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Mathematics and English Language Learners

 Mathematics is not solely a struggle for English speaking students. English Language Learners (ELL) struggle with understanding concepts in mathematics as well. Not only do these students have difficulty in mathematics, they also struggle in many content areas. Some people may say mathematics should be easy for them, because it is simply numbers. However, this couldn’t be farther from the truth. Today’s mathematics curriculum is emphasizing problem-solving skills through word problems and real-world scenarios. These problems contain words and sentences, not just numbers. Students have to be able to read the problem, determine what the problem is asking, understand the concept, and then be able to solve for the correct solution. The difficulty English Language Learners have with these problems is the actual language in the problem. Many times translations from Spanish to English, or French to English, or Japanese to English are not exact. Words in the English language have many different meanings that may not correlate with another language.

 This paper will reveal the difficulty that English Language Learners have with mathematics in school. I will also describe researched strategies to effectively teach ELL students in a way that they will be successful in a mathematics classroom.

ELL stands for English Language Learners. The former term was ESL, English as a Second Language. The program that these students can be a part of is called ESOL, English to Speakers of Other Languages. This is a program to help ELL students reach proficiency in the English language. The Georgia Department of Education believes the following is the purpose of the program: “The program’s overarching standard is that students will use English to communicate and demonstrate academic, social, and cultural understanding” (Georgia Department of Education, 2013). The District of Columbia Public Schools define ELL as “a linguistically and culturally diverse (LCD) student who has an overall English Language Proficiency (ELP) level of 1-4 on the ACCESS for ELLs™ test administered each year" (District of Columbia Public Schools, 2012). Many English Language Learners come to the United States as immigrants (sometimes legal, sometimes not). When the children are enrolled in schools, they are given an ELL test (as mentioned above) to determine their ELL level. I teach in a school that has a large population of ELL students. Some of these students are receiving the ESOL and ELL services, and some are being monitored. When an ELL student is monitored, it means that they have scored high enough on the ELL test, but they need to be watched in case services need to begin again.

The U.S. State Department describes ELL students as “recent newcomers to the country and to the international school community, for a while they may remain silent in class as they adjust to a new school, environment and culture, unless there is a native language comrade to interact with” (2006). I have experienced this silence of my ELL students during this adjusting period. As a teacher, because of the silence of these students, worries of ability and understanding surface. Teachers wonder whether the new ELL students understand what they are trying to teach. The U.S. State Department believes that “Knowledge of more than one language and culture is advantageous for all students” (2006). A partial definition of ELL created by the U.S. Congress is anyone “(A) who is 3 to 21 years of age; and (B) who is enrolled or preparing to enroll in an elementary or secondary school; and (C)(i) who was not born in the United States or whose native language is a language other than English” (2001). This definition was created with the initiation and implementation of the No Child Left Behind Act of 2001.

Luciana C. de Oliveira believes that “Teachers’ attitudes and beliefs about ELLs can be influenced by their lack of empathy for these students’ experiences and backgrounds” (2011). Many teachers do not have an understanding of ELL students and their experiences. Therefore, it is hard for the teachers to relate to the students, which in turn makes it difficult to teach these students effectively. For students to learn to the best of their ability, they have to feel comfortable in their classroom. They also have to feel like the teacher cares about their education. Oliveira also believes that “teachers need not only to learn strategies to work with ELLs but also to feel what it is like to be language learners themselves” (2011). Teachers in Oliveira’s study completed a mathematics simulation in Brazilian Portuguese. The participants were teachers and pre-service teachers in Indiana. The idea was for the teachers and the pre-service teachers to develop an awareness of the experiences and feeling of an ELL student in a mathematics classroom. The author found that the teachers and pre-service teachers were frustrated during the first phase of the simulation. During the second phase of the simulation (in this phase, ELL strategies were implemented), the teachers and pre-service teachers were less frustrated. (de Oliveira, 2011). This is proof of the need for ELL strategies to be employed in classrooms where ELL students are in attendance. Any person that has been to a foreign country, understands the difficulty of navigating a foreign land, in a foreign language. ELL students feel the same. They want to fit in with the students around them, which includes fitting in based on their language skills. They have the need to be accepted, like all students. It is harder for them because of their limited English proficiency. Oliveira closes her article with the following statement, which all teachers need to put into practice: “Feeling like English language learners through a math simulation like this gives teachers the experience of being in ELLs’ shoes” (2011). The best way to learn and truly understand another person and their experiences is through their shoes.

 Students who are identified as ELL in school receive services to help them succeed in the classroom. These services may vary depending on state and district regulations. Some services even allow students to receive instruction in their native language (Uro & Barrio, 2012). “State and district policies regarding instructional services for ELLs govern not only whether a student can opt out of the services but also, in some cases, whether students can opt into instruction in their native languages (Uro & Barrio, 2012).

 Another struggle that ELL students go through in school is having the support from trained teachers that they need to be successful, not only in mathematics classrooms, but in all content areas. ELL support is becoming more of a need because of the increased number of immigrants coming into the country. The children of these immigrant families are enrolled in schools and many of them qualify for ELL services. The more ELL students there are, the more support is needed in this area. Uro and Barrio believe that “The turnover of instructional staff in urban districts, coupled with the growing number of ELLs, is pressuring districts to step up their recruitment efforts” (Uro & Barrio, 2012). Schools are in need of teachers that can support the ELL students in attendance. Pre-service education programs are offering courses to become ESOL certified. These courses, once taken, allow the teacher to work with ELL students to provide them with the services they need. Limin Jao cites that “Today’s North American classroom populations are increasingly diverse” (2012). Jao further states that “There are students from different backgrounds, races, languages, ethnicities, and social groups in all classrooms, including mathematics classrooms” (2012). Our country is becoming more and more diverse each day. This fact solidifies the need for teachers who are qualified to teach ELL students and for effective strategies to be created and implemented to help these diverse students succeed in U.S. schools. Jao feels that ELL students struggle with “the vast English vocabulary that they have to learn. Students need to learn the social language as well as the academic language of their new culture” (2012). Not only do students have to learn the academic language of English, but they have to learn the social English, and new social skills that are specific to the U.S. Taube and Jasper state that “A majority of the English language learners (ELLs) in our country have not been successful in mathematics classes, evidenced by poor results in mathematics assessments and higher dropout rates compared to English proficient students.”

 Though teachers and administrators focus on the challenges of ELL students, they do bring strengths with them as well. Jao cites that “There are often certain properties of an

ELL’s native language that may in fact boost the students’ mathematical ability” (2012).

 Just as the types of services for ELL students are specific to the state and district, so are the requirements for the ESOL teachers. Some states and districts do “not require any particular endorsement, license, or bilingual certification of general education teachers who are instructing ELLs” (Uro & Barrio, 2012). This fact does not demonstrate awareness of the ELL students in our schools. Uro and Barrio state that “Very few districts require professional development for the general education teachers on ELL strategies” (2012). This confirms the need for teachers to be trained to teach ELL students. It also proves that many general education teachers are not qualified to teach ELL students effectively. Uro and Barrio believe that “there are numerous programs and activities in place to improve the academic attainment of ELLs but that considerable work remains to bring these students to parity with their non-ELL peers” (2012). Just as research has been done with gifted and talented students, and with students with disabilities, research to effectively teach ELL students needs to be done so that these students receive the services they need to succeed. These students deserve a quality education, equal to any other student attending a public school in the U.S. Jao suggests that “As these classroom dynamics continue to change, so too should the practices of mathematics educators” (2012). Teachers should constantly grow and learn; teachers are never truly done with their education. They can learn as much from their students as they teach them. Teachers should be able to adapt their instructional practices to fit the needs of their students so that their students have every chance possible to be successful in their education.

 Even though strategies are available through the internet and books, teachers struggle with finding the time to look for them. The Council of the Great City Schools found that their teachers believed that though “good materials exist, finding them can be difficult and time consuming” (2013). They also gave three recommendations for incorporating and creating effective strategies and resources:

* “Improve the quality of instructional materials for ELLs. There should be strong collaboration between publishers and staff members--teachers, ELL specialists, and instructional coaches--from large urban school districts who work directly with ELL students in order to develop and review instructional materials.
* Develop high-quality professional development for general education and ESL teachers in ELL strategies that are aligned to the Common Core State Standards. This will require an increased commitment to ELLs to ensure they meet the requirements of the common core.
* Ensure that high-quality ELL instructional materials are readily accessible for general education and ESL teachers. It is imperative that all those involved in teaching ELLs develop and review high-quality instructional materials and make them available to teachers who need them.” (Council of Great City Schools, 2013)

 Before teachers can implement strategies and resources in their classroom and with their ELL students, these strategies and resources need to be researched and created in an effective manner. Just like the previous authors believe, they need to be of high quality and caliber.

 There are many strategies and resources available to teachers to use when ELL students are in their classroom. The following are some of the strategies:

* Jao cites in her article “The Multicultural Mathematics Classroom: Culturally Aware Teaching Through Cooperative Learning & Multiple Representations” that “One strategy for allowing these students to develop their language skills at a faster rate is to expose the students to concepts in which they are already proficient in their native language” (2012). She also suggests that teachers should “be sensitive to these differences and incorporate into the classroom ideas and procedures which will allow students to adapt to a new classroom community and achieve academic success” (2012). Next, Jao suggests using the cooperative learning instructional strategy with ELL students (2012). This mixes up the students by ability and allows students to work with their peers on mathematical concepts, through conversation, practice, student-led instruction, etc. Small groups can enhance the learning and understanding of each person in the group. It also allows for an opportunity to ask questions and have students explain concepts to one another. “Through interactions with English speakers of various abilities, ELLs can develop their language skills by working with their peers” (Jao, 2012). Lastly, Limin Jao suggests to use multiple representations when teaching ELL students. “The use of various representation forms, which help students to make connections and communicate their mathematical understanding in multiple representation forms, is another highly effective strategy” (Jao, 2012). This strategy not only works with ELL students, but with all types of students in a school because of the various learning styles that a school encompasses with its students.
* Christine Willig lists ten strategies to help ELL students in the mathematics classroom in her article with Rusty Bresser, Kathy Melanese, Christine Sphar, and Carolyn Felux entitled “10 Ways to Help ELLs Succeed in Math: Math can feel like a foreign language for everyone. Five experts share their best practices” (2009). The ten strategies are the following: “1. Create Vocabulary Banks, 2. Use manipulatives, 3. Modify teacher talk and practice wait time, 4. Elicit nonverbal responses, like a thumbs up or down, 5. Use sentence frames, 6. Design questions and prompts for different proficiency levels, 7. Use prompts to support student responses, 8. Consider language and math skills when grouping students, 9. Utilize partner talk, and 10. Ask for choral responses from students” (Willig, Bresser, Melanese, Sphar & Felux, 2009).
* Taube and Jasper suggest a “sheltered lesson” as a strategy to teach ELL students effectively in a mathematics classroom. The following is an example of a sheltered lesson given by Taube and Jasper:



* Kgomotso suggests code switching (alternately speaking in both languages of the ELL student) as a strategy to effectively teach mathematics to ELL students (2007). The author states that “In classroom situations, code switching is used for various reasons including reformulation of instructions, explanatory, and regulatory purposes (Setati, 1998; Garegae, 2001), for regaining students’ attention and clarification purposes (Adler, 1998), for invoking cultural values (Lin, 1996; Garegae, 2001), for communicating beliefs as well as expressing expectations and disappointments (Garegae, 2002a). All these functions of code switching enhance instructional practice.” (2007). There are three types of code switching that the author discusses: “Insertion of a word or phrase”, “Alternating sentences of different codes”, and “Sentence Translation” (2007).
* Higinio Domínguez suggests using the experiences and interests of ELL students in the mathematics classroom, specifically in the mathematics word problems presented to these students (2010). The following three things are ways that Domínguez suggests using ELL student interest: “1. Problems described situations that could in fact happen and for which students would not know the answer immediately. 2. When possible, I left out key information so students could supply it from their own repertoires of knowledge and familiarity with these contexts. 3. Problems followed the language students reported using in the activities, in order to avoid, or at least minimize, the possibility of turning a problem-solving task into a language task” (2010). Just as Kgomotso suggests using code-switching as a strategy, Domínguez also mentions in his article, *Using what matters to students in bilingual mathematics problems,* that “bilingualism research has demonstrated that bilinguals make strategic use of their two languages (either by code-switching or code-alternating) in order to maximize their mathematics performance, especially when the tasks they solve are challenging” (2010).

Kgomotso believes that “The importance of language proficiency in the learning of mathematics cannot be overemphasized” (2007). The only way for ELL students to understand mathematics is for them to develop a strong understanding of the language in which they are learning it, English. This is true for any content area, but especially for mathematics because of the different meanings that words and symbols hold. ELL students need to be equipped with the skills in mathematics to help them succeed later in life, not just in school. Teachers need to be trained to appropriately teach these students as well. With effective strategies and programs in place for ELL students, they will have all the necessary components for them to succeed in school and in mathematics.

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