. These three facilitators were selected to showcase different experiences of development, but they are no means representative of all facilitators. While we focus on these three, the other facilitators in the workshop are embedded in their experiences since the facilitators interacted in several ways throughout the workshop.

Results

In the following sections, we present three case studies of facilitators' experiences that reveal how they were able to shift roles, practices, and perspectives to support and guide families. We focus on their practices (e.g. sharing reflections, asking questions), their interactions with families (e.g. making suggestions, co-creating), and their perspectives on themselves and the families (e.g. feeling insecure about their expertise, seeing how open parents can be). We use pseudonyms to refer to the facilitators and families.

Maria: Developing a tinkering mindset

Maria, a former classroom teacher and graduate student at a local university, was looking forward to helping with the workshops. As a native Spanish speaker, she was especially interested in helping Spanish-speaking families. However, she worried how helpful she could be with her limited experience with computing.

During Workshop 1, Maria helped parents get started with Scratch, who were engaging in an activity to animate the letters of their name in Scratch. She helped one parent, Andres, who recently immigrated and primarily spoke Spanish. He was having trouble getting started because the activity handouts were in English. She showed him how to add letters, and after watching him add two letters, she continued walking around the room. When she came back, he proudly shared his project with Maria. She asked him what he wanted to do next. He mentioned that he wanted to add sounds because his nephew liked music. Maria pointed out the sound features in Scratch. During the debrief with other facilitators after the workshop, Maria shared how surprised she was to see how open the parents were to trying things out and being vulnerable to not knowing. Meanwhile, she shared her desire to continue improving her experience with Scratch.

During Workshop 2, Andres worked with another parent, Julia, and they called over Maria for help. They were trying to program their project to play a drum sound whenever the space key was pressed. Maria saw that their Scratch program looked correct and became puzzled as to why their project was not working. She called over another facilitator, Alex, who was a software developer and had past experience running Scratch camps. He also recognized their blocks, but wondered if the Scratch editor did not have the keyboard focus, which allows the Scratch editor to notice keypresses. He asked the two parents to click on the Scratch editor and after they pressed the spacebar again, the project worked. Soon after this interaction, they called on Maria again to help them make their sprites dance. Maria was unsure and she called on another facilitator to help. Maria felt frustrated that she could not immediately help the two parents.

Maria shared these feelings of frustration during the team debrief. Another facilitator, Pia, who had past experience facilitating Scratch workshops, responded, "I don't think you should feel that it's all on you [to know]... You don't have to know. What you have to focus on is modeling the tinkering and exploration and the experimenting. I think it's the attitude that's more important." In a post-workshop interview, Maria noted how Pia's comment changed her mindset and approach as a facilitator. She became less self-conscious and instead focused on showing participants how to go about realizing their ideas. When she was unsure, she would ask herself: "What could I do? Where could I go? Who could I ask?" rather than worrying about her lack of expertise. She added, "That's big for me because before that I was a teacher and a teacher always has to know."

Maria's experiences also shifted her notions of what it meant to be a teacher. Instead of being someone who "always has to know," she shifted her role to model how to tinker, experiment, and learn from challenges. Additionally, in her post-workshop interview, Maria noted that her perspectives on parents had shifted. When she was a teacher, her interactions with parents were often about homework and discipline. "For the first time, I connected with a parent. That never happened before for and that was powerful. They're so curious and full of joy. I never saw that side of parents before."

Maria's experience is not unlike many of the other new facilitators who had limited experience with computing. Through pre-workshop facilitation meetings, Maria gained some basic experience with Scratch. At the start of FCL, Maria took on a teacher role (which she was familiar with as a former classroom teacher) and she shared her expertise with Andres. However, as families continued to advance and their ideas became more complex, Maria's knowledge of Scratch reached its limits and she felt frustrated at her inability to fulfill her teacher role.

The facilitation team was an important resource for her to help her answer questions from families and to shift her role in the workshops. Maria pulled on different members of the team who had varying expertise with Scratch, such as Alex, to aid in her facilitation. Rather than being someone who had the expertise, Maria realized that what was important was her ability to model how to learn through tinkering and exploration as well as through pulling on different people in the room.

Sam: Helping them pursue their ideas

Sam, a former special education teacher and graduate student at a local university, had past experience helping his students learn with technologies, such as robots, construction kits, and virtual worlds. However, he had little experience working with families and looked forward to learning how he could engage parents and kids.

He met Julia and Eric, a mother and son, early in the workshop series, and noticed that both were shy and quiet. He sometimes had to lean in to hear them speak. However, once he sat down and engaged with them one-on-one, he learned that Eric liked building things, and had just started to play with a new computer that Julia got from participating in computer classes at their community center. When they began their family project, Sam watched Eric and Julia as they quietly discussed their project and Eric drew their project idea. Sam checked in with them and learned about their rollercoaster idea. However, it was near the end of Workshop 3 and Sam was concerned about what Julia's body language communicated:

> She was directing Eric more, and she would be like, "Do that." She was looking a lot at what [another family] Estella and Carlos were doing. And I don't think she was competing with them, but I think that she wanted to produce something that she was proud of. And they [Julia and Eric] definitely liked their idea. They wanted to make the roller coaster.

He watched as they tried to find a rollercoaster image through Google. After searching for some time, he stepped in and suggested drawing their rollercoaster on Scratch showing them the paint editor in Scratch. However, as they got started, he noticed they had trouble working the mouse, frequently right-clicking instead left-clicking. They were unable to make much progress and by the Share portion of the workshop, and he felt a low energy from them as they described what they tried to do.

In Workshop 4, Sam decided to work more closely with Julia and Eric, asking them questions about what they wanted to do next, and then showing them how they might accomplish it. He worried if he was "over-facilitating," providing too much guidance in their project process. However, Sam felt that they needed a bit more guidance than other families because they were still struggling with some computer basics like using the mouse. Sometimes Sam had to put his hand over Eric's hand on the mouse to help him. He shared his feelings about over-facilitation during the team debrief. Another facilitator, Alex, shared similar feelings, but because the young girl he was working with accidentally lost her project, he felt it was necessary to step in more directly. Alex sat with her as she tried to recreate her project.

During an extra workshop session before the community showcase, Sam shared an idea about adding "riders" and he modified a plastic cup with two googly eyes. Eric liked the idea and he and Julia each created their own. As he was watching them, Sam felt he had crossed into the over-facilitation and directed a part of their vision towards his ideas rather than theirs.

For Sam, it was a balancing act between his actions and ideas and Julia and Eric's actions and ideas. This constant tension has been highlighted in other studies of facilitators (Gutwill et al, 2015). If a facilitator provides too much guidance and direction, learners may miss opportunities for discovery and exploration. On the other hand, too little guidance may frustrate and discourage learners as they run into challenges. In Sam's experience, his practice of stepping in or out was informed by his close observation of Julia and Eric as well as critical reflection, on his own and with the facilitation team. Sam's observations and interpretations of these interactions mirror the practices of researchers who collect data, make interpretations, and ask new questions. Eleanor Duckworth in The Having of Wonderful Ideas (1987) highlighted how the teacher is like a researcher:

Just as a researcher's knowledge guides her further questioning and gives rise to the next problem she asks them to consider, so a teacher, convinced that he cannot put his own understanding into the learners' heads, uses that understanding to help the learners take their own thoughts further. (Duckworth, p. 162)

In a post-workshop series interview, Sam continued to reflect on his facilitation between workshops. During Workshop 3, he felt like he "under-facilitated," giving them too much space. He shared, "I wanted them to be proud of what they're doing and I wanted them to realize their vision, so if I maneuver them a little more effectively, I thought it would be a better overall experience for them." His uses of the words "over" and "under" highlight the continual balancing act of facilitators. As he continued to help them, he struggled with that balance. Through critical reflection on his experience as well as with other facilitators, he later came to understand an important question for him to assess if he was over-facilitating: whose ideas are being represented? To him, over-facilitation occurred when his ideas were incorporated rather than their ideas.

Alex: Building relationships with learners

Alex, a software developer, joined the facilitation team late and started at Workshop 2. When he was in college, he facilitated technology-based camps for middle and high school students. However, he was new to this community site as well as to engaging families with limited backgrounds in computing.

At dinner during Workshop 2, Alex sat with another family who came late to the series: a retired great-grandmother, Sarah, who came with her 10-year old great-granddaughter, Mariah. Sarah shared with Alex how she was here for Mariah since Mariah's mother could not attend. During Share, Sarah, who had limited mobility and moved with a walker, was unable to walk around each project. Facilitators including Alex noticed this challenge and discussed ways to better include and support Mariah in future workshops.

In Workshop 3, Alex noticed that Sarah came in with a cane. During dinner, Sarah shared with Alex that it was her first time not using her walker for 2.5 years because she felt comfortable that people would take care of her in this workshop. Her comment impressed him. He sat with them as they got started on their family project. Mariah sat forward as she worked on the laptop, while Sarah sat back watching Mariah and occasionally asking her questions. During team debrief, he shared Sarah's decision to use a cane with the rest of the facilitators during the debrief. Jorge, another facilitator who worked as staff at the community center, praised the team for helping Sarah feel a sense of physical safety.

In the next workshop, Mariah came alone as there was a miscommunication with Sarah about the workshop. Alex watched as Mariah signed into her Scratch account, she was unable to find her last project. Mariah seemed upset and Alex became anxious. He tried to reassure her that they could recreate it. Alex wondered how much he should guide her and remembered one of the FCL facilitating fundamentals was to "ask questions rather than give answers." He felt conflicted and checked in with another facilitator, who shared his anxiety. He decided to work closely with her so that she would not fall behind. As she shared ideas, Alex made suggestions for how they could implement it. Together they made a pool party with friends dancing to music by Beyoncé. Throughout the process, Alex made encouraging comments about her ideas.

Sarah attended the next workshop with Mariah. In addition to her cane, Sarah carried a large bag containing a blanket she knitted for Mariah's family. She proudly showed it off during dinner and again during the Parent Meet session. When the Make portion of the workshop started, Mariah opened their Scratch project, while Sarah took out her knitting needles and started to work on another blanket. Alex noticed immediately and was worried that Sarah might be disengaged for the remainder of the workshop. However, he knew from his earlier conversation with Sarah that she came to the workshops for Mariah — something that Sarah repeated to him multiple times. He sat next to them and asked Mariah to explain her project progress to Sarah. Once Mariah began describing the project, Sarah put down her knitting work and started making suggestions.

Case analysis

In a post-workshop interview, Alex shared how proud he felt in supporting Sarah and Mariah, particularly how he re-engaged Sarah when she brought out her knitting needles. He intervened, but without being intrusive by asking Mariah to describe the project as a way to bring Sarah in. He also discussed the feeling of being part of a family. He shared, "Having to be a part and not a part another family's dynamic [was new]. It's really interesting to see how that works and to understand my role in that when it comes to both the social and the technological aspects of it." Alex provided technical support when they needed it, but he also provided emotional and social support with his encouragement when they faced challenges.

In a study of families in a makerspace, Brahms and Crowley (2014) described the ways in which facilitators can become part of a family's learning dynamic and an important social resource. Brahms and

Crowley noted that as children engaged in making, they are not only building relationships with materials, but also with the people that support them. For Sarah, her relationships with facilitators helped her feel comfortable. For Alex, relationship building was an instrumental part of his development as a facilitator as it helped him know how to intervene and interact with families. In his past experiences helping with technology-based camps, Alex shared how their top priority was making sure kids were continually "doing stuff and being engaged." However, in these workshops, facilitators were encouraged to build relationships with families (which was one of the Facilitating Fundamentals). For example, through facilitators' dinner conversations with families, he learned about Mariah's interests and Sarah's main motivation, which was being present for Mariah.

Discussion

This research highlights the different possibilities for adults to engage in facilitation. There was not one role that defined a facilitator, but instead multiple entry points and pathways that built on facilitators' backgrounds and interests. Their experience was a process of becoming — shifting roles, perspectives, and practices within the shared activity of facilitating creative computing experiences (Lave & Wenger, 1992; Rogoff, 1994). Maria had a background as an educator with limited technology experience. Her role shifted to being a learner and her views of parents expanded to see them as joyful and curious learners. While Sam had some experiences teaching with technology, he continued to negotiate his level guidance and he learned what mattered: families' ideas. Alex, as a software developer, had technical experience to contribute, but learned the value of building relationships and connecting with families in his role as a facilitator.

We are also interested in what supported these adults to take on the responsibilities and practices of facilitation. First, the facilitation team became an important context for facilitators' development as they learned from one another in the shared activity of supporting families' learning (Lave & Wenger, 1991; Rogoff, 1994). Facilitators recognized and pulled on one another's strengths and complemented their varying backgrounds. For example, Maria connected with Alex to troubleshoot families' challenges with Scratch. Secondly, collective and critical reflection allowed facilitators to strategize around challenges as well as provide emotional support as facilitators confronted their different anxieties. Sam and Alex's discussions about over-facilitation helped them understand how to recognize if their actions crossed the line into over-facilitation or if their actions still aligned with their values of helping learners realize their ideas. Maria shared her insecurities around her technical expertise during team debrief and received feedback from other facilitators on how to shift her practice towards a tinkering mindset. This collective and critical reflection was supported by their personal field notes as well as team meetings between and after workshops, where they discussed close observations, asked questions, and provided suggestions. Finally, building relationships with families was important for facilitators to understand families' needs, interests, and motivations. This understanding informed their decisions as facilitators. For facilitators, eating dinner and connecting with families was just as important as working together on projects.

In these coding and making experiences with technology, staff at youth programs or other informal learning spaces might lean towards recruiting students, professionals, and other volunteers who have expertise with computing. However, these facilitators' trajectories highlight the variety of expertise needed to support families in a creative learning experience. Maria and Sam had backgrounds as former teachers and children with special needs. The community staff played important roles in helping facilitators understand the backgrounds of the different families. Additionally, these facilitators' experiences highlight what practices might be undervalued when we focus on STEM knowledge and expertise. For example, Maria felt anxiety about her limited experience with programming. However, facilitators highlighted the importance of modeling exploration and experimentation as well as providing encouragement and suggestions. These facilitation moves have also been highlighted in other studies of facilitators (Gutwill et al., 2015; Vossoughi et al., 2013).

This study is a first step in deepening our understanding of what supports facilitators to take on the many roles that they play to facilitate creative and inclusive learning environments in computing. We are interested to continue exploring what might support adults to carry out different facilitation practices, such as surfacing learners' interests or encouraging exploration and experimentation while facing different challenges. For example, we hope to explore some of the tensions that emerged in facilitators' experiences. How can facilitators help guide learners' exploration, development, and implementation of their ideas, while under the constraints of a workshop's time limits or other obstacles (e.g. lost projects or challenging collaborative dynamics)? The FCL environment created an interesting context to study the dynamics between facilitators and families and what facilitation strategies matter when supporting a family unit, each with its own dynamics and tensions between parents and their children. Future research could contribute to how facilitators support family dynamics in the context of creative computing experiences where different family members have different expertise and perspectives on computing. For some families, the role of an expert parent and novice child are reversed in the context of computing as children develop their expertise and confidence beyond their parents'

abilities (Correa, Straubhaar, Chen, and Spence, 2013). Additionally, we understand that not all informal learning contexts with creative computing have the level of engagement and structure like FCL, but we believe that calling out the different features of facilitators' experiences in FCL could be helpful to other settings, such as drop-in sessions in some museums and other learning environments (Brahms and Crowley, 2016). More research could focus on the development of facilitators in settings beyond workshops.

Often when out-of-school organizations onboard facilitators, the mindset is to "train" facilitators. However, our studies of facilitators' experiences and the roles that they enacted suggest, instead, to "facilitate the facilitators." We argue that learning environments should support a community of learning where facilitators also take on the role of learners — people who are learning to welcome, support, and guide diverse learners in designing, tinkering, and making with computing. In these case studies, facilitators were given many opportunities to support one another, to reflect and discuss their experiences, and to build relationships with workshop participants. These were valuable opportunities to allow them to become a facilitator. In her post-workshop interview, Maria wondered "Am I the right fit?" when she was recruited as a facilitator. She later learned through her experience that fitting in was not necessary because FCL was learning environment. "I became the right fit, and FCL became the right fit for me. It's a learning experience."

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