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Teachers Navigating Educational Systems: Reflections on the Value of Funds of Knowledge (Fundamental)

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Abstract

This study focuses on how, after a series of professional development interventions and co-collaboration sessions, a group of teachers conceptualized funds of knowledge as an approach and a framework for engaging students in engineering activities. Teachers were asked to design a unit that would elicit students' funds of knowledge as they worked on activities that integrated the engineering design process. Throughout the project, we collected data from interviews, observations and field notes. The results showed that teachers acknowledged the significance of funds of knowledge as a tool for empowering and engaging students in STEAM related activities. Teachers noted that recognizing students' backgrounds was the foundation for students to see themselves as leaders, engineers and scientists. We observed that several teachers had been integrating funds of knowledge into their teaching without sometimes being aware of it. However, there were certain institutional barriers that prevented its full implementation in the curriculum. These results indicate that although teachers see the significance of funds of knowledge in engineering, the teachers and teaching practices are still embedded in a deficit-oriented educational structure that may prevent some of these changes from occurring.

Introduction

With the emergence of the Next Generation Science Standards [1], middle school teachers have been called to integrate engineering into their classes. However, there has been little discussion on how middle school teachers can be supported to effectively adopt instructional practices that combine both asset-based approaches and engineering concepts. There are several challenges that emanate from this problem. For example, the nature of the materials available to teachers may impact their level of confidence when adopting new approaches to teaching engineering [2, 3]. There is also no instructional model to guide teachers when planning and implementing engineering lessons. Although some engineering activities for middle school students have been developed, these usually separate language and content, and do not acknowledge the lived realities of students; thus, creating a cultural divide. If that cultural divide is to be closed, it is important to not just provide content knowledge, but approach teaching in a more holistic way that includes recognizing students and communities as holders and creators of knowledge. It is by bringing these asset-based perspectives that we can work with teachers to create more culturally responsive engineering education.

Prior research has shown that teachers use curriculum materials to design instruction [4, 5], rather than exploring active inquiry-based forms of learning. In its landmark report, *Education for Life and Work in the 21st Century*, the National Research Council [6] advocated for deeper learning, or the process by which an individual takes what was learned in one situation to another. "Through deeper learning, the individual develops expertise in a particular domain of

knowledge and/or performance" [6, p. 5]. This process involves transferring content knowledge in a domain and "knowledge of how, why and when to apply this knowledge to answer questions and solve problems" [6, p. 6].

Approaches to learning can entail very different strategies than the traditional lecture-based forms of instruction [7]. Yet, approaches to teaching engineering have been characterized by industrial-era schooling strategies where rote memorization and individual mastery of content becomes the norm [8]. As Coburn and Russell [9] state, "implementing ambitious instructional approaches requires more than sharing information; it requires that teachers learn new things: about the curriculum itself, about instructional strategies, and about student learning" (p. 6). Thus, teachers need access to expertise -- access that is facilitated through both formal and informal interactions or experienced individuals [10]. This expertise becomes a resource for collaborative reflection and planning in communities of inquiry [11]. We posit that active forms of learning, enacted by teachers, when deliberately related to students' personal experiences and grounded in *deeper learning* strategies are vital for achieving transformation in practice.

In this paper, we describe how a group of eighth teachers at a STEAM-focused middle school understood and elicited students' funds of knowledge in an effort to bring an asset-based approach to the classroom. This research contributes to the ongoing efforts to establish a more culturally responsive educational environment for students that have been negatively impacted by a discriminative school system that has a history of neglecting minoritized groups of society.

Funds of knowledge and teaching

The concept of funds of knowledge (FoK) was initially used to describe the existing strategic and cultural resources utilized primarily by Mexican American families along the U.S.-Mexico border for survival and well-being [12]. Velez-Ibañez & Greenberg [12] argued that, historically, Mexican American families responded to their economic, environmental, and social landscape by generating a comprehensive repertoire of skills and knowledge. For instance, living in the Southwest means that many of these families lived in remote areas with no access to doctors and were sometimes denied medical attention or not having the economic means to afford medical services costs or just for being Mexican Americans. This situation led families to constantly rely on home remedies or folk medicine to survive [12]. In other instances, Mexican American families had to manipulate their surrounding environment to access the resources that were not present in the arid Southwest region of the U.S. That meant families had to master their knowledge related to "environment, water management, flood control, and climate variations" [12, p. 317] to produce the crops they needed to secure food at their table and their own subsistence.

Scholars have asserted that funds of knowledge is a multilayered counter-discourse to the damaging conceptualizations of minoritized children, their families, households and communities [17]. Extensive research was eventually done to challenge deficit-oriented ideologies about minoritized Mexican American children in the Southwest U.S. [13, 14]. Funds of knowledge in educational contexts was framed as an asset-based approach that looks into

the assets of students while challenging deficit notions [13-17]. As indicated by Rodriguez [15], the funds of knowledge framework was intended to engage teachers in an inquiry process "to learn more about (and from) their students' home lives as a means to better connect the knowledge production occurring within the school to that occurring beyond the school" (p. 89). The intended goal of this work was to also resist the engrained idea that low-income, immigrant students and their families are more likely to fail due to their perceived natural *inadequacies* emerging from their social and cultural backgrounds.

The funds of knowledge framework did not lead directly into curricular units or materials, but in a set of teaching and learning practices that were meant to recognize the forms of knowledge that are typically not understood or valued in formal school settings. Also, it is important to note the intentionality of this framework in not framing culture as being static. The funds of knowledge project sought to shift from the traditional "notions of 'culture' as a unifying construct" to seeing culture and forms of knowledge as evolving, organic, and dynamic [15, p. 90]. This new conceptualization of "culture" as a different construct was a paradigmatic shift from what was the norm at the time when funds of knowledge was initially presented [15, 17]. "Such distinctions in analytical approaches further resisted simplistic, dismissive, and essentialist treatments of the diverse communities (and their household practices) with whom educators work" [15, p. 90].

The present study was designed to develop teachers' understanding of funds of knowledge, the role that it can play in the teaching of engineering at the middle school level and integrate language and STEAM content. It has been documented that professional development plans are important for teachers to learn how knowing about students' funds of knowledge can help them to connect to the learning processes at school [15]. This study takes as its point of departure the understanding that funds of knowledge are crucial for the transformation of beliefs and attitudes toward science [13, 14], and the importance of asset-based approaches to challenge teachers' deficit perspectives - or the idea that home inadequacy impedes students from learning STEAM content. A well-documented body of knowledge on the structure, content, and outcomes of effective professional learning suggests a number of characteristics of programs that provide high-quality, high-impact learning opportunities for teachers [18, 19]. Desimone [18] argues that "there is a research consensus on the main features of professional development that have been associated with changes in knowledge, practice, and, to a lesser extent, student achievement" (p. 183). These features include: (1) a focus on subject matter content and how students learn that content; (2) opportunities for teachers to engage in active learning; (3) coherence, which includes consistency with both teacher knowledge and beliefs, and school, district, and state policies; (4) sufficient duration, in terms of number of hours and span of time; and (5) collective participation. The *larger context of this study sought to* address each of these five features using a research design that presents problem solving through iterative stages of practice and reflection [20]. In this paper, we report on what was observed regarding teachers' conceptualization of funds of knowledge, perceived barriers when implementing this approach, and the importance this approach could have on their students.

Context of the Study

Eight teachers were recruited for participation in this study. The teachers come from a STEAM-focused middle school in the southwest U.S. - Mexico border. The school is classified as a Title I school, where approximately 88% of the students qualify for free or reduced lunch. The student population is primarily Latinx (98%) and about 45% of the students are classified as English Language Learners/Emergent Bilinguals. A large number of students are considered transnationals and several of them cross the U.S. - Mexico border on a regular basis to attend school.

The teachers included in this paper, which is part of a larger study, came from different educational backgrounds and all of them considered themselves to be bilingual (English/Spanish). The goal was to recruit a group of middle school teachers that could work together as an interdisciplinary group. The group of teachers who participated in this study included three science teachers, one English teacher, one Spanish teacher, two social studies teachers and one mathematics teacher. There were two male teachers and six female teachers. Table 1 shows the demographics of the teachers recruited to participate in this study (pseudonyms are used to indicate the names of participants). In addition, their classes were delivered either through bilingual or dual language modes. We were interested in an interdisciplinary group of teachers in an effort to allow teachers to explore how engineering could be integrated throughout the curriculum.

Table 1. Demographics of participating teachers

Participant	Grade Taught	Subject Area
Pedro	8th	Science
Arturo	8th	Social Studies
Martha	8th	Science
Rosario	7th	Science
Martha	7th	Mathematics
Maria	7th	English
Laura	7th	Spanish
Graciela	7th	Social Studies

The number of students varied depending on the classes they were placed into. The largest classes were in the bilingual program, where their home language (in this case, primarily Spanish) was promoted. Most classes had 20 to 30 students, although there were some exceptions such as the Spanish Language classes, which had less than 20 students. The teachers taught at the 7th or 8th grade level and teaching assignments changed every year.

Besides their teaching, teachers also fulfilled other roles such as being the advisors for the robotics team, the technology club, the recycling program, or coordinating the school-wide STEAM challenges.

Methodology

The teachers received more than 25 hours of professional development over two consecutive summers. During these sessions, teachers had an opportunity to learn more about the engineering design process, funds of knowledge, and language and STEAM content integration. These sessions were facilitated by members of the research team, whose expertise includes engineering education, bilingual education, and the learning sciences. The teachers also had an opportunity to work together, co-create activities, and interact with members of the research team. After the summer sessions, teachers had monthly check-ins with the research team to talk more about the activities they developed and the ways in which the research team could support them. The overall goal of these meetings was to create a community that relied mostly on collaboration and knowledge co-construction.

As indicated previously, the results presented in this paper are part of a larger study [Blinded]. Data were collected through interviews, group meetings, observations and field notes. The data presented in this paper comes primarily from interviews and group meetings conducted with the teachers over a period of two years. The interviews were approximately 30 to 45 minutes long and were audio recorded and transcribed. We were guided by the following questions: (1) What are the teachers' attitudes and beliefs toward the use of a funds of knowledge approach to teaching? and (2) How and in what ways does a teacher's understanding of funds of knowledge support their teaching of STEAM? By approach to teaching, we mean the ways in which teachers utilize different strategies or tools in their classroom to communicate and convey curricular material to students. In this case, we were interested in analyzing how teachers integrated funds of knowledge into their teaching to allow students to see themselves reflected in the curriculum. Each teacher was interviewed using an interview protocol intended to determine their understanding of the concept of funds of knowledge, the challenges that these activities presented, and the strategies they thought would be important to use to elicit funds of knowledge. They also shared their understanding of the engineering design process and the perceived obstacles or challenges faced throughout the project.

After the data was collected, Authors 1 and 2 coded and analyzed the data following a deductive coding approach [21]. Initially, the data was coded using a combination of open coding and descriptive coding, which included reading line by line and assigning short descriptive phrases or words to sentences and paragraphs. Emerging codes were aggregated to create a coding scheme. Our coding scheme included 40 codes, which were then synthesized given a definition, and refined through conversations among coders. The emerging data was then organized into salient themes, where a dual criteria approach [22] was used to ensure that there was both internal homogeneity and external heterogeneity. That is, the data was organized in a way that allowed the researchers to identify themes that cohered meaningfully while being distinct from other salient themes. The major themes that were

identified included funds of knowledge, classroom culture, and institutional barriers. What we referred to funds of knowledge is how teachers conceptualize its meaning, the ways in which they acknowledged them in the classroom, and how they apply the concept to their teaching. Classroom culture encompassed the strategies that teachers used to establish a welcoming learning environment, and how this influenced the enactment of funds of knowledge. The last theme included teachers' perceived barriers to developing activities around funds of knowledge, and even integrating language into STEAM activities. Some of the perceived barriers included lack of time and support from the school in terms of materials, and interdisciplinary spaces where teachers could meet and exchange ideas. Analytical memoing was also employed co-currently with the coding process [21]. These memos helped further analyze the data and write the final paper. The findings are presented in the following section.

Findings

Teachers' beliefs about implementing funds of knowledge into teaching

For this study, we asked eight teachers about their beliefs regarding the implementation of funds of knowledge into teaching. The majority of teachers stated that implementing funds of knowledge into their classrooms helped students understand the material better because they could draw from their personal experiences, and as a result, their academic performance could be better. For instance, Maria responded that understanding students' funds of knowledge and integrating them into the material facilitated their learning. The following excerpt from one of Maria's interviews highlights why she thought funds of knowledge was beneficial,

> I think that understanding students' funds of knowledge it's very important because sometimes they can't relate to what we're learning. Let's say I tried to read Romeo and Juliet to them. They would completely shut off because they can't relate to something so foreign. But if you tie it into something that's going on-- imagine you live here in [U.S. border city] and you meet somebody in Mexico, and then you tie that in. You could kind of draw them in, especially because they're so young. So you have to really get their attention and get their buy-in.

Based on this excerpt, there was the perception that understanding students' funds of knowledge, their trajectories and the context in which they navigate different social and cultural spaces, was important for making the subject matter more personable and interesting for them. This perspective was supported by Arturo, he stated that "bringing funds of knowledge into teaching, whether it's making connections, relating it to students, would make the classroom content more accessible to them."

Similarly, Rosario responded that "the more relevant the material is, and the more connected to a student, the more they want to care about it or the more they can care about it, and understand it." As these statements indicate, there was the perception that implementing funds of knowledge into teaching helped students connect more and thus understand the subject matter. These statements also suggest that teachers recognize the importance of

acknowledging and understanding students' funds of knowledge in order to make the material more personable for students. Additionally, some teachers expressed that students' performance improved because of that connection to their life experiences. For instance, Rosario commented that "I've definitely seen an increase in the students' performance. They're caring about being successful at what we are doing because they understand that there is a connection to their life." As she stated, students' performance increased because they can relate to the material at a deeper and more meaningful level.

The role of teachers in establishing a classroom culture

"Classroom culture," or a welcoming classroom environment, was a salient theme in our data that was related to the enactment of funds of knowledge. We defined classroom culture as a safe environment based on mutual respect and understanding where students are encouraged to take ownership of their learning, and where they feel comfortable participating in classroom discussions. Establishing a classroom culture was important for the enactment of funds of knowledge because it encouraged students to share their personal experiences and access their funds of knowledge. For instance, we asked teachers how they were able to identify those moments when students would access their funds of knowledge. Maria responded that "it's usually during classroom discussion, when we open it up to the whole class, and I ask them to share out" these moments were depicted in our conversation with Jessica. She commented that,

> "[...] This rocket project that we've been working on, there was a kid that told me all about how he went to the Jet Propulsion Laboratory and saw [...] different space hubs. And the Apollo spacecraft was there. And he used that when he was trying to think of how he was going to design his rocket [...].

In this excerpt, Jessica talks about one of the students drawing from his own experience visiting a laboratory, which may have gone unnoticed if not mentioned by the student, to design his own rocket. The student reflected on his experience and connected that moment to the classroom subject to help him design his rocket. Jessica commented that "he had some understanding and experiences already with what a spacecraft would look like or rockets, [he] drew on that."

Following up on her comment, we asked her if she could provide more instances when students would access their funds of knowledge, and how she was able to recognize those moments. To which she responded that it is through "little instances" when students are sharing an anecdote and is evident that "they are accessing something" For instance, she mentioned that,

> [For example], with this rocket project, before I told them that we're going to use an air compressor to launch the rocket, they were already thinking of [...] propelling and stuff. They were like, "Oh, I saw a YouTube video where you can mix Coke and Mentos and shake it. And that'll make it explode and go psh." Or another kid [...], "Oh, I know if you mix baking soda and vinegar, [...] produces a gas or something. And that can shoot the rocket up." It's like little things like that, I know that was also from [...] earlier experiences that they had.

In this conversation, Jessica depicts some of these “little instances” when students are recounting earlier experiences that they had while connecting them with the material. She mentioned that students were already thinking of ways to propel a rocket. They remembered moments of their lives when they learned about creating chemical reactions that would help launch an object to the sky. Based on these comments, we concluded that students would access their funds of knowledge through sharing experiences, and it was important for them to feel comfortable sharing those experiences. This is why establishing a classroom culture facilitated the enactment of funds of knowledge.

Findings also indicated that teachers have a major role in the establishment of this classroom culture because they may encourage or discourage students’ engagement with the material. For instance, when the teacher is not able to recognize the connection that the students are making between their anecdotes and the material. It may lead to the teacher discarding their comments as irrelevant to the classroom discussion thus discouraging further participation from the students. This is what happened to Ms. Laura when she was a student, she shared with us that,

> I think we as teachers have to really make an effort to listen [to students]. To listen and to embed [their experiences] into the curriculum. And tell them that it’s okay [...]. That whatever they bring into the classroom is full of rich ideas, [...] concepts, and [...] experiences that can enrich the classroom. I mean, I remember when I was going to [...] high school, a lot of my teachers said, “Oh no, no, no, no. That doesn’t have to do with the class. That’s not pertaining to the class.” So I mean, I think that’s why we need to make an effort to acknowledge that.

In this excerpt, Laura depicts one of these situations where the teacher simply discarded her comments as irrelevant to the classroom discussion, and she comments on the importance of teachers to make an effort to acknowledge that students possess a wealth of knowledge that can enrich the classroom. Based on this, we think that teachers should act as facilitators and help transfer students’ funds of knowledge to the material. This idea was reinforced when Jessica explained that sometimes students would draw from everyday experiences that may not have an obvious connection to the subject matter. But she would still acknowledge those experiences as relevant and ask her students to expand on their initial thoughts to try and dig deeper into what it is that students are trying to convey. For instance, in the case of the rocket project mentioned earlier, she commented that some students shared that they were shooting off rockets for the Fourth of July. She stated that they were drawing on these experiences, but they needed more guidance to help them extract that knowledge they had acquired from shooting off those rockets and then connecting that to the project. She would ask questions such as “what would you say would be happening or how does this relate to a rocket? What would you use to propel that firework? What was the initial course of action?” These types of actions facilitated the transfer of knowledge and it also reinforced students’ confidence that their comments and ideas can enrich the classroom discussion. This also supports Pedro’s previous comments that funds of knowledge can help in deconstructing deficit perspectives, and that “it’s

the teacher's role to help them process that knowledge" based on this we believe that teachers have a major role in the establishment of a classroom culture.

Implementing funds of knowledge into STEAM

A major part of this research was understanding teachers' perceptions about the implementation of funds of knowledge into STEAM. We asked them how funds of knowledge can help students feel more comfortable talking about or doing STEAM related activities. Their responses were very similar to the ones discussed previously. For instance, Rosario commented that bringing funds of knowledge into STEAM related topics made students feel comfortable engaging in discussions because they were designed around topics students were more familiar with. She stated that "we are building more on what they already know, they can bring more ideas from the things they have done." During the same conversation she provided an instance when students would take on more active roles. She commented that,

> They feel really comfortable talking about [science]. It's just like having them learn about science and see what they're interested in [...] they feel more comfortable talking about one topic because they know more about that topic. For example, I have students that they're laying compost in their houses. So they were talking to other students about how to do it [...]. And I like that because they bring that knowledge and they help other students.

In this excerpt, Rosario described a situation where students were the experts on the subject, and shared their knowledge with other students. She indicated that one of the benefits of teaching topics students are interested in is that they "feel more comfortable talking" about that topic, and sometimes they are able to bring their knowledge from home and share it with other students. Additionally, in our interview with Rosario, she responded that bringing funds of knowledge into STEAM related subjects "it definitely makes them more comfortable because ideas are more attainable, they are more connected to things that they already know." This representative statement made by Rosario aligned with what other teachers mentioned throughout the interviews. Teachers' perceptions regarding funds of knowledge in STEAM were similar to what they expressed with its integration into different subjects (besides STEAM).

Additionally, some teachers believed that funds of knowledge could help in deconstructing deficit perspectives. This was emphasized by Pedro who stated that "funds of knowledge is important because it helps to break that idea that students don't know anything." Pedro also expressed that students do come to the classroom with a great amount of knowledge. They are exposed to a wealth of information outside of school, and as he stated "it's the teacher's role to help them process that knowledge and have them realize that the knowledge that they carry, that they have, is valuable" Ultimately, these two statements suggest that teachers acknowledged that funds of knowledge not only serve as a tool for designing strategies to make the classroom content more accessible but it can also be utilized as a tool to initiate conversations about STEAM and see themselves reflected in the curriculum.

Perceived barriers to implementing asset-based practices

Despite the fact that teachers acknowledged the value of funds of knowledge, they recognized barriers that prevented them from fully committing to their beliefs regarding funds of knowledge. Teachers expressed that there was a lack of time that prevented them from fully engaging in developing activities that drew from students' funds of knowledge, and even integrating language into STEAM activities. This lack of time was related to teaching engineering design, incorporating funds of knowledge, and working on their units. Teachers conceptualized this lack of time in various ways. We found two major categories: (1) lack of time due to workload, and (2) lack of time due to the established structure. Meaning the curriculums, norms, and other regulations that teachers had to follow.

When it came to perceived workload, we asked teachers to rate on a scale from 1 to 10 their design of lesson plans that incorporated funds of knowledge. All participants rated themselves between a range of 5 to 7, and one of the reasons they provided was that there was not enough time to cover everything they had to do. For example, Arturo mentioned that "we are always trying to figure out how we can build time into what we do. [...] the willingness is there [but there are] time constraints." Expanding on this, Jessica provided more context into what this lack of time entailed, she mentioned that "I teach three different subjects and all the hats that I wear … like sometimes, I'm just in that survival mode where it is like, I got to get this out there, I got to." Based on her comments, Jessica conceptualized this lack of time in terms of her workload, and this limited the time she was able to spend creating lessons that would focus on funds of knowledge. Additionally, some teachers managed several groups or classrooms, where there is a large number of students per classroom (sometimes more than 30 students), which limited the time spent in activities and meaningful discussions because teachers were rushing to get through the curriculum. For instance, Rosario stated that the time available to engage with each individual student was limited because there were six groups and a curriculum that all groups had to cover. She shared the following reflection when asked about how she would rate herself on a scale from 1 to 10 on how she felt about implementing asset-based approaches in the classroom:

> I think I would give myself a strong six. And I think one of the reasons why I have a lot more improvement to do is - and we talked about this in the past - because of the time limit that I have with the kids. The discussion for each individual student or with each [...] group [about] bringing their funds of knowledge isn't as big of a discussion as I would like because sometimes it's just rushing to get from point A to point B. And I put a lot more of the load on students because there's only one me and there's -- let's say we have six groups, for example.

As indicated by Rosario, the number of classrooms or groups she managed, plus the curriculum limited the time she was able to spend with each individual student and asked about their funds of knowledge. This also resonates with what Jessica mentioned earlier, and how she feels in "survival mode" as she is rushing to get the work done.

Another challenge indicated by teachers was that they were being pulled in different directions. The school had gone through several changes and teachers took on more responsibilities to support the students. Jessica, for example, mentioned that investing more time in developing activities also meant leaving some of her other responsibilities. This created a sense of uncertainty and internal conflict, which she described by saying,

> I think it's just-- so one of my biggest challenges is that I teach three different subjects. I'm [the] coordinator. I am the webmaster. I am an advisor to like three different clubs. So being pulled in all these different directions doesn't allow me to devote all my energy and resources into focusing on a super well-constructed lesson. Not the lesson that I would like to-- it's good. It's a good lesson, but it's not a great lesson. And I think that if I had the time and the resources and everything to be able to create a good lesson, you would see even more student engagement because I would've had the time to think about like, "Oh, how am I going to get the kids to explore this concept or apply it to the project," or what have you.

Regarding the second category - perceived barriers emerging from institutional constraints -, we asked teachers what affected their ability to incorporate the concept of funds of knowledge. Graciela stated that they have to follow a pacing guide that reduces the amount of time they have available to incorporate new activities or cover subjects more in depth, she mentioned that,

> [...] there's a pacing guide we have to follow [...]. So sometimes even if I want to go more into a topic, I can't because [...] we have to move on. That's [what] I feel [...] that is going to challenge me the most. And maybe planning. [...] because you want to plan something that has structure too.

As indicated in this excerpt, teachers were positioned by the school in ways that did not allow for the flexibility needed to implement an asset-based approach. For example, teachers sometimes felt that aligning to the structure provided by the standards and the curriculum made it difficult to create new materials that connected language, funds of knowledge, or engineering thinking. The teachers also mentioned that they need to follow certain guidelines, including state-mandated standards, that may complicate how implementation of a funds of knowledge approach is done - or even possible - in their STEAM classes.

In addition, teachers mentioned the pressure that is sometimes placed on them when it comes to juggling with testing, advising, standards, and the time to do it all. Although all teachers acknowledged that a funds of knowledge approach was important, and the value that it brings to the classroom experience, they felt conflicted with trying to make changes when their perception was that it would be difficult to challenge institutional norms. Rosario reflected on these issues during one of the interviews saying,

> I feel like asking more questions too, more activities where they can create things. And I feel, especially with that-- the thing is, I would love to change things next semester. It's

> not my decision though. And the nutrition topic, I think it's important for them to learn about that. But it takes a long time for us to teach that. And then we have to use the rest of the semester, only three months, maybe less, to talk about the other standards that we need to incorporate. So more activity [...] and more chances for them to create things and more activities. But again, I do like [to do that]. I like it to be shorter so that we can actually talk about the standards. There are standards that we have to go over. And maybe that way, we'll have more time for those activities that I think are important for students to not only connect their previous knowledge but also to keep that in their heads not to forget about.

As indicated by Rosario, she was interested in creating something more relevant for the students but in the back of her mind the standards were a priority given that it was something mandated by the school and the state. Interestingly, the unit on nutrition was not part of the standards, so there may have been more flexibility than it was acknowledged by some of the teachers. Nonetheless, we recognized that time constraints were important and sometimes teachers prioritized some things over others because they felt a lot of pressure.

Discussion

The findings indicated that teachers valued funds of knowledge and highlighted how this approach could be used to empower students to take ownership of their own learning. Teachers also reflected on the importance of drawing from their own funds of knowledge to create a welcoming classroom culture where students are seen as holders and creators of knowledge [23]. Nonetheless, there were several factors identified by the teachers that prevented them from fully implementing this approach to their STEAM classes. One of these factors is the perceived notion of time constraints. As indicated earlier, teachers felt they were being pulled in different directions and that compartmentalization prevented them from spending time in their lesson planning. The pressure to cover all standards was also perceived as an important factor that made teachers continue to teach their material without changing it. Additionally, some teachers expressed that the amount of time available was limited by their teaching load, meaning the many groups they teach, and the number of students in each group, which prevented them from spending too much time in discussions and soliciting funds of knowledge from students because they prioritize covering the established curriculum.

The perceived curriculum barrier, or the perception that curriculum is very strict and static, is not uncommon and has been described by others. High-stakes testing has become a contested issue in public education since the No Child Left Behind Act of 2001, and has led to many unintended consequences [24] even after it was replaced years later by other policies. As the teachers mentioned in their interviews, high-stakes testing takes priority when it comes to curriculum. These decisions, in turn, perpetuate the idea that there is no room for culturally responsive education in classrooms when high-stakes testing is prioritized [25]. Thus, it is important that teachers think in broader terms about how rather than narrowing the curriculum, it can be expanded to include asset-based pedagogies that align with standards.

We identified that empowering and establishing rapport with students was important for creating a classroom culture, and that teachers capitalized on their backgrounds to empower and establish rapport with them. We defined background as important life events in a teacher's trajectory that may range from having migrated to the United States at a young age; having learned English as a second language; having grown up in the same community as their students; having attended the same school district where they work; having commuted from Mexico to the U.S. for school. For example, Pedro stated that he shares "so many similarities" with his students, and he tries to share those similarities to empower them. In this example he draws from his trajectory as an English Learner and how "he had to learn it" to encourage his Emergent Bilinguals to do their best. These connections led to really good relationships with his students which, and as Pedro stated, "it allows them to also open up." Based on this observation, we noted that there is a reciprocal relationship where the teacher opens up and the student does the same to create that classroom environment. We experienced this interaction firsthand during a classroom visit to Pedro's lecture. It was a bilingual class with approximately 15 students from which the majority have had transnational educational experiences, in other words, they had studied in a different education system (in this case Mexico) before moving to the United States.

There were also transborder students who commuted from Mexico to school [26, 27]. We were surprised to learn about these trajectories because students are usually hesitant to share that they live in Mexico due to the stigmas and administrative barriers that it may entail. Students shared that moving to the United States helped them negotiate between educational and economic systems. For instance, students were highly aware of the differences in materials, infrastructures and teaching methods between Mexico and the United States. They were also aware that moving to the United States granted them the opportunity for social mobility and access to higher education. For instance, one student mentioned that "*una carrera es mejor en Estados Unidos*" (obtaining a degree in the United States is better). The reason why students thought it was better was because they pay better, and they pay in dollars compared to Mexican pesos. These realizations meant that students understood economic systems, sociopolitical contexts, and they were capable of adapting and negotiating between cultural and educational systems. One instance of this cultural negotiation was language, where some students mentioned that they were hesitant before moving to the United States because they were afraid they were not going to be able to communicate. They also thought that English was the only language spoken at school, but they were surprised and happy to learn that the school had a bilingual program, which they have been using to their advantage because it helps them develop their linguistic skills in English. Students were open to sharing these experiences because Pedro had made a welcoming classroom environment, and this was evident in the way he listened and approached students.

Funds of knowledge were initially intended to challenge deficit perspectives of teachers [13, 17, 28, 29], which is something this project sought to do. While teachers highlighted the importance of funds of knowledge during meetings and interviews, it was noted that detaching from these deficit perspectives can be very difficult. In addition, emphasizing standardization took priority for most of the teachers. Since teachers are expected to show that students perform at a certain

level, they prioritize “teaching to the standards” and that may create the idea that it is not possible to bridge home knowledge and classroom content. In addition, some of the teachers talked about acknowledging the linguistic practices of students in the classroom while at the same time correcting students when they started to speak Spanglish. There was also a differentiation between the “good Spanish” and the “bad Spanish,” which contradicts what the teachers mentioned initially about appreciating linguistic practices of students. Other instances where these contradictions were observed was when teachers mentioned that creating a welcoming classroom environment was important while at the same time mentioning that sometimes what students shared in the classroom made the conversations “less academic.” Thus, teachers continued to create a hierarchical order for the knowledge that was valued in the classroom, which contradicts what a funds of knowledge approach is supposed to do [13, 14, 17]. It is important to mention that these contradictions are not coming from a place of ill intent, but rather teachers trying to come to terms with the dominant discourses that are constantly present in education. Sometimes teachers found themselves correcting themselves after some of these comments were made, thus alluding to the process the teachers were going through as they sought to explore more about their students, the community, and themselves. Research related to these contradictions related to perceived significance of funds of knowledge and falling back into deficit perspectives will continue to be analyzed for the larger context of the study. Nonetheless, we believe it is important to mention these contradictions and recognize that coming to terms with the value of funds of knowledge is a long process that requires involvement, reflection, and criticality. This process indicates that there needs to be the space for teachers to continue to have these conversations, in addition to more opportunities to connect content with knowledge emerging from the household so that they can more openly (i.e., without feeling bound by school policies and culture) challenge deficit perspectives.

Conclusion

This paper explained how a group of eight teachers at a STEAM-focused middle school understood and elicited students’ funds of knowledge to bring responsible asset-based approaches to the classroom. Teachers recognized the significance of incorporating funds of knowledge into their teaching of STEAM focused subjects. Some participants stated that this approach facilitated students’ learning, and that it could improve their academic performance. They stated that it made the content more accessible because students were able to relate to the subject matter. Students were encouraged to draw from their personal experiences and in this way, they took ownership of their own learning, as Rosario commented, “the more relevant the material is, and the more connected to a student, the more they want to care about it or the more they can care about it, and understand it.” Funds of knowledge helped teachers acknowledge and recognize that students are exposed to a wealth of knowledge outside the classroom, and that they carry this knowledge with them. Consequently, the role of the teacher is to facilitate access to this knowledge and use it as a way to bridge lived experiences with classroom content through classroom discussion. Thus, teachers played a major role in the enactment of funds of knowledge because they could encourage or discourage students’ engagement with the material. Establishing a classroom culture was important for this very reason because it provided a safe learning environment based on mutual respect and

understanding. This welcoming classroom environment encouraged students to actively participate, and acknowledge that their comments and contributions are meaningful. The results showed that teachers create a classroom culture by establishing rapport with students. Teachers also draw from their own funds of knowledge and backgrounds to establish said rapport with students.

Most of the students in the teachers' classrooms belong to historically marginalized groups, the majority were English Learners, first-generation and second-generation migrants. Teachers drew from these experiences to connect with their students, some of which shared similar characteristics and life trajectories. However, despite teachers' positive perceptions regarding funds of knowledge there were barriers that prevented them from fully committing to their beliefs. Teachers identified that there were instructional barriers, and time constraints that limited the time they were able to engage in creating meaningful learning experiences for their students. The major constraint was the "lack of time" which was conceptualized in two different ways: (1) lack of time due to workload and other responsibilities; (2) lack of time due to the established structure (state and district rules, curriculums, and standards) that teachers have to follow. During our debriefings, teachers mentioned the need for further guidance, and a time that was described as interdisciplinary where all teachers could come together and share experiences, ideas, and support each other in the creation of new materials. It is important that schools consider these needs, and provide the space for teachers to come together and collaborate. In addition, it is important to nurture a culture within the school to support teachers who want to bring these asset-based practices into the classroom. While standards need to be addressed, we must (re)frame how teachers are positioned by the school, how they position themselves as teachers, and how these two factors are in agreement (or disagreement) with each other. Teachers must be allowed to continue to develop their own identity as teachers and uncover the ways in which they can do asset-based work as we continue to support them through that process. It is this process that could help alleviate some of the institutional challenges the teachers in this study identified, which prevented them from fully implementing changes they considered important to empower their students.

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