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## **The Language Orientations of Future Mathematics Teachers in the United States**

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Date of publication: February 24<sup>th</sup>, 2020

Edition period: February 2020-June 2020

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**To cite this article:** Fernandes, A. (2020). The language orientations of future mathematics teachers in the United States. *REDIMAT – Journal of Research in Mathematics Education*, 9(1), 7-29. doi: [10.17583/redimat.2020.4297](https://doi.org/10.17583/redimat.2020.4297)

**To link this article:** <http://dx.doi.org/10.17583/redimat.2020.4297>

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# The Language Orientations of Future Mathematics Teachers in the United States

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*(Received: 05 May 2019; Accepted: 10 February 2020; Published: 24 February 2020)*

## Abstract

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Thirty-one preservice teachers at a university in the Southeast of the United States were interviewed regarding their beliefs about the teaching mathematics to English Learners. Ruiz's (1984) framework of language orientations was used to understand their responses related to the use of the native language in the mathematics class. Four typologies that ranged from language-as-problem to language-as-resource were inferred. Implications for teacher preparation are discussed.

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**Keywords:** English learners, language, mathematics, beliefs, orientations

# Las Orientaciones sobre Lenguaje de los/as Maestros/as de Matemáticas en los Estados Unidos

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*(Recibido: 05 Mayo 2019; Aceptado: 10 Febrero 2020; Publicado: 24 Febrero 2020)*

## Resumen

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Se entrevistaron treinta y un futuros maestros y maestras en el Sureste de Estados Unidos, sobre sus creencias sobre la enseñanza de las matemáticas a aprendices de inglés. El enfoque de Ruiz (1984) sobre las orientaciones del lenguaje fue usado para comprender sus respuestas relacionadas con el uso del idioma nativo en la clase de matemáticas. Se infirieron cuatro tipologías que van desde el lenguaje-como-problema al lenguaje-como-recurso. Se discuten implicaciones para la preparación de los futuros maestros y maestras.

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**Palabras clave:** Aprendices de inglés, lenguaje, matemáticas, creencias, orientaciones.

English Learners (ELs) continue to grow in the United States with 4.8 million in schools in 2015 (NCES, n.d.). ELs speak a language other than English at home and are deemed to require “language assistance services to learn English and attain the same academic content and achievement standards that all students are required to meet” (NCES, n.d.). In the U.S., the Every Student Succeeds Act (ESSA) of 2015, building on the No Child Left Behind Act of 2001, provides guidelines to the states about testing and accountability requirements related to ELs. Though the accountability requirements have shed light on the overall academic plight of ELs, they tend to pressure schools to get ELs to learn English faster and move the students into content area classes where teachers have minimal preparation to work with ELs (Lucas & Grinberg, 2008; Reeves, 2006). Without preparation, teachers’ views about ELs could be influenced by broader deficit societal views (Horenczyk & Tatar, 2002). For example, deficit perspectives about EL students lead teachers to believe that the ELs’ native language is a primary barrier to their learning English (dominant language in the U.S.) and academic success. Other beliefs include the need for ELs to be fully proficient in English before they enter the mathematics class, and the need to teach ELs in English-only classes (Crosnoe, 2006; Gandára & Contreras, 2009). The language ideologies of the teachers can position ELs lower in the class compared to the other students (Razfar, 2003). Teachers also tend to believe that the ELs in their class will slow down the learning of the other students (Youngs & Youngs, 2001). The deficit perspectives of teachers have far reaching consequences for the schooling of ELs. Teachers are reluctant to work with the perceived low proficiency ELs (Olsen, 1997; Reeves, 2004; Walker, Shafer, & Liams, 2004; Walqui, 2000). ELs are also disproportionately placed in remedial classes, where they tend to lose motivation and disengage with schooling (Crosnoe, 2006). In general, teachers may not be aware of the negative impact of their beliefs on ELs (Trueba & Bartolomé, 1997).

Despite the deficit beliefs, ELs come to school knowing another language. Research shows that the native language can be a powerful resource that can be tapped into by the teacher. When allowed to use their native language, EL students can draw on their prior literacy skills and content knowledge learned in this language to help navigate their learning in the language of instruction. Besides benefitting their academic development, the native language also provides relief for recent immigrants who are in school for six or seven hours

immersed in a language they are still learning (Schinke-Llano, 1983; Swain & Lapkin, 2000). Research also confirms that using the native language in the classroom does not delay their learning of the language of instruction (Ramirez, 1992).

Given the extensive advantages of allowing the use of the ELs' native language in the mathematics class, it is imperative that the teachers understand and tap into this resource. Teachers remain important advocates for ELs against the dominant beliefs and the push for a monolingual superiority (Bartolomé, 2004). This study seeks to understand the language orientations of PSTs as it relates to the teaching and learning of mathematics to ELs. The research question guiding this study was: What language orientations do PSTs have about EL students' native language in the context of teaching mathematics in U.S. classrooms?

### **Framework and Literature**

Ruiz (1984) outlined the concept of language orientations, which refer to a “complex of dispositions towards language and its role, and toward languages and their role in society” (p. 16). In most cases the orientations remain largely “unconscious and pre-rational” (p. 16). According to Rokeach (1968), beliefs can be thought of as dispositions to action. Thus, in this study language orientations are taken to mean the beliefs that PSTs have about the native language and its role in the mathematics classroom. Based on policies and proposals that already existed, Ruiz outlines two prevailing orientations of language – language-as-problem and language-as-right. He also extended the framework to a third orientation of language-as-resource. In multilingual situations, like in the United States, policies associate the problems (e.g. poverty) of a group to the language they speak. The home language spoken by the members of the group is seen as a problem that needs to be overcome by learning the dominant language. For example, learning English is viewed as a means to integrate into the workforce and alleviate issues like poverty. In the context of education, the language-as-problem orientation takes the view that EL students' underperformance is tied to their lack of English proficiency and pushes for EL students to learn English quickly, despite the research indicating that it takes 5-7 years to gain proficiency in the academic language in a content area like mathematics (Cummins, 2000). Overall, the

language-as-problem orientation assigns a lower status to the language of the minority group.

The language-as-right orientation frames language use as a human right, and protections are put in place within the legal system to ensure this right to the minority group. Ruiz points out that this orientation can cause tensions with the dominant group as they view this as affirming the rights of a few over the rights of the majority. The tensions make implementation of the policies challenging. Based on the problems that arise with the previous orientations, namely the lower status with language-as-problem orientation and the tensions between the majority and minority group with the language-as-right orientation, Ruiz proposes a third orientation – language-as-resource. In this orientation the majority are encouraged to learn another language (e.g. Spanish). In this orientation the users of the minority language are positioned as experts and multilingual resources for members from other groups. The language-as-resource orientation can go in some way towards mitigating the tensions that arise between the majority and minority groups and assign a higher status to the minority language. In this study, the language orientations of the PSTs are examined within the context of the mathematics classroom. Thus, the literature discussed below will exclude language-as-right since these discussions are primarily at the policy level rather than the classroom.

In the context of mathematics education several researchers have drawn on the language-as-resource orientation. ELs perform better in mathematical problem solving when they draw on their native language, especially the case when the problems are challenging (Clarkson, 1992; 2006; Clarkson & Galbraith, 1992; Rubinstein et al. 2015; Secada, 1991). Clarkson (2006) found that the bilingual students who were highly proficient in their native language (Vietnamese) and English performed better in mathematics. The students reported that they switched to their native language when they found the mathematics problems challenging. Clarkson inferred that switching between the two languages allowed the students to draw on additional cognitive resources in their native language to help solve the problem. Two ninth-grade students in a study by Moschkovich (2005) used Spanish (their native language) and English to clarify the meaning of steepness as they compared the linear equations to their corresponding graphs. According to Moschkovich, the EL students used their native language to “explain a concept, justify an answer, describe mathematical situations or elaborate, expand and provide additional information” (p. 138). Domínguez (2011)

went further and found that ELs students were more likely to listen to and build on their partner's ideas when discussing mathematics in their native language (Spanish). This was not the case when the same students interacted in English. Domínguez also found that the EL students were even willing to take more risks (e.g. suggest an alternate strategy when they were incorrect) with their mathematical thinking in Spanish interactions than in English. Despite the research that shows how the native language can be a resource in learning mathematics, little research examines the beliefs that teachers have about the role of the native language in the mathematics class. An exception being the study by Hansen-Thomas and Cavagnetto (2010). About 70% of the 118 teachers surveyed in three states –Texas, New York and Pennsylvania, believed that mathematics was a universal language and would be the easiest subject for ELs.

In contrast to the language-as-resource orientation, there were more studies that highlighted the language-as-problem orientation among teachers. Karabenick and Noda (2004) reported that 52% percent of the 729 teachers believed that the EL students' native language interfered with their learning of English. In addition, 42% of the teachers believed that the students would do better in school if they spoke in English. Fifty-five percent of the teachers went further and attributed the students' failure to express their thinking in English to their lack of understanding the content. In another study that examined the beliefs of 279 mainstream teachers, Reeves (2006) found that nearly 40% of the teachers disagreed with the continued use of the native language in school. Looking more broadly at studies in bilingual education, teachers were more supportive of the theoretical aspects of bilingual education (e.g. transfer of literacy from native language to the language of instruction) than the practical aspects (e.g. the use of the native language in the class) (Ramos, 2001; Shin & Krashen, 1996). Shin and Krashen (1996) examined the beliefs that 794 teachers from six districts in California had about various aspects of bilingual education. The teachers supported theoretical aspects, like 74% agreed that reading and writing in the native language could facilitate literacy in English. However, when it came to the use of the native language in the class there were 41% who believed that the ELs would learn English quicker in English-only classrooms (37% were not sure and only 22% did not agree).

The 582 K-8 teachers surveyed by Ramos (2001) also had a language-as-problem orientation. The teachers were less supportive of using the native

language in reading and writing. They were concerned that the native language would hamper the EL students learning English. Further, they believed that using both the native language and English in the class for teaching would confuse the students. As such, the teachers preferred English only classes for ELs.

In smaller studies, Escamilla, Chávez, and Vigil (2005) had 35 teachers from two local school districts in Colorado answer questions like why their school got a low rating from the state. Despite receiving training and being endorsed to work with ELs, the teachers associated the low rating of the school with the large population of EL students as a major contributing factor. The teachers believed that the students' lack of English proficiency was the root cause for their low academic performance. The teachers mentioned that they curbed the use of Spanish in their classes to ensure that the students were prepared for the assessments. In a subsequent study, Escamilla (2006) examined the way 18 teachers evaluated the writing of EL students in English and Spanish. The teachers focused more on the errors in grammar and syntax than on the students' ideas. As such, the teachers concluded that the ELs were not good writers in either language, despite the EL students attempting to write about their complex social and economic realities. The teachers believed that Spanish was the cause of the EL students' problems in writing and something the school would have to focus on.

García-Nevarez, Stafford and Arias (2005) and Griego-Jones (2002) found that prior experiences and preparation led teachers to have beliefs that were aligned with bilingual research. Griego-Jones (2002) is the only study that examined the beliefs of PSTs. The study surveyed 91 PSTs in Arizona and found that those who had experiences with ELs (e.g. observing bilingual classes, afterschool programs, one-on-one tutoring) were open to developing the ELs' native language in school (mostly Spanish), and using the native language in content instruction. Further, the PSTs believed that the native language would not confuse the ELs if used together with English during instruction. Despite their experiences, most PSTs still believed that the students should use English at home. Among the PSTs who just observed bilingual classrooms, most believed that the ELs should be taught in English only.

In sum, teachers believe that the native language is a cause for concern with ELs and can hamper their learning when the language of instruction differs from their native language. With the exception of Griego-Jones

(2002), all the studies examine teachers' beliefs, instead of PSTs' beliefs. Further, except for Hansen-Thomas and Cavagnetto (2010), no studies examine the PSTs' beliefs in the context of teaching mathematics. This study examines the orientations that PSTs have about the teaching of mathematics to ELs. In particular, the research question guiding this study was: What are the language orientations of PSTs in the context of teaching mathematics to EL students?

### **Methods**

Thirty-one PSTs from a university in the southeast United States were interviewed using items from the Mathematics Education of English Learners Scale (MEELS) (Fernandes & McLeman, 2012), a survey designed to elicit the teachers' beliefs about teaching mathematics to ELs. There were 30 items in the survey that elicited five factors Teaching (0.79), Language in school context (0.73), Fairness (0.66), Language and mathematics (0.59) and Culture (0.48). The low Alphas in the last two scales motivated a refinement of the MEELS. As part of the refinement, the researcher conducted interviews with 31 PSTs to examine their thinking about these items and refine the wording of the items. The items were sorted in two groups to keep the interviews to under one hour and prevent fatigue. The first set of items (referred to as LMR here on) had 14 items that related to language and mathematics (e.g. Math is not language intensive) and resources (e.g. The math that EL students learn in their home country can be useful to teach all students math). The second set of 12 items (referred to as FT here on) related to items about fairness (e.g. It is fair for ELs to get accommodations on tests) and teaching (e.g. My lesson plans will include both the content and the language when there are ELs in my class). There were 4 items that were common to both interviews. Three of the four items were tied to teaching and one was broader about learning English. The common items helped check if the other items within a set (LMR or FT) were influencing the way the PSTs responded. Given the time availabilities of some PSTs, three interviews were conducted in pairs (two LMR and one FT). With minimal interaction between the PSTs, the researcher considered the paired interviews as two one-on-one interviews. The PSTs were randomly assigned to respond to one set of items when they arrived at the interview location. Seventeen PSTs were interviewed using the LMR items and 14 with the FT items. During the

interview the PSTs first responded to the items and were probed about their responses. Given the possibility that the PSTs' could respond in socially desirable ways, the researcher attempted to create scenarios where the PSTs had to respond to a hypothetical situation that could test the robustness of their belief. For example, if the PSTs agreed that they would allow the students to use their native language in the class, the researcher asked them how they would respond to another teacher who insisted that the ELs should speak English at school. The PSTs responses to these probes indicated the strength of their beliefs.

All the interviews were videotaped and transcribed later for analysis. The videos and the transcripts of the interviews were moved to QSR International's NVivo 12 software for coding. The researcher watched the videos and read through the transcripts, making notes during the process to get an overall sense of the responses. The researcher coded portions of the transcripts with the codes language-as-resource and language-as-problem based on the particular orientation towards the native language expressed by the PST. After multiple passes of coding, the researcher examined the codes within each PSTs' transcript and noted portions that were coded as language-as-resource and others that were language-as-problem. Thus, the PSTs could not be inferred to have a language-as-resource orientation or language-as-problem orientation, instead most PSTs were some blend of both. Based on a close reading of the coded portion, the researcher organized the PSTs into four typologies that formed a continuum from language-as-problem to language-as-resource (Patton, 2001). The four typologies, based on their orientations towards the use of the native language in the mathematics class were – No native language, Limited use of the native language, Extended use of the native language, and Bilingualism (see Figure 1) PSTs who were classified as No native language believed that the native language had no role in the teaching of mathematics and viewed its use as a problem. On the other hand, the PSTs classified in the Bilingualism category actively promoted the use of both languages by all the students in the class. The typologies in between favored limited and extensive use of the native language in the mathematics classroom.

After the initial round of classification of the 31 PSTs into a typology, the researcher repeated the process twice with a gap of a week between each analysis. The classification of the PSTs remained unchanged from the second round to the third.

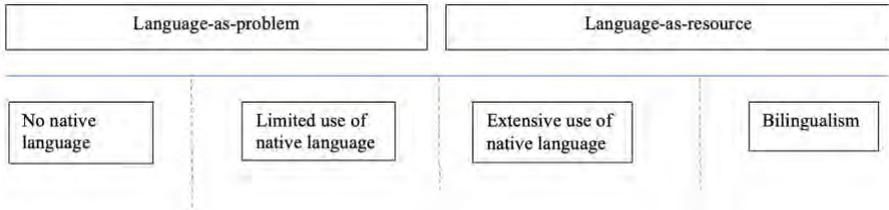


Figure 1. Language orientations of preservice mathematics teachers.

## Results

Building on Ruiz's (1984) framework, specifically the orientations of language-as-problem and language-as-resource, a continuum was developed that included four categories based on the PSTs beliefs about the use of the native language in the mathematics classroom - No native language, Limited use of native language, Extensive use of native language, Bilingualism. The next sections will provide a description of each category and evidence to support the development of the categories.

### No Native Language

In this category the two PSTs viewed the native language as a problem and believed that there was no role for it in the teaching of mathematics to ELs. The PSTs believed that the use of the native language would hamper the education of the ELs. Andy, a middle grades PST, would not allow the use of the native language in the class. She cited her clinical experience where a group of students were speaking in Spanish. She believed that the students were off task and she could not intervene due to her lack of Spanish. As such, she mentioned that the students not use their native language in her class.

Andy: I had a couple of boys that would all sit together, and they would all speak Spanish back and forth to each other. Because I don't know Spanish, I don't know what they are talking about. So, I mean I'd like to think in my perfect little world that they were discussing math issues, but I know that they are probably not, and I don't think that's appropriate.

Andy makes it clear that as a teacher she needs to understand what the students in the class were discussing. Andy also believed that speaking the native language would slow down the EL students learning English. Overall, Andy viewed the use of the native language as a problem that should be avoided in the classroom.

Laura, the second PST in this category also agreed that the students should use English in the class. When asked if the state tests should be in English, she mentioned that the ELs would “end up using this math a lot in America, (and) they’re going to need to know the English”. Thus, she was concerned about the ELs assimilating into the dominant language of the country. Laura also cited her lack of Spanish as a reason she would not be able to modify the problems for the Spanish speaking ELs; assuming that translations were the only modification a teacher could make. Both PSTs in this category focus on their lack of knowing the students’ language and the need for ELs to learn English in the U.S. as a primary reason for not allowing the use of the native language in the class.

### **Limited Use of the Native Language**

The 15 PSTs in this category advocated for a limited use of the native language based on their understanding that ELs were new to the country. The PSTs believed that the more advanced ELs or the English as a Second Language (ESL) teacher could help translate for the new ELs. The PSTs agreed that the translations could go on for the duration the new ELs were learning English. Typically, the PSTs believed that this time frame of using the native language would be less than a year and then the new ELs would need to interact in English. The PSTs in this category were concerned that the use of the native language would not motivate the ELs to learn English, especially if the tests were translated into the EL students’ native language. The PSTs believed that having the tests in English was one way in which the ELs would be forced to learn the language. The PSTs leaned towards grouping the ELs with the native English speakers for groupwork in the class; once again, forcing the ELs to start interacting with their peers in English. In some cases, the PSTs agreed that there could be another EL together in the group so that the ELs could assist each other in the discussions using their native language. When asked about EL students discussing mathematics in

their native language in class, Ophelia agrees that they can do so “to an extent”, she adds,

Ophelia: I think they should be able to discuss it (in their native language) if they are just starting to learn English. I’d say once they start to get a little bit better, I think they need to do it in English so they can start building up that math vocabulary and communication in English. But I think like at first if they communicate in their native language, it’s better than not communicating at all. I think they should be able to discuss ideas with other students in their native language. But I think once they start to understand the math vocabulary, they should have more opportunities to talk about it in English.

Ophelia is open to the ELs using their native language till they grasp the mathematics vocabulary and get a “little bit better” in English. Though ELs may be able to converse in English in a year, it takes up to seven years to become proficient in the academic language associated with mathematics. Ophelia thinks primarily of the mathematics vocabulary when discussing the native language. When asked about the teaching of ELs in English and their native language she says that the ELs should be “new”, as in recent immigrants. She believed that it was important for the ELs to be taught to some extent in their native language so that the students could “make connections between the math vocabulary in their native language and math vocabulary in English”. Ophelia mentioned that the ELs need to be forced to learn English.

Ophelia: I think its ok for them to use their native language sometimes. But if they like rely on that and speak that too much then I think it would, they wouldn’t learn English as quickly. You know, if you don’t, if they’re not forced to speak English very much then they’re not going to learn it. You can only learn a language through practicing it. You’re not just gonna just automatically learn it from being in the, you know, in the classroom. So, I think they need to be able to speak in English and they need to have more opportunities to do that. While still having some time where they can speak Spanish or whatever their native language is.

Though Ophelia brings up an important point about the ELs having opportunities to interact in English, these do not need to come at the expense of the native language. The theme of the ELs not being motivated to learn English was also expressed by the other PSTs in this category. For example,

when Emma was asked if allowing a group of ELs to speak Spanish would hamper their learning of English, she agreed.

Emma: I think it would (hamper the students' learning of English) because they have a mindset now where they can just speak their language and not try to learn English because they have this opportunity where they can just speak their native language. So, I think it would.

The PSTs also provide other reasons why ELs should not be allowed to use their native language extensively in the mathematics classroom. Carl, a middle grades PST, though open to the use of the native language, believed that it would "build a language barrier" between the teachers and the other students in the class. Carl supported the use of the native language in the small groups if the ELs interacted in English with the non-EL students in whole class discussions. When asked about setting up groups in the classroom, Carl proposed to keep two ELs together with non-ELs so that the two ELs could have the opportunity to interact in their native language, but most of the interactions would be in English. In noting the drawbacks of using the native language in the classroom, another PST Kate mentioned that the use of the native language would be regressive for the ELs since they were in school to learn English.

Kate: Because I think them discussing it in their native language to each other kind of hinders them from progressing. The whole purpose of them being in there (school) is to learn English and to get them to not explain themselves in their native language so much, I guess. I mean it might make them feel more comfortable but it's not, I guess, progressing.

Kate was concerned that the use of the native language would make the ELs feel more comfortable in class, maybe to the extent that they would not be motivated to learn English. Jane, another teacher in this category, when asked about teaching ELs using both English and their native language, alluded to the possible confusion of using two languages in the classroom.

Jane: I think the goal eventually would be able to like work in an English classroom, and have the same terms, vocabulary same understanding (in English). ... I think it might just like be confusing to the whole class (using the native language). And it is frustrating if you have half (the teaching) in one language and half in the other. So, I think the goal will be to eventually have them participate in the whole group in English.

Jane believed that the ELs should receive all the instruction in English and that using two languages in the classroom would be confusing for the students. This belief was also expressed by teachers in prior research (e.g. Ramos –2001–), though it runs counter to the bilingual principles of transfer from the native language to the language of instruction.

Overall, the PSTs in this category were not completely against the use of the native language in the class, but viewed it as a problem, allowing limited use for new ELs. The PSTs advocated for a quick transition to learning English. Without some level of pressure, the PSTs believed that the ELs would get comfortable using their native language and not learn English. Even though there was a push to learn English, some PSTs recognized that the native language was an important part of the EL students' identities. According to Ophelia, "it is good to still support their own language because it's still important to them and part of who they are". Though it seemed that the mathematics class was not the place for encouraging the ELs' native language.

### **Extensive Use of the Native Language**

The 10 PSTs in this category demonstrated support for using the native language in the mathematics class. Unlike the PSTs in the previous category who viewed the native language as a translation tool to help new ELs, the PSTs in this category viewed the native language as a resource to develop the mathematical knowledge of the ELs as they engaged with other students who shared the same native language. Further, the PSTs also paid attention to the overall well-being of the ELs in the class and believed that there was a better chance for the students to learn when they had the opportunity to use their native language and build on their previous thinking. The PSTs in this category had a language-as-resource orientation. According to Sandra, a PST in this category, the ELs could "gain an understanding by talking to each other in their language". Another PST, Jean, believed that the use of the native language would help the ELs "correlate" the new material with what they learned in their native language.

Jean: I think if they're able to speak to someone else in their native language to see that they are understanding what I'm teaching them, I think that will help them to correlate the (content from the) two

languages together. I think restricting them from their native language wouldn't be good (for learning mathematics).

Further, Jean also believed that the connections the students made with the mathematics they learned in their native language would help the EL students to become more involved in the mathematics class.

Interviewer: Ok. How would you respond to someone who says, you know these kids speak their native language at home, so when they are in school, they should be speaking English? How would you counter or argue your point to a person who says that?

Jean: I think if it's helping them to adjust, it's making them more comfortable and they are not uncomfortable. I feel like they feel like more, I'm not sure of the word. They're more involved, I guess. They feel like it's ok for them to speak in their language when they need to. I mean if they speak at home that's (shrugs) how it is at home cause their parents, if they're EL learners their parents probably don't know English so (the ELs would have to interact with their parents in their native language).

Jean goes beyond the mathematics to point out the ELs would feel comfortable interacting in their native language and feel that they belonged in the mathematics class. This orientation contrasts with that of Kate in the previous category (Limited use of the native language) who also claimed that the use of the native language would make the ELs comfortable but believed that the ELs would not try to learn English as a consequence.

The PSTs in this category also saw other benefits of the native language. Teresa pointed out that having the homework in Spanish would allow the parents to engage with their children. In responding to the item about using English and the native language to teach new ELs, Teresa adds,

Teresa: I definitely agree with this (using English and the native language to teach). This is probably one of my biggest issues in general. Absolutely, I think they should be taught both languages. Even if not in the school, send stuff home so their parents could help them. You know, I mean, I just think it is ridiculous when the parents cannot even help them because they don't understand English. Send stuff home, let their parents help them with that in their native language, even if you can't do that. Yeah, I really agree with that.

In addition, Teresa also points out that the native language is lost in the second and third generations, a further reason to "build that language". The

following interactions happened when Teresa was asked if the use of the native language would hamper the ELs from learning English.

Interviewer: So, you don't think that will hamper them in any way?

Teresa: No. Really, I mean a lot of people lose their native language a lot of times. Especially within second third generations, you're looking at a lot of language loss there, instead of, let's build that language, let's build our language. They are going to learn our language (English). They are going to go through school, they may have an accent, they may do whatever, but I think that is so important, for themselves and us. I mean we don't need to just make everybody 'Oh, you need to learn English, you need to learn English'. Let's embrace everybody and learn something new from them.

Unlike the PSTs in the previous category (Limited use of the native language), Teresa and the other PSTs in this category did not believe that the use of the native language would hamper their learning of English. Further, the PSTs did not insist that the ELs had to learn quickly. In terms of grouping students in the class, the PSTs in this category agreed that they would group the ELs together to facilitate the discussion in their native language. Even though the PSTs in this category stated that eventually the ELs would need to learn and interact in English in school, this was not supposed to happen quickly, or at the expense of their native language. On being asked about grouping the ELs together, Candy explains,

Candy: If they all spoke the same language, at first, I think I would sort of group them together so that way they can grow comfortable being able to explain and then slowly sort of integrate them into other groups that would require them to speak more English.

A key point to note is that Candy, like the other PSTs in this category, favored a gradual transition to English. This contrasts with the PSTs in the previous group who were eager that the ELs stop using their native language and start interacting with the other students and the teacher in English as soon as possible.

## **Bilingualism**

The last category consisted of three PSTs who, in addition to supporting the extensive use of the native language, also actively promoted bilingualism among the students. Their push for bilingual education of all the students

distinguished the PSTs from those in the previous category who also had a language-as-resource orientation. Though the PSTs did not explicitly mention it, the push for all the students to be bilingual would position the EL students as experts in their native language (Ruiz, 1984). In addition to viewing the language as a cognitive resource that would help ELs engage and learn the mathematics, the PSTs also believed that the use of the native language would not hamper their learning of English, but support it. In contrast to the teachers described in Shin and Krashen (1996), the PSTs in this category supported both the practical and theoretical aspects of bilingualism. The PSTs also believed that the native language fostered stronger bonds of the EL students with their families outside school. Ginny, a PST who was an immigrant herself, mentioned that she would actively encourage the EL students to use their native language in the class and would ask them to explain both in their native language and English. She explains,

Ginny: My parents are from Poland, I'm the child of immigrants and my mother would go back and forth all the time (between Polish and English). I just thought that she had the most brilliant brain. ... I don't have a problem saying, 'Ok tell me that in Pharsee, okay, now tell me that in English'. Once they are getting it to me, I will go back and say tell me the whole thing in Pharsee, tell me the whole thing in English. I don't want them to think one is more (referring to the native language and English) ... they are both equally important. I do need English, but I'm not gonna expect that English at the detriment of their home language. I will not do that.

Ginny was clear that she would get the EL students to use both languages in the class and encourage the EL students to be bilingual. She was against developing the students' English at the expense of their native language. She believed that the native language could help the students to make connections to the material they learned in their native language. Ginny was the only PST who also touched on Ruiz's original notion of language-as-resource in a globalized world economy.

Ginny: So, I would tell those teachers is that the face of America is that we are a population of immigrants. And we are always looked on as a melting pot, where we are all supposed to blend together. Now we are a salad, it's ok for us to keep our individualities. Does it take a little bit more scaffolding? Yeah, but you know what, that's who we're as a country and that's who our student population is. Really and truly as a nation we are global now. We are not just

United States. We are a global economy and the best thing we can do is ...keep that language alive and teach it together with English. Because we are a global country and that's a strength, that's where the future of our country lies.

Another PST, Kelly, believed that students should be encouraged to know more than one language. Kelly favored mandating that all the students in the school learn multiple languages. She says, "I feel that language can only help you. The more language that you know, I feel like that it's more helpful to you as a person, especially as a student." Kelly believed that not allowing the EL students would "just hinder their success in the long run." Allowing the use of the native language would foster an understanding of the content.

Kelly: I think that allowing or not allowing someone to speak a language that they are comfortable with and that they are familiar with will just hinder their success in the long run. If they are allowed to speak their native language in their math class that just might be their way of building connections. To make sure that the patterns, generalizations and shapes become clear. So, to just limit them in saying that they can just figure these things out in English might not be the best way for them to succeed, especially in a math class.

When Kelly was asked to respond to the critique of another teacher who was against the use of the native language in the class, she pointed out that the mathematical growth of the ELs should be the focus of the mathematics teacher. Further, according to Kelly, the native language allowed the EL students to build connections in mathematics as they interacted with their peers and developed their understanding. She was not overtly concerned about the ELs learning English and believed that this would happen over time through their interactions at school.

Abbey, the third PSTs in this category, believed that the native language played a key role in the EL students' learning English.

Abbey: I think that they should learn English, but I think that they should learn English with the aid of the language they already know. So, don't drop that language. I think there should be two languages to help make them better in both languages. So, using their first language to help build on their second language and then in turn being bilingual versus dropping their native language and just learning English. Because I don't think that that's very helpful.

Her belief aligns with the research in second language acquisition of developing the second language by building on the native language

(Goldenberg, 2008). Overall, the PSTs in this category went beyond encouraging the use of the native language in the class to encouraging bilingualism for all students. The PSTs believed that the students' bilingualism was a resource that extended beyond the mathematics classroom in developing students who could function in a global economy.

## Discussion

The analysis of the PSTs' interviews shows that most of the PSTs do not fit neatly into Ruiz's (1984) orientations of language-as-problem and language-as-resource. Instead, the PSTs' responses generated four typologies based on the extent to which they would draw on and use the EL students' native language in the mathematics classroom. The typologies point to a continuum of language orientations, from language-as-problem to language-as-resource. The No native language typology is based on a language-as-problem orientation to language-as-resource orientation with Bilingualism. The two typologies in between – Limited and Extended use of the native language, blend language-as-problem and language-as-resource orientations. Zúñiga (2016) obtained similar blended language orientations between language-as-resource and language-as-problem for teachers.

There were 15 PSTs in this study were not supportive of the continued use of the native language in the class (Limited use of the native language). This was slightly higher than the 40% of teachers in Reeves (2006) who held a similar belief. The primary concern for the PSTs in the No native language and Limited use of the native language categories was that the native language would interfere with the EL students learning English, a concern that was also expressed by the teachers in other studies (e.g. Karabanick and Noda, 2004; Ramos, 2001; Shin & Krashen, 1996). The PSTs believed that too much use of the native language would not motivate the ELs to learn and interact in English. However, unlike the 55% teachers in Karabanick and Noda (2004) who attributed the ELs' failure to express their thinking in English to a lack of understanding the content, most of the PSTs in this study did not believe this to be the case for mathematics. The PSTs in this study believed that the ELs would know the mathematics but would be challenged to express their thinking in English. Thus, the reason why most of the PSTs in this study were open to the use of the native language, albeit for a limited time. The support for the native language in this study contrasted with other

studies like Escamilla (2006) where the teachers blamed the ELs' challenges with reading and writing to the interference from the students' native language. The contrasting beliefs could be attributed to the subject area of mathematics which the PSTs believed was less language intensive; like the teachers in Hansen-Thomas and Cavagnetto (2010).

### **Implications for Teacher Preparation**

The language orientations of the PSTs in this study indicate that there is a need to develop a language-as-resource orientation that leverages EL students' native language in the classroom. Educators can use the framework from this study to understand the PSTs' current orientation and move them towards language-as-resource orientations during the teacher preparation program. The goal being to develop PSTs who understand the role of the native language in the teaching and learning of mathematics to ELs.

The PSTs also need to understand the process of learning a new language, and the role of the native language in the process. In the interviews, the PSTs invariably associated ELs with recent immigrants who had beginning levels of English proficiency. The use of the term English Learner is problematic since PSTs tend to associate the term with students who do not know English, rather than students who know a language (or more) and are trying to learn English. Recently, researchers suggest the use of "emerging bilingual" for the students who speak another language and are in the process of learning English (e.g. García, Kleifgen, & Falchi, 2008). The term EL also prompts the PSTs to think that these students are a homogenous group and do not account for the variation between ELs. For example, a significant percentage of ELs were born in the U.S. and are classified as long-term ELs after being in the program for six years or more.

Like the teachers in Hansen-Thomas and Cavagnetto (2010), the PSTs in this study believed that mathematics was universal and that the challenges in language mostly consisted of vocabulary and word problems. PSTs need to develop an understanding of the academic language in mathematics which includes discourse features like providing explanations, building on the thinking of other students, conjecturing and proving conclusions. Further, the PSTs also need to be exposed to how the native language can be a cognitive resource for the ELs in mathematics. By developing a language-as-resource orientation, the PSTs can look beyond the immediate language issues to focus

on the mathematical meaning that the ELs students are making with the available linguistic resources (Moschkovich, 2007). Thus, the PSTs are more likely to view the ELs as assets to the class, than a problem.

The PSTs' prior experiences featured prominently in their responses in this study and is a promising avenue for further exploration in teacher preparation. Most of the PSTs in this study based their orientations on prior experiences (e.g. class observations, interactions with family and friends). Thus, providing the PSTs with structured opportunities to observe best practices with skilled mathematics teachers, along with guided reflection, can impact their language orientations (Fernandes, 2012). The PSTs in this study were open to the use of the native language in the mathematics classroom. With the right preparation they can develop a language-as-resource orientation and even push for students who are bilingual and mathematically proficient.

### Acknowledgments

This work was partly funded by the Faculty Research Grant of the University of North Carolina Charlotte. The views expressed here are those of the author and do not necessarily reflect the views of the university.

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