Connecting to the Physical Space through Funds of Knowledge: Lessons Learned from a STEM Summer Enrichment Program (Fundamental, Diversity)

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Perla Myers is Professor of Mathematics at the University of San Diego (USD), where she has been on the faculty since 1999. She earned her B.S. in Mathematics from the University of Houston, and her M.A. and Ph.D. in Mathematics from the University of California, San Diego. Perla is passionate about achieving equity in education and diversifying the Science, Technology, Engineering and Mathematics (STEM) fields, and believes that one step towards these goals is changing the reaction people have towards mathematics: She would like people to smile when they hear the word mathematics.

Dr. Myers works closely with students, colleagues and the community, as transformation is achieved through joint efforts, when students, families, future teachers, educators, leaders come together to create affirming experiences, delve into creative explorations, and empower each other to persevere, enhance their understanding, and reinforce the belief that they are capable. In collaboration with her students, colleagues and the community, Perla enjoys creating experiential opportunities in mathematics and STEAM

at USD and at K-12 schools locally and abroad, including summer camps, family nights, mathematics walks, teacher workshops, conferences, and other community events. Her most recent initiative, Project Mathigami, takes advantage of origami to explore mathematics with college students, educators, and K-12 students and their families.

Perla has been active with the Mathematical Association of America, is the liaison for the Association for Women in Mathematics to the Society for the Advancement of Chicanos and Native Americans in the Sciences (SACNAS), and is a proud life member of SACNAS. She co-organized Preparing Mathematicians to Educate Teachers (PMET) national workshops, and was co-PI on a California Mathematics and Science Partnership Grant for an Inquiry Learning Partnership with the Reuben H. Fleet Science Center and a couple local school districts. Perla is currently PI of an NSF grant to explore ways to help middle school students enhance their STEAM identity. and is PI of an NSF S-STEM grant to increase the number of college students in STEM. She received the University of San Diego's Women of Impact Award, the Innovations in Experiential Education Award, and the Mathematical Association of America Southern California-Nevada Section Award for Distinguished University Teaching of Mathematics.

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Abstract

The concept of funds of knowledge has been widely studied in different educational contexts. Funds of knowledge are described as the historically accumulated skills, experiences, practices, and ways of knowing that develop within a household for functioning and well-being. Sometimes these include the intellectual, communicative, emotional, resistance and even spiritual resources for learning that emerge from household and community practices. As a framework, funds of knowledge is important when trying to understand the learning processes occurring at home and communities that can be transferred into any learning environment (e.g., school, museum, library, after-school program). However, there has been little discussion on how immediate role models, such as STEM summer program facilitators, can engage in eliciting the funds of knowledge of summer enrichment program participants in order to make their experiences more enriching and culturally responsive. This pilot study sought to understand how STEM facilitators, also known as pod leaders in this study, understood "funds of knowledge" as a framework and utilized it as a tool to elicit and make the most of the funds of knowledge participants (middle school students) brought to a two-week STEM summer enrichment program. The study, which is a small piece of a much larger research endeavor, primarily relied on data collected from interviews with eight individual pod leaders. The results of this study indicated that elicitation strategies are sometimes hindered by programmatic features–primarily the time constraints and subsequent lack of time for reflection–of summer enrichment programs.

Introduction

The renewed focus in STEM education has led to the increased number of summer enrichment programs across the United States. These programs and other out of school experiences are intended to increase student awareness about and interest in STEM while bringing more students into STEM fields [1-4]. Particularly, this interest has been motivated by the need to increase the number of underrepresented students in STEM programs. The National Science Foundation, along with other national agencies, have discussed the importance of bringing more students with diverse backgrounds into STEM fields in order to encourage inclusion and close the achievement gap [5-8].

One way to attract students to STEM is through informal learning environments and experiences that "can kick-start and sustain long-term interests that involve sophisticated learning" [9]. Informal learning environments have become common due to different reasons. For example, these summer enrichment programs are seen as programs that "help" students become more interested in STEM, they target underrepresented students, and promote hands-on activities [1]. Studies have pointed at how STEM in these informal spaces have a significant impact on underrepresented students in terms of interest, motivation, and perceptions of STEM [1,2,10,11]. However, there are limited studies that explore the long-term impacts of these programs due primarily to time constraints (e.g., the length of the program). Furthermore, there is a dearth of

research focusing on the relationship between specific informal science learning activities and the progression from situational toward individual interest in STEM, especially among middle school students.

Unfortunately, even as the number of informal experiences for underrepresented students becomes more common, the master narrative continues to situate underrepresented students as lacking information and knowledge about STEM or higher education [12-15]. The perpetuation of deficit models continue to constrict the opportunities that students have in succeeding as future STEM leaders, even after participating in formal and informal STEM activities. Although there are immediate positive impacts of summer enrichment programs, long-term benefits can be improved when STEM experiences become more student-centered, focus on the assets of the students, and take into consideration their embodied knowledge. Embracing students' formation of engineering and scientific knowledge that is based on linguistic, cultural, and historically informed skills and practices as resources in new learning spaces can significantly enhance the long-term effects of STEM summer enrichment programs.

In an effort to investigate how summer enrichment program facilitators can become immediate agents of change by eliciting students' cultural and cognitive resources that derive from historical, cultural and social practices, also known as funds of knowledge [16,17], we sought to investigate how summer enrichment program facilitators conceptualize and elicit funds of knowledge to make the summer experience for the students more relevant and significant. Particularly, we focused on how the facilitators, hereinafter referred to as "pod leaders," perceived funds of knowledge and the value of asset-based practices in summer enrichment programs. This study is part of a larger project intended to explore new, evidence-based approaches to STEM learning in informal environments, and other related projects focusing on how STEM knowledge develops from cultural and social practices.

Funds of Knowledge Theoretical Framework

The public education system has relied on deficit models for instruction of students, particularly those of Mexican backgrounds [18]. These ideologies present low achievement as a result of various student inadequacies, such as lack of motivation, home learning experiences, parental support, and culture [19]. These views then create expectation and acceptance of lower achievements by low income and minority students [19], which in turn serves to further disenfranchise these student populations [20]. In order to better engage growing diverse student bodies in public education, theorists argue that cultural knowledge and resources that students from underrepresented backgrounds bring to the classroom should not be ignored [21]. This cultural knowledge, resources, and strategies for survival, as well as the recognition of communities and social networks as educational resources, is referred to as *funds of knowledge* [16-18,22]. A funds of knowledge approach to teaching can assist in countering deficit-based models [19,23], yet literature on using this approach to support summer enrichment program facilitators in STEM contexts (particularly engineering) is limited.

The concept of *funds of knowledge* (FoK) is used to describe the existing strategic, and cultural knowledge utilized primarily by Mexican/Latino people for survival and well-being of families/communities [16-18,22]. This concept also places communities and households as

spaces in which students gain valuable strengths and resources [16], which can be connected back to the classroom. Through lived experiences and social relations, households accumulate a variety of complex knowledge. This knowledge can range from managing the characteristics of a local ecosystem to ensure survival, to blacksmithing and mechanics for the maintenance of essential equipment [18]. Through an ethnographic design, Gonzalez and colleagues confirmed the notion that the more the subjects identify with a topic the more interest and motivation will exist [16]. Using a funds of knowledge theoretical grounding, summer enrichment program facilitators can then reflect on how to provide engaging strengths-based educational experiences for students [24]. A FoK approach is beneficial for underrepresented students since it serves as a counter-discourse to harmful deficit-based models by validating the existing knowledge that has been previously invalidated or neglected [23,24].

It is important to note that the concept of funds of knowledge is *not* prior knowledge. FoK includes the practices that inform the everyday lives and ways that communities operate, the cultural and social capital of communities that were previously considered to be resourceless, and the recognition of vast historical knowledge that exists in households [24]. Central to the understanding and formation of funds of knowledge is also the consideration of social networks since information grows and undergoes important transformations through interactions with family and non-family members alike [16]. Lastly, the recognition of existing students' funds is especially important, being that this existing knowledge helps them mediate the formalized theory and strategies regularly taught in schools.

Context of the Study

This pilot study sought to understand how STEM facilitators, also known as pod leaders in this study, understood "funds of knowledge" as a framework and utilized it as a tool to elicit and make the most out of the funds of knowledge participants brought to a two-week STEM summer enrichment program. Two core questions guided this pilot study: (1) How do pod leaders understand and utilize the framework of funds of knowledge? and (2) What strategies were used to elicit the STEM summer enrichment program participants' funds of knowledge?

The larger study described in this paper involved 16 pod leaders (8 undergraduate students, 5 graduate students, 3 in-service teachers) working with incoming sixth-graders from backgrounds underrepresented in STEM (primarily Latinx English Language Learners) for two weeks. All pod leaders came from underrepresented backgrounds in STEM (predominantly women and of Latinx or African American backgrounds). The STEM summer enrichment program was divided into two sessions, and served 39 and 38 participants during the first and second sessions, respectively.

Of the 77 students who were originally enrolled, 18 were English Language Learners, 23 were previously enrolled in bilingual education programs but had been reclassified as English proficient, 62 were eligible for free or reduced lunch, and 5 were in special education. Their average Smarter Balanced Assessment Consortium (SBAC) math achievement score in 4th grade was 2506 (21 points above the proficiency level 3-standard met). Their average SBAC English Language Arts achievement score in 4th grade was 2511 (38 points above the proficiency level 3-standard met). Before the beginning of the summer program, all the pod leaders received a

two-week training where they learned about the STEM summer enrichment program curriculum and how to facilitate the different activities included in the program. In addition, pod leaders received a brief introduction to the concept of funds of knowledge, applicability, and strategies to elicit funds of knowledge of summer enrichment program participants. The workshop was 2 hours long devoted to highlight strategies on how to elicit funds of knowledge, identify funds of knowledge, and use funds of knowledge to start conversations about STEM. For example, one activity focused on promoting trust and encouraging dialogue. The activity involved a series of categories (e.g., household, caregiving, friends and family, home language, etc.) and pod leaders were asked to identify their own funds of knowledge (in the form of anecdotes) in order to simulate ways in which they could potentially elicit and identify their students' funds of knowledge. For example, for the caregiving category, pod leaders were asked to write something about a time they went to their grandma's house and the grandma told them how to get rid of a cold. Then, the activity was followed by group discussions about the funds of knowledge they described, and how they used those funds of knowledge to mediate their own learning. This short-term format for the pod leader training mirrors the standard structure of professional development that pre-service and in-service teachers receive when learning about new pedagogies or pedagogical strategies.

STEM Summer Enrichment Program Curriculum

The summer program curriculum included (a) STEM hands-on activities focused on mathematics and engineering (including mathematical visualization, engineering design process through towers and chain reaction machines, explorations with arduinos and circuits, and mathematical thinking through folding), and (b) World of Work activities that centered on self- and career-exploration experiences (including career cards, games, virtual reality experiences, conversations with and presentations from STEM professionals). The first week of the summer program the students focused on introductory STEM activities and explorations and alignment of their current interests and abilities to career pathways leading to STEM. In the second week, these activities laid the foundation for students to engage in projects inspired by real-world scenarios. The second week also included a visit to a local historical landmark with connections to the Chicano community in the area where the students learned about history, arts, and STEM -related practices in the Chicano community. At the end of the summer program, students' families were invited to come to the university campus to learn about what their children experienced the last couple of weeks, to see the students' final collaborative projects, and to celebrate their accomplishments. For their final project, each group of 3 students selected one of the United Nations Goals for Sustainable Development (No Poverty, Zero Hunger, Good Health and Well-Being, Quality Education, Gender Equality, Clean Water and Sanitation, Affordable and Clean Energy, Decent Work and Economic Growth, Climate Action, Life Below Water, etc.).

Data Collection and Analysis

This pilot study relied primarily on data collected from interviews from 8 out of the initial 16 pod leaders. These interviews were conducted after the summer program concluded. The pod leaders were interviewed for 45 minutes on average and their responses to questions were audio-recorded and transcribed. The interview questions were framed to help pod leaders reflect on

how they elicited funds of knowledge, how funds of knowledge were reflected in the curriculum throughout the program, programmatic features that helped or hindered their ability to elicit and value funds of knowledge, and their perceptions of the program in general. Pod leaders were also asked to fill a short daily survey reflecting on their experience and the program implementation during the summer enrichment program. Two pod leader focus groups were conducted to understand the pod leaders' perceptions of the value of the program. The data was collected for the researchers to get a sense for how well the funds of knowledge training "stuck."

At the end of the data collection, authors Mejia, Popov and Rodriguez coded and analyzed the data following a deductive coding approach to qualitative research [25]. To begin analyzing the data, an open coding approach was used to identify shared meaningful themes among pod leaders. First, transcripts were read carefully to identify meaningful units of the pod leaders' responses to all interview, focus groups, and survey questions. Second, those selections of text addressing the same issue were grouped together in analytic categories and given tentative definitions. An instance of a theme usually consisted of a whole paragraph or a sentence. Codes were assigned to a text chunk of any size (usually a single response to an interview question), as long as that chunk represented an issue of relevance. The same unit of text could be included in more than one code. Third, the data were systematically reviewed to refine the coding scheme. The initial coding scheme was reviewed and refined through conversations among the authors. We applied dual criteria [26] for judging categories in terms of internal homogeneity and external heterogeneity, i.e., data pertaining to a theme must cohere together meaningfully, while the themes should be distinct from each other.

The results and analysis obtained from the data are presented in the following sections. These representative examples obtained from the data analysis focus on the salient themes that were descriptive of the whole data set. The data excerpts show similarities present across groups and provide a more descriptive interpretation of the data [27].

Results

The coded data revealed three main themes, as illustrated in Table 1. The first theme was the ***operationalization of funds of knowledge***. This theme encompasses the ways in which the pod leaders made sense and meaning of funds of knowledge. The pod leaders defined funds of knowledge, and made sense of them, based on previous experiences either from the summer enrichment program training or from other sources including teacher training, personal reading, or professional development. For instance, some of the pod leaders mentioned that funds of knowledge included "background knowledge," "different ways of learning," or "prior knowledge." However, a clear and more correct description of funds of knowledge was never materialized.

Nonetheless, the pod leaders acknowledged the value of funds of knowledge, or what they internalized as funds of knowledge, in educational spaces. Mariana, one of the pod leaders and in-service teacher, verbalized the importance of acknowledging that students bring a wealth of knowledge to the summer enrichment program by saying,

I think in terms of the students, they are all coming in not as blank slates. They are all bringing something already to the program…I think it is something good for us to be aware of because when they come in, then we can relate or at least be able to understand where they are coming from.

The pod leaders emphasized the significance of funds of knowledge to be able to not only connect with the students, but also to make connections between curriculum materials and their embodied knowledge. The pod leaders saw themselves as immediate mediators between both the formal and informal spaces. They also indicated that not many people talk about funds of knowledge or wove it into the conversation during the summer program, which made it difficult for them to reflect on how to elicit funds of knowledge or help students utilize them. Jessica, a middle school in-service teacher, mentioned that "funds of knowledge is tricky because people do not take the time to make connections." In fact, they all agreed that the time spent in the summer enrichment program was not enough to reflect, make connections or learn about the students' experiences, which made it even more difficult to operationalize funds of knowledge.

Table 1. Emergent themes and categories obtained from data analysis. The text in italics provides a description of each theme and category

Themes	**Categories**
Operationalization of FoK *how pod leaders made sense and meaning of the FoK phenomenon*	Understanding of funds of knowledge *how pod leaders defined, expressed, or demonstrated comprehension of FoK*
	Value of funds of knowledge *ways in which pod leaders expressed significance of FoK in educational spaces*
Scaffolding of FoK *programmatic features of summer enrichment program*	Program Structure *related to the characteristics of the program that hinder or facilitate the elicitation of FoK*
Transferability *individual ability to reflect on, transfer knowledge, skills and attitudes*	Elicitation strategies *strategies to identify, elicit, or utilize funds of knowledge*

The second theme was related to the pod leaders' perceptions of how the program allowed for the ***scaffolding of funds of knowledge***. Pod leaders identified the programmatic features of the summer enrichment program that either hindered or supported the elicitation of funds of knowledge. As indicated before, there was a consistent sentiment among pod leaders that the time spent on reflection was very limited due to the amount of activities that were included in the curriculum. In addition, the amount of time given to complete all activities every day made it a bit problematic for them to have conversations with students about their families, histories, cultures, or communities, which are the foundation of funds of knowledge. Nevertheless, pod leaders admitted that there were certain programmatic features that allowed, and encouraged, students in the summer enrichment program to connect with their funds of knowledge. For example, Adriana, another pod leader with a background in environmental science and current graduate student, highlighted the impact of the visit to the Chicano community not only for her students but also for herself. She said,

> *It was really, for me, really interesting and really powerful when we went to the Chicano Park. I think it's really good for the pod leaders to have a background information about the Chicano Park and have [conversations] together as pod leaders before leading the students, understanding why is that so important, how does this link directly to the students that we are talking with. Their families knew a lot about it. One of the moms is really -- wasn't really impressed we were taking them and she knew a lot of the history of it and had talked to their -- her daughter a lot of it. I think and I felt and I remember thinking -- I don't know that much. I think we should have discussed this in training before because this is something really important for them as a culture. That for me, like, is one specific example where we could have discussed a little bit more in deep something that is connected to them as a community.*

Although the time for reflection and discussion was limited during the program, the pod leaders recognized the importance of learning about the histories of their students and their communities. It was evident for the pod leaders that there was the potential to make the activities more meaningful for them if they would have had the opportunity to reflect more on the impact and value of funds of knowledge. Adriana also indicated that it was necessary to have "more casual talks" because the students have the "building blocks of connections."

The pod leaders indicated that they felt comfortable talking to students about their lives and tried to "open up" to them as a way to elicit funds of knowledge. However, they reported that there were limited opportunities to execute a more robust funds of knowledge approach during the summer enrichment program. For instance, it was hard for some of the pod leaders to come up with everyday life experiences that they could relate to the curriculum. Moreover, the pod leaders also believed that the master narrative that has promoted deficit models has also impacted how students make sense and value their own funds of knowledge. The impact, according to Adriana, affected how students responded to her attempts at eliciting funds of knowledge. She said,

> *They have such wonderful questions and I wish in that moment to have more time to just dig into it more. But for me, it was not just the tools or strategies of what to ask or what are the questions that will trigger them but when to ask them and practice it with*

students. I think it's an art to be able to take that from a student. I think it comes again also with the student having connection with us, with the leader, with the pod leader. Because I feel sometimes the students are really scared of, "What's the right answer, what is the answer? Is this a test? Why are you asking me this." And I'm like, "No. I'm just trying to know you more. There is no right or wrong answer"… I feel there is a big problem that the students…don't think they can bring anything to [the conversation].

Pod leaders indicated that when trying to elicit funds of knowledge through a series of questions, students interpreted the questioning as a way for the pod leader to look for "a particular answer." At the same time, they recognized that current school structures have created that exact same dynamic where the teacher is expected to receive a "right" answer from the students. In addition, these dynamics have generated obstacles for students by making students believe that they have nothing to contribute to STEM-related conversations. Thus, the pod leaders realized that the scaffolding of funds of knowledge in the summer program depended primarily on the capacity to execute funds of knowledge, the systemic and engrained normative discourses that have promoted deficit models in educational settings, and the limitations created from both internal (e.g., time, curriculum materials) and external (e.g., dominant discourses in school structures) factors.

The third theme involved the pod leaders' perception of their ***transferability***, or their ability to reflect on, identify, elicit, or utilize funds of knowledge across contexts. Almost two-thirds of those pod leaders were interviewed indicated that they felt unprepared or somewhat intimidated about implementing the funds of knowledge approach during the summer enrichment program. They indicated that, at times, it required a paradigm shift. For example, Adriana mentioned that she only had experience working as a teacher assistant with undergraduate or graduate students, and it made it difficult for her to think about funds of knowledge in a new setting with middle school students. The summer program gave her the opportunity to redefine how learning happens in a different setting. She realized,

I don't even have the background…For me, it was helpful to have, like, every moment kind of scripted out. It was a nice way for me training but I also sometimes didn't have enough practice employing funds of knowledge. It's something that it didn't go as planned. Sometimes like I don't know what to do and that I wish I had more experience and more training and being able to reach students and doing something out of what was planned, I guess. At that moment, I didn't have much experience.

In Adriana's case, transferability was impacted by her own perception of lack of preparation working with middle school students. Adriana also realized that the "teacher" is not the holder of all knowledge and that the teacher learns with the student during the process. The process of redefining mutual learning through student/teacher interactions thus required a paradigm shift. Other pod leaders indicated that stressing questions about power/oppression and social justice were very good ways to elicit funds of knowledge. Talking about problems in the community became a way to engage students in meaningful conversations related to STEM. Mariana, for example, mentioned that "students were more aware of pollution and other things around them in the real life, and they wanted to change that." Funds of knowledge became a vehicle to engage

students in conversations that made STEM more tangible for them and they were motivated to create change.

Moreover, the pod leaders were also aware that working with this type of framework required a good sense of self-awareness to not create a detrimental effect on the students. For example, Sara, an in-service elementary school teacher, expressed that when asking questions and utilizing funds of knowledge it is important to not impose onto the student your own personal beliefs and values, which can be interpreted as "the truth" by the students. She indicated that,

> *I think I have to be super careful and, like, that all about this is a unique person in front of me maybe we've had a similar experience but this is their story. This is not my story, so I can't project my feelings or attitudes or ideas on them in that moment but more of like try to facilitate their thought process by asking questions or rather than like assuming things or -- yeah, I don't know. That's kind of what I mean of being careful of not projecting my own bias or my own experiences or feeling towards something on them, the kids.*

Sara was aware that eliciting funds of knowledge requires the individual to be aware of the embodied knowledge of the student, and that projecting personal biases could influence the students' perception of what validated or not. Just because there is a commonality or shared experience, it does not mean that the pod leader can assume that the student will have the same reactions, or emotions toward that event. Sara's reflection highlights the importance of finding commonality but also respecting individuality, their experiences, the coloring, and perception of things and how individuals understand their surroundings.

Discussion

As indicated in the results section, understanding of funds of knowledge was primarily based on what was either (1) learned during the summer program training, or (2) learned through formal preparation in the form of professional development, teacher training, or graduate studies. However, there still existed a perception among pod leaders that funds of knowledge is the same as prior knowledge. It is important to make it clear that this continues to be a misconception among educators. Since our pod leader training was modeled after teacher professional development, in that a similar amount of time was given for pod leaders to learn about and implement a funds of knowledge framework, it follows that similar misconceptions developed among pod leaders. Prior knowledge and funds of knowledge come from different epistemologies. Funds of knowledge are communal and historic, and grounded on the idea that human behavior is shaped by the limits and possibilities created by social relations [16,24]. Prior knowledge, on the other hand, involves a cognitive process that influences conceptual learning [28,29]. Funds of knowledge takes into consideration the material conditions of the individual, cultural practices, and the resources used for the survival and well-being of the household.

Although the perception that funds of knowledge is the same as prior knowledge persisted among pod leaders, they were able to acknowledge that funds of knowledge have familial, cultural, historical and community components. Pod leaders also acknowledged that funds of knowledge could become a vehicle for students to relate familiar things to STEM concepts that

are learned in the classroom. As Sara pointed out, "it is the process of meeting the students where they are" and not about imposing onto the students a curriculum that does not reflect the students stories or lived realities.

Although there was some appreciation for funds of knowledge as a framework, the pod leaders had a difficult time eliciting and utilizing students' funds of knowledge to engage students in the STEM summer enrichment program due to some constraints. Overall, time and curriculum materials were the main constraints. For example, the program included several activities that did not allow for time to reflect on how to make meaningful connections to students' everyday life experiences on the spot. In addition, there were internal and external factors that prevented pod leaders from elaborating on their ability to elicit funds of knowledge. Internally, a common view amongst the interviewed pod leaders was the inability to identify ways to make connections between students' funds of knowledge and the content of the summer program, which could have been due to the pod leaders' lack of understanding of the framework itself. Furthermore, meaningful elicitation of FoK is also a highly demanding task. Pod leaders were required to monitor and facilitate a multitude of student activities that occur at a rapid pace. Maintaining an overview of student activities is highly challenging due to so called 'orchestration load', i.e., "the process of productively coordinating supportive interventions across multiple learning activities occurring at multiple social levels" [30]. These findings will be used to better inform the structure and content of both the pod leader training and the structure of the summer enrichment program itself, in an effort to remove the barriers identified by the pod leaders.

Some of the program features that provided better opportunities for the pod leaders to elicit funds of knowledge included hands on activities (e.g., building chain reaction machines, origami activities), visits to the Chicano community, bringing guest speakers to the summer enrichment program , and talking to parents during the final days of the summer enrichment program or when they picked up the students from the program. Particularly, the visit to the Chicano community allowed for a better understanding of the context in which the students lived and how their everyday life experiences influenced their decision and meaning-making practices. It also provided an opportunity for the students to talk to their parents about how STEM in the community was enacted. As one of the pod leaders indicated that the visit allowed the students to connect funds of knowledge to "the physical space," which made it more tangible and meaningful for the students.

Conclusion

This pilot study sheds light on how STEM summer enrichment programs can become more culturally relevant for underrepresented students. The pod leaders in the study were aware of the value of identifying and exploring the funds of knowledge of students. Pod leaders also indicated that there were differential societal norms that impacted how children and educators value funds of knowledge, primarily in the form of deficit models. Although the pod leaders were highly conscious and sensitive to the role of funds of knowledge, they mentioned that connecting this knowledge to the physical spaces and formal classroom practices was challenging due to different factors. The results from this study provide some direction on how to help develop reflective educators and STEM enrichment program facilitators that can engage in practices that are truly transformative in K-12 engineering education. . Our findings point to the particular

structures that must be in place to support the implementation of such a transformative framework as funds of knowledge and may have implications for more formal educational settings. Documenting these experiences has the potential to provide a better understanding of how to engage in the scholarship of activism that leads to shifts from deficit models toward more asset-based approaches.

Pod leaders needed to be aware constantly of students' engagement and anticipate possible connections between students' unique life experiences and curriculum/learning episode to make informed decisions about how to support student learning. Externally, there were time constraints and lack of explicit strategies that created limited options for the pod leaders to utilize funds of knowledge in meaningful ways - just in time, just for you, just enough. Given facilitators' crucial role in enabling students to find relevance in the material, it is important to support facilitators so that they feel confident and competent to engage students in the sense- and meaning making processes with the help of FoK approach. Therefore, there is a need for more extensive training on the application of FoK to equip pod leaders with the actionable knowledge, skills and attitudes.

While much emphasis in STEM education has been placed on cultivating interest in STEM fields, more work still needs to be done to understand the dwindling retention rates of underrepresented students. One of the major factors that affect new and experienced teachers and summer program facilitators is the lack of a more situated understanding of STEM as it relates to students everyday experiences. One of the goals of this project and corresponding future work is to identify best practices and programmatic features that could help teachers and summer program facilitators identify, enact and develop culturally responsive practices grounded in asset-based approaches in STEM.

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