Preparing Teacher Candidates to Work with English Language Learners

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Abstract

We know little about how teacher candidates are prepared to work with English language learners (ELLs) in mathematics classes. This qualitative study, based on interviews with 16 instructors of mathematics methods courses for pre-service teachers, examined instructors' reported classroom practices regarding helping teacher candidates learn to work with ELLs in mathematics. Findings suggest that ELLs' needs may not be addressed in mathematics methods classes for varied reasons. This study has implications for mathematics teacher educators, PreK-12 mathematics teachers, and higher education and district level staff members who provide professional development for teachers.

Discussion And Reflection Enhancement (DARE) Pre-Reading Questions

1. What needs do ELLs have in the classroom in general and in the mathematics classroom, in particular?
2. What are some effective instructional strategies for teaching ELLs in the mathematics classroom?
3. Respond to the statement, "Mathematics is a universal language so ELLs should have little difficulty with it."
4. Reflect on the statement, "Good instruction for English learners views language as a resource rather than a deficiency."

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Mathematics Teacher Educators (MTEs) are tasked with helping their students learn to work with pupils with diverse needs (National Council of Teachers of Mathematics, 2000, 2014). This includes accommodating needs of English language learners (ELLs) enrolled in PreK-12 mathematics classes. What are MTEs doing in mathematics methods courses to prepare teacher candidates to work with ELLs? Are there constraints that may hinder them in seeking to address this topic? Our study, based on interviews with 16 MTEs who work with pre-service teachers (PSTs) in mathematics methods classes, addresses these questions.

Preparing Teachers to Work With ELLs

Teachers, administrators and other school staff need to understand issues related to the growing population of ELL students (Goldenberg, 2008). By 2025, one of four public school students will be an ELL (NCLEA, 2010 as cited in NEA Policy Brief, 2008, p. 1).

Lucas, Villegas and Freedson-Gonzalez (2008) report that, even though the number of ELLs is growing, "most mainstream classroom teachers have had little or no preparation for providing the types of assistance that such learners need to successfully learn academic content and skills through English while developing proficiency in English" (p. 1). It is not uncommon for pre-service mathematics teachers to enter the profession knowing little about the needs, resources and support that will be needed to teach mathematics effectively to ELLs (Chval & Pinnow, 2010). In fact, there is relatively little information concerning the knowledge of MTEs about ELLs (Arnold, 2013). Consequently, the authors wanted to learn what MTEs report about instructing teacher candidates on working with ELLs in mathematics methods classes. Such knowledge is indeed needed to inform continuing dialogue on how best to prepare mathematics teachers to work with ELLs.

Review of Literature

Opportunities for teachers to learn how best to educate ELLs has not kept up with ELLs' rapid growth (Samson & Collins, 2012). Though there is evidence that some teacher preparation programs are attempting to prepare candidates to teach ELLs, in general, most pre-service teacher educator programs, for various reasons, have "a long way to go" in developing necessary knowledge and skills among teacher candidates in this regard (Lucas, Villegas, & Freedson-Gonzalez, 2008, p. 2). According to a report from the U.S. Department of Education (2001), although 41% of K-12 teachers have ELL students in their classrooms, 72% of these teachers did not feel well prepared to work with ELLs. Even a decade later after these statistics were reported, Samson and Collins (2012) assert that mainstream teachers are still not able to fully meet the challenges of working with ELLs.

In mathematics in particular, many PreK-12 classroom mathematics teachers leave teacher preparation programs still holding misconceptions about ELLs and their needs (Costner, 2008; Moschkovich, 1999). Among them, the incorrect idea that having the ability to carry on a basic social conversation using *conversational language* (Cummins 2008) means the ELL should be able to understand and speak *academic language* (Cummins, 2008) in mathematics class. Other common myths are that a mathematics teacher is responsible for teaching only about numbers, as in "I'm not here to teach English – that's the ESOL teacher's job" (Costner, 2008, p. 31), that mathematics is its own language, independent of verbal speech, and that ELLs need help only with mathematics vocabulary and learning how to solve word problems (Costner, 2008).

The research literature on strategies for preparing teacher candidates is thin, but there are studies such as Fernandes' (2012) research on the process of PSTs doing task-based interviews in mathematics with ELL students. PSTs are sometimes shown research about working with ELLs that indicates the limitations of approaches to decoding words and word problems. Such approaches do not address the current increased emphasis on mathematical discourse and communication (Moschkovich, 2012; Vomvoridi-Ivanovic & Razfar, 2013).

Although "generalizing about the mathematical instructional needs of all students who are learning English is difficult" (Moschkovich, 2011, p. 18), two basic research-based principles suggest that good instruction for English learners views language as a resource rather than as a deficit and emphasizes academic achievement, not just learning English (Gándara & Contreras, 2009). ELLs should be encouraged to abstract, generalize, conjecture and engage in mathematical reasoning at the same level as native English speakers (Moschkovich, 2012). In order to accomplish this, classroom environments should furnish "abundant and diverse opportunities for speaking, listening, reading and writing" and "encourage students to take risks, construct meaning and seek reinterpretations of knowledge within compatible social contexts" (García & Gonzalez, 1995, p. 424). ELLs need to be involved in discourse within communities of practice, dialoguing about mathematics with peers, rather than be simply given individual help which, if used alone, only serves to isolate them from native English-speakers in the classroom (Chval & Pinnow, 2010).

ELLs require additional instructional support, beyond what is known to be effective for native English language-speaking mathematics students in general (Goldenberg, 2013). Additional support does not indicate lower expectations. It is essential that educators hold high expectations for the mathematics achievement of ELLs (Cady, Hodges, & Brown, 2010; Van de Walle, Karp, & Bay-Williams, 2012). Just because an ELL does not know as much English as his or her peers does not mean that the student should be expected to learn less mathematics.

Although there are several approaches to ELL instruction, one well-known general model is the SIOP or Sheltered Instruction Observation Protocol (Echevarria, Vogt & Short, 2012). This overarching model offers a framework of eight interrelated research-based components to support content area teachers. Goldenberg (2013) states that SIOP organizes instruction for ELLs and has empirical research-documented positive effects on student learning. Readily available materials, including entire books on teaching the subject of mathematics to English language learners, have been published using SIOP.

Moschkovich (2011) emphasizes focusing on mathematical reasoning, not just on accuracy in language. This can be accomplished by shifting to a focus on mathematical discourse practice, recognizing and supporting students to engage with the complexity of language, treating everyday language and experiences as resources (not obstacles), and uncovering the mathematics in what students say and do. Furthermore, in their guiding principles for teaching mathematics to ELLs, Ramirez and Celedón-Pattichis (2012) emphasize challenging mathematical tasks, providing a linguistically-sensitive social environment, supporting English while learning mathematics, using mathematical tools and modeling as instructional resources. Additionally, they suggest that MTEs identify ELLs' cultural and linguistic differences as potential resources, not obstacles, in the mathematics classroom.

Method

This was an exploratory study investigating what mathematics teacher educators (MTEs) report doing to prepare teacher candidates in methods courses to work with English language learners. The research question was: What do teachers of mathematics methods courses for pre-service teachers report doing to help teacher candidates prepare to work with English language learners in the mathematics classroom?

Description and Limitations of the Study

This was a qualitative study based upon in-depth individual interviews with volunteer participants. Limitations of the research were that: (1) data were collected from the 16 MTE volunteers who self-reported their own personal perspectives and classroom practices, (2) no actual classroom visitations were made by the principal investigators nor were the students of the teachers observed or interviewed, and (3) interviews were conducted via Skype and phone, not in person. Therefore, findings were limited to themes and ideas that arose from qualitative analysis of the verbatim transcripts of these one-time interviews.

Participants. Sixteen MTEs volunteered to participate in the study after being identified through a web search of U.S. mathematics teacher educators working at colleges and universities and invited via email. Those eligible were limited to those currently teaching mathematics methods courses for elementary and secondary teacher candidates in colleges and universities. All volunteers who met these criteria were accepted for the study. Fifteen held doctorates and one was in the dissertation-writing stage. There were 10 males and 6 females, and 13 of the 16 participants were

native English speakers. The interviewees came from institutions of higher education that were diverse in terms of region, size, and public/private status.

Data collection. Each participant took part in one semi-structured interview (via Skype or phone) conducted by the first author. The interviews progressed organically following the initial question, "Could you describe what you are doing in your mathematics methods course to help pre-service teachers learn to work with English languages learners in the mathematics classroom?" Follow-up questions, depending on participants' responses, were open-ended and designed to guide but not dictate the flow of the interviews (Carspecken, 1996). Data were digitally recorded and transcribed verbatim for qualitative analysis.

Data analysis. Interview transcripts were read and re-read using a process of constant comparison (Strauss & Corbin, 1990), re-reading and constantly comparing data, after which manual coding began. As analysis continued, themes emerged related to awareness of issues dealing with accommodating ELLs and the participants' commitment to having teacher candidates in their mathematics methods classes engage with these issues. It appeared that most of the MTEs' approaches could be classified based on levels related to commitment, ranging from *quite limited* to *strong*. In no way does this indicate a claim that every MTE will fit perfectly into one of four levels– rather, the various levels of awareness may be conceptualized as part of a continuum. To be placed at a particular level, a substantial majority of individual participants' statements had to reflect that level. When all 16 participants' data were analyzed, data from two of the 16 participants could not be classified into any of the four levels identified for the other 14 and therefore, those two participants' data do not appear in Table 1 but still informed conclusions and recommendations.

The first author prepared four separate data summary sheets, one for each level shown in Table 1. Data were re-read and re-examined until findings emerged which led to conclusions concerning the participants' access, professional development, intended curricula, required curricula and cultural connections to English language learners.

Results

In general, it can be said that participants in this study were aware of the presence of ELLs in U.S. schools, yet the extent of their knowledge regarding how to accommodate ELLs varied. Due to a variety of self-reported challenges, the MTEs also expressed different levels of commitment to preparing pre-service teachers to work with ELLs. Data analysis identified the four classifications of responses presented in Table 1.

Level One

Half of the interviewees in this exploratory study were classified as Level One: having no plans to explicitly discuss the needs of ELLs with teacher candidates in mathematics methods classes. In some cases, participants felt challenged and perceived they had no time to address this topic in their classes. Thus, they omitted the topic and concentrated on others they deemed to be "more important," or about which they felt themselves to be more expert. In other cases, participants went so far as to express resistance to including the topic of accommodating ELLs in their mathematics methods classes. Reported reasons included: the belief that different approaches are not needed for accommodating ELL mathematics students, the belief that mathematics is its own language, the belief that the focus should be on "best practices for all" to help ELLs, a stated lack of training in how to teach mathematics to ELLs, time constraints, and a belief that other classes or professional development courses PSTs might eventually take provided everything necessary for PSTs to learn about the needs of ELLs.

Level Two

MTEs at Level Two had limited plans to address the needs of ELLs. One assigned readings on the topic, but did not plan on discussing them in class. Another told PSTs about using manipulatives as an effective way to help ELLs learn mathematics, but did not mention other ways to help ELLs. Participants here, as in Level One, were challenged either by lack of time to teach, lack of specific knowledge on meeting the needs of ELLs, or both. Additionally, these participants reported that discussing how to work with ELLs "arose naturally" at times, such as when working with manipulatives, but the MTEs had only very limited plans to discuss the topic if it did not arise.

Level Three

At Level Three, MTEs expressed some commitment to addressing the topic of ELLs in their classes, and talked about

Table 1
Classification Levels of Responses from Research Participants

Level and Fraction of Participants	Example of a Statement Classified at This Level
No commitment to present PSTs with research-based practices for ELLs in mathematics. 7/14	"I think your question really is, 'Do I take time out of teaching them how to teach math to focus on English language learners to the exclusion of other students?' The answer is no, I don't…"
Limited commitment to presenting PSTs with research-based practices for ELLs in mathematics. 2/14	"In the methods textbook I chose, there was a piece that had to do with English language learners, so they read about it, but we just couldn't find time to discuss that reading."
Some commitment to presenting PSTs with research-based practices for ELLs in mathematics. 2/14	"In their lesson plans they do have to address ESOL standards and write an ESOL objective. And I tell them in math that one of the best ones to do is a vocabulary objective for math."
Strong commitment to presenting PSTs with research-based practices for ELLs in mathematics. 3/14	"…I talk to (them) a lot about using content based language learning techniques, or those things that CEMELA and those folks have written about. And then SIOP materials (with) mathematics specific texts, so we can look at the lesson plans these folks have researched and used and talk about how to use them in their own classroom…"

explicit methods in their instructional repertoire. Also, at this level, the teaching of ELLs might be addressed because instructors were required to do so by their university or college, as part of the curriculum. For instance, one participant stated that she accommodated ELL needs by requiring teacher candidates to include a "vocabulary objective for math" in lesson plans. Others went beyond this. Specific accommodations mentioned included "printing off the Spanish version of the textbook and using that" and "checking with your textbook company for [second language] ... materials…. Don't put them [ELLs] behind twice, with language development *and* mathematical development."

Level Four

At this level, participants were strongly aware of the needs of ELLs. They shared knowledge of specifics, such as the SIOP model, and planned to explicitly address misconceptions that PSTs might hold about English language learners. They were familiar with research on the topic and presented teacher candidates with solid opportunities to learn about ELLs' needs, including the need for discourse, challenge and participation in learning communities. Some created their own curricular activities when necessary, and some showed activism in sharing their knowledge with fellow MTEs. The quote below illustrates how one MTE expressed her strong awareness and commitment to working with ELLs.

> You should always plan for students that have English as a second language or who may speak well but not really understand the mathematics terminology. We talk about how to modify and make accommodations with all of our materials in the classroom: giving things ahead of time, certain students realizing, online glossaries, text-to- speech options, using content-based language learning techniques or those things that CEMELA [Center for the Mathematics Education of Latinos/as; math.arizona.edu/~cemela/] and those folks have written about. And then also pulling SIOP materials mathematics specific, so that they can easily picture… how to do things in their own classroom.

Conclusions, Implications, and Recommendations

This was an exploratory study, and its small sample, although diverse (see participant descriptions), means that the authors cannot claim that results can be uniformly generalized. Additional studies with larger numbers of participants are recommended. However, data from a small, exploratory study (such as this one) may be found to be transferrable to a greater population, depending upon the situation (Hatch, 2002). Additionally, results gleaned from the qualitative analysis of the data can contribute to the dearth of published research on the topic of preparation of preservice mathematics teachers to work with ELLs.

Several implications and recommendations would be con-

sistent with our findings. First, the study provided examples of teacher preparation programs that have no explicit plans to specifically prepare future mathematics teachers to work with ELL students in mathematics. This correlated to research cited earlier indicating a deficit in PSTs' preparation to work with ELLs, even though large numbers would be asked to do so (Samson & Collins, 2012). We suggest that colleges and universities consider requiring instruction about ELL accommodations in mathematics methods courses, and not just in general education classes. They should also make specific plans to support MTEs in implementing these requirements.

It was not uncommon for participating MTEs to adhere to misconceptions, such as the idea that mathematics is a *universal language*; thus, ELLs will not have much trouble excelling at it. This study supports previous studies (Moschkovich, 2011) that have refuted such ideas and called for the continued need of professional development for MTEs. The literature reflects that such continued professional development should include how to support ELLs in their development of both oral and written academic language in the context of mathematics. Additionally, it should include information on the importance of holding continued high expectations for ELLs and how to encourage and nurture ELLs to feel comfortable in their oral language and ability to participate in classroom talk with peers. Data and information from the present research, indicating that many pre-service mathematics teachers may not have been prepared to work with ELLs in mathematics, may be of interest to school leaders, and to district level staff who provide professional development for new or even experienced teachers. Participants in the present study varied greatly in how they approached the topic of ELLs in mathematics. This level of variability can affect what mathematics teacher candidates learn, and can result in inconsistency of instructional quality for ELLs. Therefore, in addition to professional development for MTEs (already discussed), this study also supports recommendations for continued professional development for all PreK-12 content area teachers in school systems.

Half of the participating MTEs in the study reported that they did not intend to add explicit instruction about ELLs in the mathematics classroom to the curriculum. Some assumed the topic had been covered adequately in general education courses. This is consistent with the research of Chval and Pinnow (2010), who found that 63% of the PSTs in their study "did not focus on *their* own actions [in helping ELLs] but rather, on the actions of others" (p. 7). MTEs should not assume that instruction on the needs of ELLs in general education courses is sufficient to produce teachers who can help ELLs succeed in mathematics. MTEs should be aware of the importance of the needs of ELLs as they relate to mathematics instruction. We recommend that all MTEs should be certain that this topic is included in mathematics methods courses.

There has been little published information about how MTEs help prepare teachers and teacher candidates to work with English language learners. This study seeks to begin addressing this gap. All students deserve access to mathematical thinking and learning (NCTM, 2000, 2014). By looking at teacher preparation courses through the lens of the statements and reported practices of MTEs, various levels of commitment to the mathematics education of ELLs became apparent in the participants. Therefore, it is hoped that continued professional development and research will increase the level of commitment by all MTEs so that addressing the needs of ELLs in the mathematics classroom may become an explicit part of their mathematics teacher preparation courses.

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Discussion and Reflection Enhancement (DARE) Post-Reading Questions

1. What specific instructional strategies would you suggest for working with ELLs in the mathematics classroom?
2. How could the SIOP Model (Sheltered Instruction Observation Protocol; see Echevarria, Vogt & Short, 2012) be effectively used to teach ELLs in the mathematics classroom? Give specific instructional strategies and detailed student activities that are not already covered in question 1.
3. What type of accommodations do *you* feel comfortable implementing with ELLs in the mathematics classroom?
4. How can good instruction for English learners use language as a resource rather than as a deficiency (Moschkovich, 2011)?
5. What should the mathematics education community do to help support MTEs in addressing the needs of ELLs in the mathematics classroom?
6. Discuss this statement: A general commitment to diversity and equity on the part of MTEs is not sufficient to ensure that mathematics teacher candidates will be adequately prepared to work with ELLs.