Journal of Multicultural Affairs

Volume 3 | Issue 2 Article 5

December 2018

Facilitating Pre-Service Teachers to Engage Emergent Bilinguals in Productive Struggle

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Facilitating Pre-Service Teachers to Engage Emergent Bilinguals in Productive Struggle Introduction

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"I should embrace that they can speak Spanish. I try to put myself in their shoes. I feel like the students can connect to the lesson better when they can count in Spanish" (Sarah (pseudonym), PST).

The 21st century saw an increase in students whose home languages are other than English in the United States. Emergent Bilinguals (EBs) comprised 10% of the total school population in 2014-15 (McFarland, 2016). Of this population, 66.1% of the students were in kindergarten through third grade, which is an indicator that the population of EBs will continue to grow. EBs face the challenge of learning academic language required of all students, while simultaneously navigating social and academic spheres in two or more languages. Therefore, it is imperative for teachers to learn to best engage EBs and provide them with instructional resources to help them grow academically, socially, and emotionally.

A common misconception about EBs is they will be successful in mathematics classes because this subject is considered a universal language (Murrey, 2008). However, learning both academic content and language at the same time can be a challenging task if the teacher is not adequately prepared to meet EBs' needs. The values word problems in mathematics promote typically are associated with White, heterosexual, U.S. American norms. If educators do not know who their students' identities are, then some questions in mathematics could promote values that do not relate to the student (Bright, 2016). This is detrimental for EBs' learning through the continued marginalization of their culture in education institutions. Teachers can combat this marginalization through creating a classroom environment that challenges the dominance of society's norms.

One approach to serving marginalized populations is how an educator can engage EBs in productive struggle. Students learn concepts more deeply when they are provided opportunities to engage in problems that are challenging for them and yet within their zone of proximal development (Vygotsky, 1978). Zone of proximal development refers to providing challenging instruction that is not too rigorous or easy. Productive struggle refers to the process of students expending effort on math problems without the teacher reducing the academic cognitive level. The teacher, in productive struggle, builds on students' thinking, prior knowledge, and encourages the students to justify their answers. This involves the educator asking questions to facilitate higher ordered thinking (Forman & Ansell, 2001; Sfard, 2007; Yackel, 2002). There are four levels of questions teachers can utilize to engage children in productive struggle. The four levels are described below from Warshauer's (2014) study on increasing the cognitive load in mathematics through productive struggle.

> In a telling response, the teachers generally provided sufficient information for the students to overcome the struggle, often by removing the cognitive demand… Directed guidance responses appeared to redirect student thinking toward the teacher's thinking, narrowed down possibilities for action, directed an action, broke down problems into smaller parts… Probing guidance made students' thinking visible and served as the basis for addressing the

> students' struggles… Affordance type of teacher responses provided opportunities for students to continue to engage in thinking about the problem and build on their ideas with limited intervention by the teacher.

Language barriers may inhibit educators from effectively engaging EBs in productive struggle through questions used and consequently lower the cognitive demand (Ewing, 2016).

As future educators in a society where diversity is increasing, it is important to be aware of how teachers can engage EBs. This will allow educators to teach their students more successfully and develop an environment where every student can prosper. The guiding question in this study was, *how do PSTs view EBs and how does their perceptions of EBs influence how early they intervene when a student is struggling?*

Literature Review

For the purpose of this review of literature, the authors focus on how productive struggle might be used to engage students, strategies to engage EBs, and how educators can prepare PSTs to teach mathematics to EBs.

Emergent Bilinguals and Language in Mathematics

Schleppegrell (2012) points out that language is required for students to justify their answers. Furthermore, language in mathematics tends to be dense. To complicate matters, teachers tend to dominate the discourse and do not allow students enough opportunities to develop their language (Stein & Smith, 2011). There is ample research suggesting that students learn mathematical concepts more deeply when they are provided opportunities to justify their answers rather than merely listen to teachers explain concepts (Forman & Ansell, 2001; Sfard, 2007; Yackel, 2002).

The fact that language in mathematics is more challenging than other subjects makes it even harder for EBs to participate in monolingual classrooms (Schleppegrell, 2012). Thus, teachers can develop their students' English during mathematics class by providing them opportunities to listen, speak, read, and write about mathematics (Moschkovich, 2013). Borgioli (2008) adds to have language objectives as well as mathematics objectives for lessons. Teachers may be tempted to give computational problems to EBs with minimal language, but this would not help develop language proficiency. Martiniello (2008) suggests that assessments use controlled vocabulary to measure EBs' mathematical aptitudes, but teachers immerse EBs in rich discourse throughout the curriculum to develop English proficiency skills.

Moschkovich (2013) explains that although it is the teachers' role to develop students' language in mathematics, it is also important to focus on students' mathematical arguments. She shares how a student mispronounced the word "rectangle," but had a strong mathematical argument. If teachers spend too much time correcting students' grammar, they may not be willing to take risk and justify their mathematical arguments. Moschkovich (2013) states teachers should allow students to use their home language to learn new content and focus on mathematical concepts, not just the accuracy of student language or vocabulary. These strategies promote teacher language that provides EBs access to the content.

Math Mindset

Environments with low anxiety, mathematics problems connected to real-world examples, and activities utilizing students' prior knowledge fosters a classroom with high participation from EBs. Bridging students' background knowledge and connecting problems to the real-world creates meaningful learning opportunities for students (Borgioli, 2008). Leonard & Guha (2002) discussed a similar experience in their study, they analyzed how using a culturally relevant teaching strategy, helped create an environment that allowed students to see how real-world problems can be solved by using mathematics. Murrey (2008), stated engaging students in authentic, meaningful, real-world tasks creates the opportunity for students to use authentic mathematics language when solving a problem. This approach is also beneficial for EBs because it creates a bridge from their prior knowledge and experiences to new concepts they are learning.

EBs benefit from an environment that assists and scaffolds their language proficiencies (Fernandes, 2011). This is because some EBs may not interact in the classroom because they are either too nervous to speak (Borgioli, 2008), or they lack the language proficiencies needed to participate (de Oliveira, 2011). A non-threatening environment where students feel safe to voice their answers in class is important to engage EBs (Ewing, 2017). Murrey (2008) posits one way to decrease the anxiety for EBs is to allow students to collaborate with one another and work in groups. This allows students to talk amongst themselves instead of having to engage in a whole-class conversation.

There is no single approach to teaching EBs (de Olivera, 2011), but educators should teach PSTs the importance of language in mathematics and strategies that can be used to engage EBs (Ewing, 2017). The type of language PSTs use can also depict how deeply students engage the material (Warshauer, 2015). Language plays an important role in learning and expressing understanding of mathematics. In addition, this knowledge can help future educators create intentional lessons that include both mathematical and language content to support EBs engagement in productive struggle.

Productive Struggle

In a handbook summarizing research on mathematics education, Hiebert and Grouws (2007), discuss effective strategies of teachers. They stress that one of the strategies is for teachers to increase the cognitive load for students by refraining from giving them too much help when solving problems. Dixon, Adams, and Nolan (2015) add that students should be given ample opportunities to engage in productive struggle—tasks that are challenging but within their grasp to solve. The literature suggests that students learn mathematical concepts more deeply when they engage in challenging tasks (Clarke et al., 2014; Hiebert et al., 1997; National Council of Teachers of Mathematics, 2014).

Strategies and indications of productive struggle involve four components; questioning, encouraging, giving students time, and acknowledging students' struggle (Warshauer, 2015). When teachers ask students questions they should build on their thinking and help them identify their struggle. Educators need to support students' struggles, rather than focusing solely on finding the correct answer. Instead, the teacher's focus ought to be on the process of the students' struggle. Students benefit when teachers provide them ample amount of time to make sense of problems. The provision of

wait time will allow students to create and use their strategies to understand the meaning of the problem (Warshauer, 2015). Acknowledging students' struggles is a natural and important part of developing a deeper understanding of mathematics. This acknowledgement encourages students to continue to work in depth with mathematics problems.

The choices teachers make in response to students' struggles has a large impact on student learning. Responses can either enhance or diminish student learning (Warshauer, 2015). Opportunities that enhance student struggle, allow students to engage in deeper meaning of the mathematical concepts. Utilizing this strategy with EBs can help teachers engage these students in mathematics lessons by building on their prior knowledge and acknowledging the effort used to solve a problem (Ewing, 2018). This approach will encourage and strengthen students' attitudes towards engaging in challenging problems (Warshauer, 2015).

In this paper, we use Warshauer's (2015) framework to observe PSTs as they asked EBs questions while tutoring mathematics. Warshauer notes teachers are faced with continuous choices for responding to students' questions. Categories of responses teachers may choose from include: supply information or suggest a strategy (telling response), redirect students' thoughts (directive guidance response), ask the students for reasons or justifications of their work (probing guidance), and build on students' thoughts or ask for an explanation of their work (affordance). These questions can either enhance or lower the cognitive level of students' learning. Teachers, who use the pedagogical approach of productive struggle, focus on providing students the opportunity to engage mathematical concepts for deeper understanding.

Research Context: Mathematics Lesson Course

The context of this study was an elementary mathematics methods course at a teachers' preparation education program in Eastern Texas. The course consisted primarily of first semester seniors who were predominately White females (*N=33*). Their educational experience prior to the course consisted of introductory courses to early childhood and early adolescent education and a placement in a local, diverse public school for the duration of one semester. The demographics of the public school were 37% Black/African American, 2% Asian American, 33% White/European American, 23% Latinx/Hispanic American, and 70% Economically disadvantaged (Texas Tribune, 2017). Furthermore, social justice and differentiation practices, and English Second Language instructional strategies were infused in all required courses. The focus for the mathematics methods course was to foster a positive attitude towards math with an emphasis on growth mindset (Dweck, 2016) to create future teachers who have a love for learning math. This was accomplished through creating a safe, inviting environment where the intended outcome was for students felt valued and appreciated.

The professor for the mathematics methods course attempted to create a safe, inviting environment through developing a sense of community. Community creates a risk free environment, which encourages students to take risks (Hiebert & Grouws, 2007). This community environment was fostered through up-beat music played at the beginning of each class and circle discussions where PSTs can see and learn more about each other and their experiences, including mathematics. Also, to try to build positive relationships with students, the professor arrived to class 15 minutes early

and talked to the PSTs about their personal lives and daily events. These steps were aimed at fostering a friendly, collaborative community and culturally relevant environment in the classroom.

Culturally relevant pedagogy was infused through writing seven lesson plans (three multiplication, three division, one fraction) aimed at engaging low socio-economic students in productive struggle for mathematics. Lesson plans were aligned to multiplication and division content standards for fourth grade Title I students and implemented through seven lessons throughout the duration of one semester. PSTs were challenged to develop strong relationships with their tutees (children in fourth grade) in order to further students' knowledge and mindset for mathematics. Furthermore, throughout the duration of the semester, PSTs had their tutees draw pictures daily depicting their interests. These pictures would later be used to illustrate books created by the PSTs to engage their learners in productive struggle. The books were written by the PSTs with a fractions mathematical focus to engage and guide their lesson.

Participants

Three PSTs completed seven mathematics lessons with two fourth grade EBs, three interviews before three different lessons, and three interviews after three different lessons. The participants were PSTs from East Texas. The participants were female, two identified as White and one identified as Hispanic. The study's trustworthiness was strengthened through the random selection of three PSTs enrolled in a four-year university pursuing a degree in early childhood education because of their close relationship with the focus of the study. As PSTs they "influenced the adequacy of the sample" (Olson, 2011, pg. 25) because their demographics aligned to the scope of the study.

The recruitment process for PSTs in the study involved a short presentation, presented by the lead author Benjamin J. Dickey, about the focus of the study and what participants would be asked to do if they decided to participate. After the presentation, Benjamin then pooled the names of PSTs who would be tutoring EBs in the mathematics methods course, then drew one name from the pool at a time. Next, Benjamin proceeded to ask the potential PST participant if they would like to participate in the study. If the PST said yes and wanted to be a participant, Benjamin handed them a consent form and told them if they had any questions they were available to meet in person or communicate via email.

Tutees for the study were recruited through the elementary school where the PSTs would be teaching. The researchers contacted the assistant superintendent of the district and the principal of the school to receive permission to work with the students. Once permission was granted, a flier was sent to families of EBs in fourth grade. The flier stated the purpose of the research study and how their child could potentially be involved. Families then returned the fliers with consent forms. Consent forms were used to comply with IRB protocols for both district and university guidelines. From the group of students who were given permission to be a part of the study, the researcher divided them into three groups and assigned a PST at random (drawn out of a hat) to work with the group for the rest of the semester.

Data Collection and Analysis

This study utilized four researchers who triangulated two data sources (Gall, Gall, & Borg, 2014) for how PSTs engaged EBs in productive struggle. The sources of data

included: audio recorded observations for each of the seven lessons the participants performed and three pre and post interviews after the first, fourth, and seventh lesson. The lessons and observations were audio recorded and later transcribed. During observations of the lessons, researchers took field notes based on non-auditory signs of productive struggle. Non-auditory signs of EB's engagement in productive struggle included focus and determination on a mathematics problem. The researchers monitored how often the EBs lost focus or were frustrated during the problem-solving process. These two sources of data provided the study with rich information, which will be used to inform the researcher how PSTs engage EBs in productive struggle.

The protocols for the interviews included setting a time, date, and location for each interview prior to the start of the investigation. The researchers would interview the PSTs (participants) in an area they chose. The interviews were guided with four general questions on how prepared the participants felt in meeting the needs of EBs and engaging EB's in productive struggle. When the participants answered the questions, the researchers would ask probing, open ended questions based on their responses to elicit further details on how the participants were going to engage or how they felt they engaged EB's in productive struggle.

Data were then organized and analyzed through a six-step process (Marshall and Rossman, 2011). The first step was to derive data from the seven one-hour tutoring sessions was organized based on the questions asked by the Pre-service teachers. The questions were categorized based on Warshauer's (2015) definition of productive struggles' questioning levels (telling, directive guidance, probing guidance, and affordance). Data derived from the three pre and post interviews on the first, fourth, and seventh lessons were categorized based on knowledge the participants had in engaging EB's in productive struggle. The researchers' analyzed where this knowledge was learned and how effective the participants were at implementing the theories into practice. Second, the researchers after each lesson and interview, transcribed the data. They would then analyze the transcript three times checking their coding and looking for new insights. Third, the researchers highlighted and coded the data using Warshauer's (2015) framework for questioning strategies used for engaging middle school students in productive struggle. For interview data the researchers' highlighted data associated with the participants' knowledge of productive struggle and where they acquired their knowledge. Fourth, the three researchers met twice weekly to discuss the data and how the datum was coded. A table in a word document was used to organize the coded data for further analysis. The researchers would then review each other's coded responses and examine any new information or themes elicited during the process. Researchers would also question each other's coded data and asked the question why to challenge each other's reasoning and elicit conversations focused on the meaning of the data. Fifth, if new themes or codes immerged, the researchers would review the literature and re-organize the existing data. New themes were also introduced to the mentor of the researchers. The mentor (seasoned qualitative researcher) would ask the researchers' questions about their study to elicit insight on what the scope of the study was and if the new data had any alternative assumptions. Lastly, once the data had been collected and analyzed the researchers began to form themes based on the information that was discussed. The themes were created based on common codes noticed throughout the duration of the

investigation. This process of collecting and analyzing the data provided the researchers with insight as to how pre-service teachers can engage EBs in productive struggle.

Observations

Each participant was observed teaching seven lessons to two students during a three-month period in Fall of 2017. The lessons lasted for one hour each, and 21 total lessons were observed for a total of 21 hours of observations. During observations researchers recorded the lesson on a tape recorder to capture productive struggle interactions. The researchers kept field notes during the process noting non-auditory behaviors that demonstrate students and teachers engaged in productive struggle. Notes taken during observations were centered on cues of productive struggle that could not be captured through an auditory recording device. The guiding research question during the observations was *how do PSTs view EBs and how does their perceptions of EBs influence how early they intervene when a student is struggling.*

When the researchers analyzed the observation data, they focused on the kind of teacher responses to their tutees' struggles. The kind of teacher responses the researchers focused on included: telling, directed guidance, probing guidance, and affordance responses (Warshauer, 2014). Inter-researcher reliability was ensured during this process through weekly meetings where researchers would analyze the data collected by another researcher and either agree or disagree with their classifications of the data. This data gave insight on how PSTs respond to various student struggles and how these responses enhanced or inhibited learning.

In an attempt to strengthen the reliability of the study, the researchers used the process of inter-related reliability. Throughout the duration of the study, the researchers used inter-related reliability through collaboration when analyzing the lessons. They would challenge each other's reasoning for the productive struggle categories used for the participants' actions during their lessons. This process was done in order for the researchers to come to a consensus on how to best categorize PSTs' responses to students' struggles.

Interviews

The pre and post interviews were conducted with the first, fourth, and seventh mathematics lessons the participants performed. The interview style chosen for this case study was formal semi-structured. This style was chosen because formal semi structured interviews allows the researcher to "follow up on ideas raised by participants" (Olson, 2011, p. 36). This format gives the participant and researcher a common starting point, allows the interviewee to tell their story, and gives the interviewer the option to pursue ideas that the participant has stated. If an answer was unclear or more information was needed, the researcher has the flexibility to follow up and ask more probing questions to clear what information was communicated. The common starting point is derived from the three to four general, broad questions the researcher has prepared prior to the interview. An example question from the pre-interview includes: *what is your most important goal is for this lesson? Why?* An example question from the post interview includes: *Do you think your lesson engaged your students in productive struggle? Why?*

Findings

The researchers found five themes based on Warshaur's (2015) framework of productive struggle: (1) Productive struggle was not infused throughout the program. (2) PSTs used 31% telling based questions and 36% directive guidance questions at the beginning of the semester. At the end of the semester the PSTs used 11% telling based questions and 48% directive guidance based questions. (3) No apparent increase in affordance questions used. (4) Two EBs spoke only English at the beginning of the semester; however, later they began to vocalize their thinking in Spanish. (5) Culturally relevant pedagogy was integrated into almost all courses PSTs were required to take.

Theme 1

According to interviews, the PSTs learned cultural relevant pedagogies in many courses, but the concept of productive struggle was new to the mathematics methods course: "Well, I hadn't heard about productive struggle until this semester. I think maybe like introducing it earlier would have been, would have been helpful. Um, but I'm really glad that I learned it in this class" (Nora (pseudonym), PST). The term productive struggle was not explicitly used during the course until the last three weeks, but the pedagogy of productive struggle was implicitly applied to discussions and reading for PSTs throughout the semester. For example, after observing the PSTs dominating the discourse during a tutoring session, the professor asked the PSTs to be quiet for two to ten minutes so the fourth-grade students could have opportunities to make sense of problems and persevere to solve them on their own. Thus, productive struggle as a practice was supported through actions the professor utilized.

Theme 2

The PSTs saw growth in the use of directive guidance questions (see Table 1). Furthermore, due to the growth of directive guidance-based questions, the PSTs decreased the use of telling based questions during their tutoring (see Table 1).

Table 1

Frequency (%) of Directive Guidance (DG) and Telling (T) Questions Used

	Sarah % of T	Sarah % of DG	Nora % of T	Nora% of DG	Heather % of T	Heather % of DG
Lesson 1	30	27	37	33	25	49
Lesson 2	40	36	21	39	28	69
Lesson 3	31	42	15	39	NA	NA
Lesson 4	6	33	20	45	17	41
Lesson 5	17	65	6	46	14	60
Lesson 6	5	33	25	51	NA	NA
Lesson 7	6	33	9	45	19	66

**The NA represents either the PST or student was absent for the lesson.*

Overall, Table 1 suggests the PSTs' developed stronger questioning strategies in the use of directive guidance-based questions during their tutoring sessions.

Theme 3

Despite the increased use of directive guidance-based questions used by PSTs, there was no documented growth noted for using affordance questions. Instead, this category fluctuated in use between zero and nine percent of all questions used (see Table 2).

Table 2 demonstrates the fluctuation seen in use of affordance-based questions.

Table 2

Frequency (%) of Affordance (A) Questions Used

	Sarah % of A	Nora % of A	Heather % of A
Lesson 1	0	4	0
Lesson 2	0	0	0
Lesson 3	9	0	NA
Lesson 4	0	0	2
Lesson 5	5	6	6
Lesson 6	0	0	NA
Lesson 7	0	0	0

**The NA represents either the PST or student was absent for the lesson.*
Lessons 1-3 were over multiplication, lessons 4-6 were over division, and lesson 7 was over fractions.

It should be noted, although there were no affordance-based questions used by the PSTs during the last two lessons they used 13 affordance-based questions during lesson five. A few PSTs stated they felt more confident with division and multiplication than they did teaching fractions. This concept was demonstrated in the following quote: "I believe I am stronger with multiplication of the three. I struggled with fractions in school, and explaining division can at times be confusing with larger numbers for younger students that are trying to divide" (Heather, PST). Hence, consistent with other research, PSTs benefit from having strong content knowledge. Although they used fewer telling questions (see Table 1), the PSTs may not have felt confident enough to ask their students the most advance productive struggle questions when they were not familiar with how to teach fractions.

Theme 4

During the tutoring sessions, two EBs began to vocalize their thinking in Spanish. This did not occur at the beginning of the tutoring sessions when the PSTs and fourth grade students were beginning to meet each other. The code-switching occurred toward the later end of semester. The EBs who code-switched did not vocalize their thinking in Spanish directly towards the PSTs. Instead, they often spoke Spanish to themselves when solving problems during their work time. Perhaps, the EBs began to code-switch because they potentially felt more comfortable with their tutors.

Theme 5

When interviewing the PSTs, it was revealed culturally relevant pedagogy was often discussed in relation to tutoring and engaging EBs in productive struggle. The PSTs expressed the importance of relating content to the students' lives (see Table 3). This pedagogy was infused through courses the PSTs were enrolled in during their collegiate career.

Table 3

Examples of Cultural Relevance as Engagement

	Cultural Relevance
Example 1	I think that if you make it like uh similar to their life or if you add something they like they're more likely going to pay attention or think about it in a better more positive way instead of just thinking I'm just dealing with numbers and trying to figure this out.
Example 2	Using things that they like. Especially using the board game! They really liked the board game the whole time! Like I've used it for every lesson and they've loved it every time! I think just gearing the lesson to what they like helps!
Example 3	**Interviewer:** I saw at the end of your lesson you spoke Spanish with your students, can you tell me about that? **PST:** Yes, so I asked them about like different traditions that they do during the Thanksgiving and uh Christmas holidays. And they were talking to me and you know like um mentioning food that they eat or stuff for celebrating those holidays like tamales and um they said they brought up benulo and pisole and I just wanted them to talk about kind of their home life and so they, they enjoyed that and they got talking.

Table 3 highlights various quotes demonstrating the PSTs' knowledge about culturally relevant lessons and techniques they had learned from their collegiate courses. Despite the PSTs understanding of culturally relevant material, there were no discussions over rigor for students. The PSTs' courses did not always integrate discussions or practices of how to enhance lessons through rigor. "Well I hadn't heard about productive struggle until this semester. I think maybe like introducing it earlier would have been, would have been helpful. Um, but I'm really glad that I learned it in this class" (Norma, PST). This quote from a PST demonstrates rigor for all students was not discussed often during their collegiate courses. Due to this, the PST felt they could have benefitted from this knowledge if it was presented earlier in their undergraduate career.

Implications and Conclusion

This study can be useful for teachers as a reminder of the importance of maintaining high expectations for EBs in mathematics courses and reframing from reducing the cognitive load when providing access to the content (Harper & De Jong, 2004). While authors recognize the need for more research in this area, this study can start the conversation for facilitating PSTs to engage EBs, in mathematics. Current teachers express a lack of preparation to engage EBs (Lucas, 2011). Thus this research emphasizes the importance of preparing future teachers to meet the needs of EBs in one area of mathematics, such as productive struggle. During this study, PSTs were challenged to meet the needs of EBs. The PSTs met this challenge through engaging the EBs in culturally relevant practices. When children can connect with the material they are learning they are more likely to develop deep mathematical understanding (Ewing, 2018). The PSTs may have been effective at engaging EBs in culturally relevant practices because this pedagogy was infused throughout a majority of their courses.

Despite the PSTs ability to engage EBs in culturally relevant practices, their preparedness to engage EBs in productive struggle was limited. The PSTs did progress in their development from using telling based strategies at the beginning to more directive guidance based approaches towards the end of the semester. This growth was beneficial for the EBs in enhancing their learning through questions requiring higher cognitive thinking (Warshaur, 2015). However, affordance based questions, the highest ranking of productive struggle, was used minimally by the PSTs. When asked, the PSTs expressed productive struggle was not integrated in a majority of their courses. Instead, the only time PSTs were taught how to engage EBs in productive struggle was during the mathematics methods course. This contradicts most research findings for Educators. Instead of only having one course focus on engaging EBs in productive struggle, this pedagogy needs to be integrated into a majority of courses PSTs are required to enroll in (Ewing, 2016).

With the burgeoning population of EBs, educators should not continue to teach PSTs the same way. Thus, tutoring in methods courses may be one avenue for facilitating PSTs to meet the needs of EBs. Furthermore, our society is becoming increasingly complex as globalization continues to diversify our world. Therefore, teachers must be inter-culturally competent and able to educate EBs.

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Appendix A

Table 1

Frequency (%) of Directive Guidance (DG) and Telling (T) Questions Used

	Sarah % of T	Sarah % of DG	Nora % of T	Nora% of DG	Heather % of T	Heather % of DG
Lesson 1	30	27	37	33	25	49
Lesson 2	40	36	21	39	28	69
Lesson 3	31	42	15	39	NA	NA
Lesson 4	6	33	20	45	17	41
Lesson 5	17	65	6	46	14	60
Lesson 6	5	33	25	51	NA	NA
Lesson 7	6	33	9	45	19	66

**The NA represents either the PST or student was absent for the lesson.*

Appendix B

Table 2

Frequency (%) of Affordance (A) Questions Used

	Sarah % of A	Nora % of A	Heather % of A
Lesson 1	0	4	0
Lesson 2	0	0	0
Lesson 3	9	0	NA
Lesson 4	0	0	2
Lesson 5	5	6	6
Lesson 6	0	0	NA
Lesson 7	0	0	0

**The NA represents either the PST or student was absent for the lesson.*
Lessons 1-3 were over multiplication, lessons 4-6 were over division, and lesson 7 was over fractions.

Appendix C

Table 3

Examples of Cultural Relevance as Engagement

	Cultural Relevance
Example 1	I think that if you make it like uh similar to their life or if you add something they like they're more likely going to pay attention or think about it in a better more positive way instead of just thinking I'm just dealing with numbers and trying to figure this out.
Example 2	Using things that they like. Especially using the board game! They really liked the board game the whole time! Like I've used it for every lesson and they've loved it every time! I think just gearing the lesson to what they like helps!
Example 3	**Interviewer:** I saw at the end of your lesson you spoke Spanish with your students, can you tell me about that? **PST:** Yes, so I asked them about like different traditions that they do during the Thanksgiving and uh Christmas holidays. And they were talking to me and you know like um mentioning food that they eat or stuff for celebrating those holidays like tamales and um they said they brought up benulo and pisole and I just wanted them to talk about kind of their home life and so they, they enjoyed that and they got talking.