Using Interviews to Identify the Resources of Multilingual High School Students

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Abstract

The resources that multilingual students bring to school mathematics are often ignored. During a teacher-researcher collaborative project focused on creating more equitable learning environments in high school math classrooms, we noted an initial tendency to focus on the challenges and barriers facing multilingual students. To counter this tendency, we worked with two teachers to engage in a structured teacher-student interview to identify and highlight secondary multilingual students' home and community resources. We adapted a module from TeachMath to guide the activity and facilitated surveys, debriefs and teacher-research conversations to unpack this experience. After the interview, the two secondary mathematics teachers reported they were more familiar with their students' resources in the areas of language, family, school/mathematics class and out of school activities. We close by discussing how other teachers might do this activity in their local context.

Discussion And Reflection Enhancement (DARE) Pre-Reading Questions

Think of one of your multilingual students who is classified as an English Learner.

1. Write down what you know about this multilingual student beyond the fact that they are classified as an English Learner.

2. Make two lists: one of what you think are the student's *resources* and one of their *challenges* related to learning math.

3. How can you learn more about this student's resources, particularly their interests and knowledge base? How would knowing about the student's resources help you teach this student mathematics better?

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Megan D'Errico and William Zahner

Emergent multilingual students who are labeled English Learners[1] (ELs) are often denied access to high quality learning experiences in secondary mathematics (Kanno & Kangas, 2014; Mosqueda & Maldonado, 2013). Many multilingual high school students are relegated to mathematics classes where learning activities focus on practicing routine skills and procedures, and little attention is given to conceptual development (e.g., Zahner, 2015; de Araujo, 2017). We know from prior research that multilingual learners can engage in classroom mathematical discussions and can benefit from participating in conceptually-focused discussions of important mathematics concepts (e.g., Turner et al., 2013). Yet, at the high school level, few studies have investigated how to create mathematics learning environments in which multilingual students can similarly benefit from discussions. In order to transform the realities of tracking and the overemphasis of procedurally-focused mathematics lessons for multilingual learners at the high school level, we are working with ninth grade teachers to develop conceptually-focused activities and lessons that create opportunities for multilingual ninth graders to participate in classroom discussions.

In an early phase of our project, we interviewed the participating teachers and examined tasks from their curriculum. In these task-based interviews we asked the teachers to identify both the *challenges* multilingual students might face in working on the problems and the *resources* these students might draw upon to meet these challenges (Zahner et al., 2018a). However, while analyzing the interviews, we noted that our conversation usually focused on students' challenges. Reflecting on these early data, we wondered if we were unintentionally reinforcing deficit framing of multilingual students in the project. This reflection led us to seek resources to help our teacher collaborators—and ourselves—identify and highlight the cultural and linguistic resources of multilingual students.

One avenue for such work is to identify students' Funds of Knowledge (FoK; González, Andrade, Civil, & Moll, 2001). While several projects have examined multilingual mathematics learners' funds of knowledge at the elementary level, few studies have addressed this topic at the secondary level, possibly because there are relatively fewer students who are classified as ELs in high school than elementary school. For example, in California, 25% of students in grades K-5 are classified as ELs in 2019-20, while only 11% of students in grades 9-12 were classified as ELs (California Department of Education, 2020). Nonetheless, given patterns of disparate educational outcomes for students classified as ELs in high school, there is an equity imperative to meet the needs of multilingual secondary students.

In what follows, we introduce a student interview activity that we (both the researchers and collaborating teachers) did to identify student resources. First, we set the stage with background research and the context in which the activity took place. Then we describe the interviews that two participating teachers did with their students. We also describe how we (as collaborating researchers) collected data to understand what the teachers reported learning. We close by discussing how other teachers might do this activity in their local context.

Background Research

The educational potential of identifying and building on linguistically diverse students' everyday resources was described by Civil and colleagues (Civil, 2002; Civil & Andrade, 2002; González, Andrade, Civil, & Moll, 2001) who designed mathematics activities to incorporate students' Funds of Knowledge (FoK) in elementary

[1] We use the term "English learners" when describing the label that the state uses for multilingual students who are learning the language of teaching and learning. However, we and many educators who work closely with students who are classified as ELs, find this term problematic because it highlights what students lack, rather than the resources multilingual students bring to school. Therefore, throughout this paper we use "multilingual students" to describe students and "ELs" only when talking about student classification from the school system.

mathematics classrooms (González, Moll, & Amanti, 2005). FoK is defined as "historically accumulated bodies of knowledge and skills essential for household functioning and well-being" (González, Andrade, Civil, & Moll, 2001, p. 116). Civil's work illustrated how teachers can build on FoK in school mathematics, and recent research has extended Civil's work by highlighting the multiple ways Latinx parents support their childrens' mathematics learning in home life (Williams et al., 2020). Teacher educators have built upon and extended this work by developing a series of activities called TeachMath for prospective elementary teachers (Aguirre et al., 2013; Foote et al., 2015). The TeachMath materials have been used to show elementary teachers the resource bases of students from non-dominant communities. We conjectured that engaging in discussions about multilingual secondary students' FoK would also be useful for our collaborative work with secondary math teachers. Thus, we adopted one of the activities from the TeachMath materials to guide the in-service secondary teachers with whom we were collaborating to learn more about students' backgrounds and out-of-school experiences through student interviews (paralleling the research in Zavala, 2014).

Situating Ourselves as Researchers

The first author came to this project while working as a post-doctoral researcher in science education and says: "I was interested in investigating ways to empower STEM teachers to advance change in their classrooms, and the tools that could be used to promote more equitable learning environments. Following this project, I went on to direct a program for underrepresented science and math students (some bilingual) in a 4-year college in northern California. I identify as White, cis-woman and monolingual."

The second author is the principal investigator of the research project within which this activity took place and says: "I started my mathematics teaching career 20 years ago in a high school where all students were multilingual and learning mathematics in a second language. As an emergent multilingual white cis-male teacher, I started developing an understanding of how language, identity, culture, and mathematics are closely related, despite the commonly held belief that mathematics is the 'universal language'. My experiences as a math teacher led to my current research interest. I currently work as a mathematics professor and mathematics teacher educator."

In this activity we investigated the following question: What can high school mathematics teachers learn about their students, who are classified as ELs, through engaging in a structured interview activity focused on students' out-of-school experiences? Specifically, what resources do the teachers identify in the students' lives and community?

Context

For this activity, which was part of a larger project, we worked with two of our collaborating ninth grade integrated mathematics teachers at City High School[2] a comprehensive public high school located in an urban area of Southern California with a large immigrant population. Despite being located in a diverse city, City High was (and continues to be) effectively segregated by income and student race/ethnicity. The majority of City High students were Latinx (75%), followed by Asian (11%) and African-American (9%). Additionally, over 80% of the students were eligible for free or reduced-price lunch, a proxy for low family income. City High was also linguistically diverse: 30% of 9th and 10th graders were classified as English Learners and an additional 50% of City High's students were formerly ELs (California Department of Education, 2015). The most common languages other than English were Spanish (75%), Vietnamese (5%), Burmese (2.5%), Somali (2 %) and multiple other languages each spoken by fewer than 2% of students.

For this activity, we focus on our work with two participating teachers who were willing and able to engage in this interview activity. The two teachers, Mr. S and Ms. G, were credentialed to teach mathematics. Mr. S had 8 years of experience and Ms. G had 12 years of teaching experience, all at City High. Mr. S is bilingual (Spanish and English) and identified as Latino. Ms. G is monolingual (English speaking) and identified as White.

[2] All names are pseudonyms.

The students who were interviewed for this project were selected by the teachers (see below for an explanation for how the teachers selected students), and at the time of the study, they attended City High as ninth graders. Each student was taking Integrated Math 1 (IMI) and also spoke Spanish as their first language. Mr. S planned and carried out an interview with Maya, a young woman who recently immigrated from Central America. She was classified as an "emerging" EL. Ms. G interviewed Jarrah and David, two boys in her ninth grade mathematics class who were classified in school records as Latino and were both formerly ELs.

Student Interview Activity

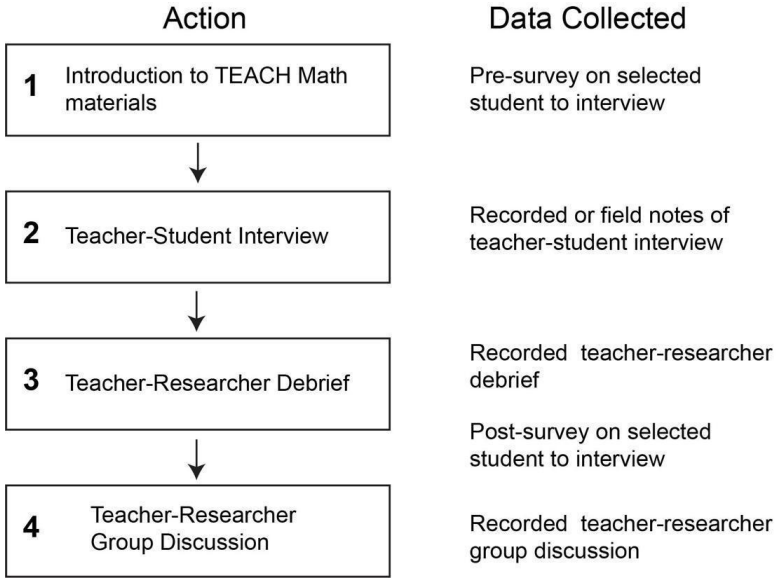
We *flexibly* adapted the "Getting to Know You" Interview from the Case Study module from the TeachMath materials (Foote et al., 2015). We chose this interview protocol because it aligns with the aims for the overall project. We introduced the student-teacher interview activity during one of our regular teacher-researcher meetings in early 2017 (Action 1, Figure 1). Following the guidance in the TeachMath materials, each teacher was asked to interview a student who was different from themselves in one or more socio-cultural ways, who was classified as an EL, and who had consented to the larger study. Mr. S chose to interview Maya. Ms. G had initially planned to interview a student named Josue, but due to a scheduling mishap, she ended up interviewing Jarrah and David.

The interview materials (from TeachMath) included questions about the student's interests and activities outside of school, home and community knowledge base, and home and community resources. The teachers reviewed these suggested questions (Foote et al., 2015 pp. 7-8), then adapted and changed the full list of interview questions to focus on a few relevant questions during their interview. They completed a pre-survey (Appendix 1) prior to conducting their interviews. Figure 1 shows the sequence of activities and data we subsequently collected, which we will explain next. The activities in Figure 1 took place across three weeks.

We had to be flexible in multiple ways. Our participating teachers conducted the student interviews (Action 2) in a way that made sense for them and their students. Specifically, the teachers arranged to meet interviewees during the lunch period, food was provided, and the teacher audio recorded the conversation for the sake of recalling what the students said. The approximately 35-minute lunch period limited the amount of time for the interviews, but the teachers and students

Figure 1

Data Collected at Each Action Throughout the Intervention



found it easier to meet during lunch than after school. To triangulate the teachers' surveys responses, and to debrief the student interview activity experience as a whole, we asked the teachers to do a written reflection and conducted two follow-up debrief interviews and group discussions (Actions 3 and 4) with the teachers. The materials we used are available as an online supplement at https://bit.ly/3uuDYrr.

Learning from the Interview Process

As noted in Figure 1, we (the researcher-collaborators) collected additional data to help us understand what the teachers experienced before, during, and after conducting the student-teacher interview. The pre-survey included questions (Appendix 1) about what the teachers knew about their interviewee and why they selected their interviewee. In Figure 2, we provide examples of questions that the teachers asked in their student interviews, but we note that these questions were tailored to the students (e.g. Mr. S, knew that Maya had recently immigrated from Central America, and he wanted to learn more about her experience of immigration so he asked questions about that experience).

The teacher-student interview between Mr. S and Maya was recorded, translated, and transcribed by a bilingual research assistant. Because of the change in plan for Ms. G's lesson, I (the first author) collected field note observations during the teacher-student interview between Ms. G and Jarrah and David since they expressed a preference to not be filmed. After the interviews were complete, we gave out a post-survey and conducted the debriefs. The surveys and transcripts (of both the student-teacher interviews as well as the teacher-researcher discussions) were coded using an open-coding process (Miles, Huberman, & Saldaña, 2014). Our final codes focused on language, family, activities outside of school, school, and mathematics.

Figure 2

Selected Interview Questions That Mr. S Asked (Action 2 in Fig. 1)

2) Teacher-Student Interview

- How many brothers and sisters do you have?
- Do you walk to school? What do you see when you do?
- How old were you when you left [Home Country]?
- What's the last math class you took? In [Home Country]?
- What do you like to do when out of school?
- What do you want to be when you grow up?
- Do you listen to music? Do you like music?

Interview Activity Reflections

Pre-Interview Activity

Responses from the pre-interview survey indicated that both teachers had a wide range of prior knowledge of all their students, but couldn't provide very many details about the potential interviewees' interests, family life or community (we note that this level of familiarity is not a sign the teachers do not know their students, but rather reflects the teachers' choice to interview a student they did not feel like they knew well). Mr. S knew Maya, the student he planned to interview, had relatively low grades in his math class and felt her low grade was "certainly a language demand issue". He knew that Maya spoke Spanish and had a history of immigration, but did not know what country she was from or when she had immigrated. He wrote "she puts forth effort, and wants to be successful, but is struggling". When asked about his knowledge of Maya's life outside of the classroom, Mr. S. knew very little about her interests and home life, but reported that she was social with other students. He planned on translating the interview questions into Spanish and asking her in both Spanish and English to make her more comfortable answering.

Although Ms. G did not interview the student she initially selected, in her pre-interview survey, she

reflected that she hoped to learn "a lot more about Josue, his interests in and out of school, details about his family". Given all other survey questions were specific to her perspective student she planned to interview, these data are not relevant.

Post-Interview

One of the successful elements of this project, in relation to our goals, was the re-focusing we observed in the teachers' perspectives of their students. Initially, our questionnaires and discussions about the students prompted responses that highlighted their students' relatively low achievement in mathematics. Both teachers conjectured this was due to being distracted in class, or not understanding enough English to follow lessons. After Mr. S's interview with Maya, the fact that Maya had only been in the U.S. for two years appeared to shift to a positive framing, where Mr. S realized Maya was more motivated than he had known to learn more English (both at school and at home listening to pop songs in English). He commented, "She's starting from scratch with English…she's done a pretty good job". We saw a similar change in Ms. G, who reported, "I liked knowing about their families…and what their life was like outside of school". She highlighted her students' passions for sports and drawing, as talents that she did not know about and that she could encourage them to try out for a team and ask them about it in the classroom in the future.

Another related outcome of implementing the interview was that the teachers reported it led to enhanced teacher-student interactions. The teachers shared that they had gained a better understanding of their students, and they ended up with more motivation and hope for positive future classroom interactions. Ms. G reported that "knowing more about the students makes me think of them differently, and respond to them differently in class". We also found some evidence that the students who were interviewed, in turn, increased their interactions with their teachers. After the interview, Ms. G had some e-mail communication with David's mother, which Ms. G noted resulted in David being motivated during classroom work time. Overall, Ms. G reported she was more motivated to keep David and Jarrah on task and she was planning to encourage them to try out for sports teams: "I have a stronger connection with them, which makes me believe that future interactions will be more meaningful".

Mr. S reflected that the interview established trust with Maya and he hoped that she would be more comfortable asking for help. However, in his post-interview reflection, Mr. S also reflected on the challenge of sustaining positive relationships with students given the structured interactions in secondary schools where both students and teachers have busy schedules and limited contact time in a classroom period. An excerpt from Mr. S's reflection was:

> *Maya was an interesting case because she is so quiet and shy. I would definitely say that she was more likely to ask me for help after class after the interview, but she still didn't ask for help in class whatsoever. She seemed to have a sharply increased interest in doing make up work and bringing her grade up, but it wasn't maintained. It sort of trailed off as time passed. After I interviewed Maya she did come to me after school for help. There were a handful of times that we had made plans for her to come after school, but that she either couldn't stay or was absent from school on that day. I would greet her at the door and she would smile and say good morning, but she's still so quiet. I really attribute much of her trepidation to speak, not so much with discomfort with me, but discomfort with speaking English, and just speaking in general. She never really found someone in class, a peer, that she was comfortable asking for help either. All in all I do believe that the interview had a positive effect on our interactions. In this particular case however, I think I needed to do a little bit more of my own outreach to her to get better results in terms of her success as a student.*

Despite the hurdles expressed by Mr. S, we do believe the knowledge the teachers gained about their students positively changed the teachers' outlook and perspective on future interactions with their students.

Discussion and Conclusion

In this study, we set out to investigate the power of asking high school mathematics teachers to get to know their multilingual students through conducting an interview. In general, we found that the interview and reflection process from TeachMath materials allowed two ninth grade teachers to expand their knowledge about their

multilingual students' home and community *resources*, instead of focusing on students' *challenges* related to language and mathematics. This resonates with prior work at the elementary level, and one strength of using the materials from the TeachMath project was that the interview activity and guiding questions focused on students' Funds of Knowledge (Aguirre et al., 2013).

While the TeachMath materials and the original FoK research were done with elementary-age students, we were encouraged to see that, with minor adaptations (e.g., making sure the questions were relevant to high school students), these materials could also be used by teachers in high school math classrooms. We note that in this project we used just a small slice of the available resources from TeachMath. In future work, we plan to continue to use the "Getting to Know You" interview process with other high school mathematics teachers. We also plan to supplement this interview with modified versions of math-problem solving interviews and activities from TeachMath, adapted for use with high school students.

For others who seek to do this activity, we note that the success of this activity appeared to be supported by a stance of flexibility. We designed the activity so that the teachers chose their students to interview, and allowed the teachers and students to find a time to meet. We also encouraged each teacher to pick and modify questions of the TeachMath interview protocol. These modifications made it possible for the in-service high school teachers to do this activity with one of their students. One additional important factor in the success of this activity was the fact that the teachers started with a stance of openness and willingness to learn about their students. We believe such a stance is prerequisite for the success of this activity.

The activity we describe in this article was done in the context of a teacher-researcher collaborative. As researchers and designers, we found that knowing a student's background, including their familial, cultural, and linguistic resources, has provided a foundation for our ongoing work of co-developing and redesigning mathematics problems from the curriculum to support emergent bilingual students (Zahner et al., 2018b). However, this activity could work in different structures and we offer these suggestions for teachers:

1. Do a version of this activity in a collaborative, reflective setting. For example, this interview activity could be done as part of a sequence of professional learning community meetings or as a stand-alone professional learning activity with a group of colleagues. In a reflective setting, the group members can focus on student resources and to design lessons that are more responsive to students' lives.
2. For teachers who do not speak the same first language of emergent multilingual students who are at the early stages of language development, we would encourage doing the interview with the help of a bilingual colleague to allow multilingual students to communicate using their full linguistic repertoire. Alternatively, the interview can be translated and a student could respond in writing. In addition, if multiple students in your class speak the same home language, consider doing the interview as a small group, allowing students to discuss their responses (as Ms. G flexibly did with her participants).
3. Last, a prerequisite for the success of this activity is that teachers must be open to learning from their students and believe their multilingual students are capable. We are aware that it is possible that a teacher who starts with negative beliefs about students might find evidence to support his/her beliefs through conducting an interview such as this. To counteract this possibility, we suggest that teachers who plan to engage in this activity also engage in critical dialogue about their own biases before engaging in this activity. Resources for such conversations can be found in books such as White et al. (2016).

With an open mind, a teacher has the power to become aware of students' home and community knowledge and resources, which can help the teacher be more effective in supporting the mathematics learning of linguistically diverse students.

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Discussion And Reflection Enhancement (DARE) Post-Reading Questions

1. The introduction described how our early discussions with teachers focused on multilingual students' challenges, even though that was not our intention. Have you seen this happen in your discussions with colleagues about teaching math to multilingual students? What can you do to disrupt this powerful tendency to focus on students' challenges?

2. One teacher interviewed a student in Spanish. How do you think relating to your multilingual students in their first language might allow you to learn more about their Funds of Knowledge and to incorporate these resources in math lessons?

3. Try This**:** Identify a multilingual student who is classified as an EL in your mathematics class and who is different from you in one or more socio-cultural ways. Try adapting the "Getting to Know you Interview" from the TeachMath Materials. Meet with your colleagues and share what you learned.

Appendix 1: Instruments of Data Collection

Pre-Survey Prompts	Post-Survey Prompts
1. What is one thing you like about teaching math at [City High School]? 2. How well do you know your students? 3. If you could rank how well you know your students from 1 to 10 (with 1 being a complete stranger and 10 as knowing them like a friend or family member)? 4. Which student do you plan on interviewing? Why? 5. In what ways is this student different from you? 6. In what ways is this student similar to you? 7. Is this student a low, medium or high achiever in your math classroom? Why did you choose that category? 8. What do you already know about the student's ideas and their attitudes towards math? 9. What do you know about the student's interest and activities (in school/out of school)? 10. What do you know about this student's home and community? 11. What do you expect to learn from this interview?	1. What is one thing you like about teaching math at [City High School]? 2. How well do you know your students? 3. If you could rank how well you know your students from 1 to 10 (with 1 being a complete stranger and 10 as knowing them like a friend or family member)? 4. Which student did you interview? Why? 5. Did you discover anything new about that student that makes them different from you? 6. Did you discover anything new about that student that makes them similar to you? 7. After interviewing, do you think the student is a low, medium or high achiever in your math classroom? Why did it change or stay the same? 8. What did you find out about the student's ideas and their attitudes towards math? 9. What do you know about the student's interest and activities (in school/out of school)? 10. What do you know about this student's home and community? 11. What did you learn (or take away) from this interview?