



Pre-service Teachers' Assumptions about Latino/a English Language Learners in Mathematics

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Abstract

We share data collected from 51 pre-service elementary mathematics teachers who were asked about teaching mathematics to English Language Learners (ELLs) who moved to the U.S. from Central America and China. We describe three critical misconceptions held by pre-service teachers (e.g., differential treatment of ELLs based on country of origin, isolation rather than community, and outsourcing to meet ELL needs) and discuss implications for teacher preparation and professional development to better equip teachers to teach mathematics to Latino/a students.

Discussion And Reflection Enhancement (DARE) Pre-Reading Questions

1. Do you make assumptions about how ELLs learn mathematics based on their country of origin?
2. How might these assumptions influence your interactions with ELLs?

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Imagine a third-grade teacher in her first year of teaching who has two English Language Learners (ELLs) in her classroom. One student is from China and the other is from Central America. What assumptions might this teacher make about what these children know mathematically? Would the teacher make different assumptions or instructional decisions based on the children's countries of origin? This article shares qualitative data collected from pre-service elementary mathematics teachers who were asked about these potential scenarios. These data indicate that pre-service teachers (PSTs) would have lower expectations for Latino/a students that would hinder their participation and achievement in mathematics classrooms. These data also suggest that we need to strengthen our teacher preparation programs so that PSTs are better equipped to teach mathematics successfully to Latino/a students.

To assess elementary PSTs' beliefs about teaching ELLs from different countries of origin, we undertook a qualitative study (Miles & Huberman, 1994) to determine whether or not country of origin might affect teacher expectations regarding mathematical ability and instructional needs of ELLs. We collected written responses from 51 PSTs using two writing prompts on a one-page document (see Appendix). The first prompt stated, "Imagine it is your first year of teaching. You have taken a position as a third grade teacher. One of your students has just moved to the United States from Central America." The second prompt was identical except that "Central America" was replaced with "China." For each of the two prompts, PSTs wrote individual responses to Questions 1-3. Next, they wrote responses to Questions 4 and 5.

1. What do you think this child will need during mathematics instruction?
2. How will you assess the child's needs?
3. How will you support this student during mathematics?
4. Do you anticipate that the needs would be different depending upon the continent of origin?
5. How comfortable would you feel about these two different situations?

To analyze the data, we coded the 51 PSTs' responses to Questions 1-5 to identify and examine (1) how PSTs would meet the needs of ELLs in general and (2) how they would meet the needs of ELLs from different countries of origin.

The respondents were juniors enrolled in two sections of the only mathematics methods course required for their program and participating in field experiences in local schools prior to entering a year-long student teaching experience. The first author taught the only section of this course to 28 students and all of them participated in the study. Intrigued by the students' responses, she decided to replicate the study the following spring semester. That semester, there were three sections taught by adjunct faculty, two of which were taught by full-time elementary teachers who had never taught undergraduates. The first author believed that these inexperienced instructors would not be prepared sufficiently to handle the conversations that would follow and chose to have the prompts administered only in the section whose instructor had experience teaching elementary PSTs. All 23 students from this section participated. All 51 PSTs (48 women, 3 men) were Caucasian, native-English speakers who had no coursework or experience in teaching ELLs.

PST Responses to Meeting the Needs of ELLs

Based on the analysis across all 51 PSTs' responses, we found four major categories in relation to how PSTs would meet the needs of ELLs in general. We discuss each category in the following subsections.

Outsourcing to Meet ELL Needs

Although the PSTs were asked how *they* would support these children, 63% of the respondents did not focus on *their* own actions, but rather on the actions of others. Their responses revealed underlying assumptions that other people (e.g., ESL teachers, translators, tutors, other students, and parents) would be available to work with ELLs both inside and outside their classrooms. For example, they wrote:

- "A translator should be present in the classroom and perhaps a dictionary."
- "I think weekly conferences with the family would be beneficial."
- "Also any extra work could be sent home if needed for the parents and a tutor would be provided."

- “Bring in an ESL teacher; assess – taking pre test; have ESL teacher explain math problems.”
- “Bring in an ESL teacher for assistance.”
- “I would feel better with an interpreter because then I feel (or believe) that everyone would feel well represented and perhaps that their voice is heard.”

They also indicated that they would pair these children with other children—children who were at a higher level mathematically, children who were from the same country of origin, or just “helpful” children.

Utilizing Resources to Support Students

Second, the PSTs suggested that they would utilize resources to support students. For example, they indicated that they would find games to help students learn English and provide manipulatives when appropriate. In addition, they explained that they would use an Internet translator or provide translated curriculum materials during mathematics instruction. The underlying assumption in some responses was that if a translator was not available, then they could at least provide translated materials to help ELLs learn mathematics and if translated materials were not available, then they would be able to use the Internet to create translated materials. However, the PSTs did not elaborate on how they would actually use the translated materials, how these materials would be incorporated into whole class discussion on mathematics concepts, or what role providing separate curriculum materials might play in engaging ELLs in math conversations with their peers.

The PSTs’ responses revealed the belief that ELLs would be proficient in reading academic content in their native languages and that Internet translation engines would be able to provide grammatical and syntactically recognizable sentences for ELLs. Unfortunately, at this point, Internet translation search engines do not consistently provide translations that native speakers would use or recognize as typical everyday language (Rieha & Rieh, 2005; Savoy & Colamic, 2009). This has prompted Google to continue to refine this service.

Using Teaching Strategies

Third, some PSTs identified particular teaching strategies to support ELLs such as demonstrating and modeling, providing detailed explanations and clear instructions, using visual aids and concrete examples, and including examples

from the child’s culture. All of these strategies have the potential to be effective for ELLs. However, the PSTs considered using these strategies only while working with the child in isolation, rather than as excellent whole-class strategies that could be more efficient and effective at addressing the needs of ELLs without unnecessarily isolating them. In other words, PSTs did not consider using these strategies or other strategies as resources for engaging ELLs in a community of practice.

Providing Individualized Support

Fourth, the PSTs explained that they would make themselves available to provide individualized support to ELLs. For example, they stated that they would assess ELLs’ English proficiency and provide English instruction (unrelated to math instruction). PSTs also stated that they would conference with the child one-on-one, visit the child’s desk frequently during class, and spend time with the child before and after school and during recess. These future teachers explained that the ELLs would need more help than their native-speaking peers and this help would be provided by giving them extra time to complete class work, extra practice, and additional opportunities to demonstrate understanding. These PSTs also stressed that they would provide encouragement and patient guidance to help ELLs feel comfortable in school. Yet, they did not elaborate on the nature of this encouragement and support. Additionally, they seemed unaware of the difficulties associated with balancing this type of support with other students’ needs.

It should be noted that several PSTs indicated that they did not know what to do for either case as the following quotes illustrate:

- “I honestly don’t know what I’d do.”
- “I think it would be hard. I would probably not know what to do and have to see what the students know to make decisions.”
- “I would find this very challenging and would need outside resources for further support.”

These honest statements capture the thoughts of a few PSTs who were willing to admit that they did not have sufficient knowledge or experience to address adequately the needs of ELLs in general. In the next section, we examine the PSTs’ approaches to mathematics instruction for different ELLs based on country of origin.

PSTs' Approaches to Country of Origin

Our analysis of participant responses to prompts revealed that some PSTs would use different approaches for ELLs from different countries. Out of 51 respondents, seven indicated that ELLs from different countries would not have different instructional needs while 43 respondents indicated that these children would have different needs and these needs were directly related to their country of origin. (One PST did not indicate one way or the other.) Some PSTs elaborated and provided reasons for these differences:

1. Culture, and thus teaching and learning, varies between countries (16 PSTs)
2. The value of education and mathematics varies be-

tween countries (6 PSTs)

3. Each student has different background knowledge and needs (5 PSTs)

Of the 43 that indicated that these children would have different needs, eight indicated more specific differences related to country of origin as illustrated in Table 1.

Discussion

The data collected from these pre-service elementary teachers suggests three major findings that need to be addressed in mathematics teacher education: 1) differential treatment

Table 1. Written responses from eight PSTs

PST	About Child from Central America	About Child from China
#1	Needs a lot of visual aids and concrete examples; check for understanding in personal interviews/conferences; provide manipulatives and detailed explanations.	Needs to be challenged; check for understanding in personal interview/conference; provide many opportunities to show understanding.
#2	The child will need extra help maybe from an ESL coach or volunteer.	The student will mostly likely excel at mathematics.
#3	The child will need extra help and support during mathematics instruction.	The child will need deeper instruction and manipulatives to work out problems.
#4	The child will need one-on-one help and some translation & explanation.	The child will need me to explain the directions, but based on previous experiences, my Asian students are excellent in math.
#5	I would guide the child through what we are learning and try to use lots of pictures. I would also allow him to have extra time.	I have a student like this in field. He is already far more advanced in science than the other students. During math time he leaves to go to ESL because he is already able to understand the concepts being covered. I would support him by giving him appropriate level work that will help him continue to grow.
#6	This child will need extra time to complete assignments and more practice. Support will come from me, as the teacher, the child's classmates, parents, and aide. Together we will help the child better learn and understand the English language and mathematics through encouragement, patience, drawings, and any kind of support necessary.	From my experience, Chinese students excel in mathematics, but learning the English language hinders their progress. I would assess them through conferences, assigned work, and other methods with support from an aide.
#7	Well the student is going to need some English instruction first. I would pair one of my higher-leveled students with that student to help the student during math.	Help child with the English, they more than likely have a good background in math, so math won't be a problem – but English will. Pair student with student from China.
#8	She would probably need to get used to our whole class discussions, so I would have the students guide the student and show her how it is done.	This child will probably need to be challenged more since China is ahead of the U.S. in math. So I will do my best to include more challenging material.

based on country of origin; 2) isolation rather than community; and 3) outsourcing to meet ELL needs.

Differential Treatment Based on Country of Origin

Some PSTs appear to make assumptions based on one isolated characteristic of a child (i.e., country of origin) rather than on any information about student knowledge, experiences, mathematical and language proficiencies, and performance on assessments. For instance, eight pre-service elementary teachers clearly expressed a discrepancy between how they would support children from Central America and China (i.e., students from China would need challenge while the students from Central America would need remediation). The data indicated that some PSTs had stereotypical ideas about students from both origins. Of course, it is problematic when teachers make assumptions of deficiency or proficiency without appropriate assessments. Mathematical knowledge, skill, or ability is not the province of a particular gender, race, or ethnicity.

When we designed the prompts, we selected Central America, rather than a specific country south of the United States such as México, Columbia, or Guatemala to avoid potential bias PSTs might associate with specific countries. For similar reasons, we used China rather than Asia or countries such as Japan or Singapore. Moreover, we avoided terms that would invoke SES stereotypes common to U.S. entertainment and media. As a result, we expected that some PSTs would realize that SES and educational backgrounds may influence ELLs' prior experiences and academic preparation. However, none of the 51 participants mentioned this notion.

Decisions teachers make about classroom practices can greatly facilitate student learning or serve as an obstacle (Wenglinsky, 2002). The assumption that children from different countries of origin should receive different mathematics instruction would lead to different teacher expectations, teacher-student interactions, and student participation in mathematics classrooms. Good (1987) documents how differential expectations as shown by these eight PSTs would lead to differential treatment in the classroom in terms of grouping practices, locus of responsibility for learning, feedback and evaluation practices, motivational strategies, public display of thinking, and cognitive demand of tasks posed to students. These assumptions reflect Ogbu and Simons' argument (1998) that, "the treatment of the minorities in the wider society is reflected in their treatment in education" (p. 161). The eight future teachers' statements are problematic and will perpetuate low expectations and ultimately, low achievement for Latino/a students.

Isolation Rather than Community

Overwhelmingly, PSTs expressed the notion that the best way to help ELLs learn is to isolate them in order to provide individual instruction. Not one PST indicated strategies for helping a child engage with peers to solve mathematics problems or to participate in classroom discussions related to mathematical ideas. This striking result is in sharp contrast to research that clearly indicates that teachers must (1) promote active ELL participation in mathematical discussions, and (2) recognize the resources that ELLs use to express mathematical ideas in order to facilitate participation and learning of ELLs, especially Latino/a ELLs in mathematics classrooms (Brenner, 1998; Brown et al., 1993; Khisty & Chval, 2002; Moschkovich, 2002). When instruction facilitates full engagement and participation in communities of practice (Lave & Wenger, 1991), Latino/a ELLs are successful (Chval, 2001). Thus, the PSTs' notions about isolated instruction contradict what we know about supporting the learning of Latino/a ELLs in mathematics classrooms. This finding suggests that PSTs need the knowledge and competencies to reframe instruction for Latino/a ELLs that values the construction of mathematical knowledge in social arenas, producing classroom norms that facilitate ELL participation in whole-class settings and during small-group peer interactions.

Outsourcing to Meet ELL Needs

The PSTs, with limited knowledge about how to meet the needs of ELLs, made assumptions that other educators with specialized knowledge and experience will be available to support ELLs in their future classrooms. The PSTs assumed they would not need to develop this specialized knowledge since they would have a host of assistants (i.e., translators, tutors, ESL specialists, parents, and peers) to help them meet the needs of their ELLs. They also assumed that translating curriculum materials to the child's first language would be helpful, not realizing that some ELLs may not be literate in the printed word in their native language, especially in the academic language of mathematics. The PSTs also assumed that peers would have the ability to interact with ELLs in academically productive ways; however, elementary students do not necessarily know how to engage ELLs so that they are equal partners who have a voice (see Chval et al., in preparation, and Van Lier, 2004, for other problematic issues with this assumption). None of the 51 PSTs indicated that they would need to develop knowledge or expertise to meet the needs of ELLs. This was not unusual given that at the time of the study the participants were enrolled in a certification program in a state that had not officially aligned ELL instruction with TESOL

(Teachers of English to Speakers of Other Languages) national standards. This finding is problematic and needs to be addressed in teacher preparation programs.

Implications for Classroom Teachers and Mathematics Teacher Educators

In most (if not all) U.S. teacher preparation programs, future teachers are not prepared to teach mathematics to Latino/a ELLs. The undergraduates in our study, less than a year away from entering the teaching profession, have little knowledge about the needs, resources, and supports required to effectively teach mathematics to Latino/a ELLs. Furthermore, U.S. teachers are not participating in professional development related to teaching ELLs (Wenglinisky, 2002). These problems suggest that as a field we need to address some important challenges:

- What are the critical elements that need to be added to teacher education programs so that teachers are better prepared and supported to make informed decisions regarding teaching mathematics to Latino/a ELLs?
- What are effective methods for identifying and challenging PSTs' assumptions and beliefs about teaching Latino/a ELLs?
- When we identify resources and supports for ELLs through research, how do we initiate implementation of their effective use in a larger number of classrooms with Latino/a ELLs?

First and foremost, we need to improve mathematics teacher education programs and professional development opportunities to address misconceptions related to teaching mathematics to Latino/a ELLs. Teacher preparation programs should include experiences specifically aimed at addressing the often implicit assumptions, beliefs, and expectations that teachers have in regard to students from linguistically and culturally diverse backgrounds. These experiences should not be isolated in one course, but rather should be purposefully integrated across the curriculum (i.e., these experiences should not be limited to one course such as "multicultural education" or "culture and society") and specifically addressed within the mathematics context. Moreover, these experiences need to include opportunities to expose assumptions PSTs might hold *about students* based upon their ethnicity, race, and educational background so that they can develop more critical and reflective pedagogy. Coursework that delves into multicultural curriculum is vital, but also must address the often "hidden beliefs" teachers hold about Latino student achievement and knowledge (Gutiérrez, 1999; Rolón-Dow, 2005).

After administering the prompts to our PSTs, we compiled their responses and distributed a summary of comments back to the PSTs. We asked them to analyze and discuss what they noticed and what they still needed to learn about teaching mathematics to ELLs from different countries of origin. The instructor then fueled and facilitated what became a heated debate among students where assumptions and misconceptions were questioned and challenged. Next, the instructor provided a variety of experiences over the course of the semester that continued to address these assumptions and misconceptions. These experiences included the examination and discussion of (a) videos of successful Latino mathematics students who participated in a community of learners, (b) ELL student work, (c) research about ELLs, and (d) newspaper articles related to ideas such as ELL policies in U.S. schools and reasons for low mathematics achievement for Latinos. The instructor recognized that challenging PSTs' beliefs would take a significant investment of time and may not change during one 15-week course.

Second, teacher preparation programs must include opportunities for PSTs to learn how to establish and maintain productive learning environments for ELLs, and specifically Latino/a ELLs. PSTs need to view images, from video or field experiences, of effective mathematical learning environments. For example, they need to see:

- how Latino/a ELLs can participate in productive peer interactions as members of a community of learners;
- how teachers can support Latino/a ELLs without isolating them or outsourcing the work to others;
- how a mathematical task can be enhanced to grant access to all the students in the classroom, including the Latino/a ELLs; and
- how Latino/a ELLs can flourish when they are challenged mathematically.

Third, teacher preparation must include content that develops knowledge and competencies in teaching mathematics to Latino/a ELLs. For example, viewing or observing productive learning environments will not necessarily enable PSTs to facilitate these environments themselves. Shulman (1986) outlined a variety of knowledge bases that teachers need to develop including content knowledge, pedagogical knowledge, pedagogical content knowledge, and curricular knowledge. As a result, in recent years, there has been greater attention placed on developing pedagogical content knowledge, or content knowledge for teaching mathematics (Hill, Ball, & Schilling, 2008). Unfortunately, discussions in mathematics education have not given sufficient attention to developing teacher knowledge related specifically to teaching ELLs and Latino/a ELLs. The development of this

knowledge should not be deferred to additional certification programs or professional development, but rather should be initiated early in the preparation process.

Finally, PSTs' responses indicated a strong preference for outsourcing ELLs to other personnel within the school (e.g., ESL teacher, translator, etc.), but no mention was made of the need for proactive collaboration with ESL teachers or bilingual colleagues. Given this, we strongly recommend that prospective and practicing teachers, along with their students, collaborate with ESL teachers and bilingual colleagues in order to draw upon their colleagues' expertise as well as build the capacity of the school to respond to the needs of ELLs.

The three critical misconceptions identified above (i.e., differential treatment of ELLs based on country of origin, isolation rather than community, and outsourcing to meet ELL needs) as well as the related implications for teacher preparation also need to be addressed with practicing teachers. The current teaching workforce in the U.S. has not had sufficient preparation for teaching mathematics to Latino/a ELLs. Achieving excellence and equity for Latino/a ELLs in current and future K-12 mathematics classrooms will require a significant investment in teacher preparation and professional development.

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Appendix: Writing Prompts Given to Pre-service Teachers

No names please. We just want your honest thoughts.

Imagine it is your first year of teaching. You have taken a position as a third grade teacher. One of your students has just moved to the United States from Central America. What do you think this child will need during mathematics instruction? How will you assess the child's needs? How will you support this student during mathematics?

Imagine it is your first year of teaching. You have taken a position as a third grade teacher. One of your students has just moved to the United States from China. What do you think this child will need during mathematics instruction? How will you assess the child's needs? How will you support this student during mathematics?

Do you anticipate the needs would be different depending upon the continent of origin?

How comfortable would you feel about these two different situations?

Thank you for sharing your thoughts.

Discussion And Reflection Enhancement (DARE) Post-Reading Questions

1. What role might student country of origin play in your instructional strategies or expectations?
2. Are there norms in your classroom that facilitate isolation rather than community?
3. What role does outsourcing play in meeting the needs of Latino/a ELLs in your context?
4. How can we best prepare PSTs to teach mathematics to Latino/a ELLs?
5. How would prospective or practicing teachers you work with respond to the questions in the Appendix? Try it!

“DARE to Reach ALL Students!”



“[Equity is] being unable to predict students’ mathematics achievement and participation based solely upon characteristics such as race, class, ethnicity, sex, beliefs, and proficiency in the dominant language.”

-- Rochelle Gutiérrez (2007)